

NOAA OAR Special Report

***PMEL Tsunami Forecast Series: Vol. 13***  
***A Tsunami Forecast Model for Wake Island***

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March 12, 2015

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Contribution No. 3375 from NOAA/Pacific Marine Environmental Laboratory  
Contribution No. 2090 from Joint Institute for the Study of the Atmosphere and Ocean (JISAO)

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# Foreword

Tsunamis have been recognized as a potential hazard to United States coastal communities since the mid-twentieth century, when multiple destructive tsunamis caused damage to the states of Hawaii, Alaska, California, Oregon, and Washington. In response to these events, the United States, under the auspices of the National Oceanic and Atmospheric Administration (NOAA), established the Pacific and Alaska Tsunami Warning Centers, dedicated to protecting United States interests from the threat posed by tsunamis. NOAA also created a tsunami research program at the Pacific Marine Environmental Laboratory (PMEL) to develop improved warning products.

The scale of destruction and unprecedented loss of life following the December 2004 Sumatra tsunami served as the catalyst to refocus efforts in the United States on reducing tsunami vulnerability of coastal communities, and on 20 December 2006, the United States Congress passed the "Tsunami Warning and Education Act" under which education and warning activities were thereafter specified and mandated. A "tsunami forecasting capability based on models and measurements, including tsunami inundation models and maps" is a central component for the protection of United States coastlines from the threat posed by tsunamis. The forecasting capability for each community described in the PMEL Tsunami Forecast Series is the result of collaboration between the National Oceanic and Atmospheric Administration office of Oceanic and Atmospheric Research, National Weather Service, National Ocean Service, National Environmental Satellite Data and Information Service, the University of Washington's Joint Institute for the Study of the Atmosphere and Ocean, National Science Foundation, and United States Geological Survey.

NOAA Center for Tsunami Research

## **Abstract**

The present study documents the development of a tsunami forecast model for the U.S. territory of Wake Island. Despite the small relevance of Wake Island as a population center, and its decreasing strategic importance in today's political landscape, the island remains an important reference point for tsunami forecasters. Due to its geographical location, unique topography, and its large distance to any continental platform that could interfere with a tsunami signal, the tide gauge on Wake Island can provide a clean and distinct signal of a tsunami in deep water. In order to guarantee the accuracy, robustness, and stability of the forecast model in an operational environment, 10 historical events have been simulated and results compared with tide gauge observations when these data were available. Additionally, the robustness of the model to very large events has been tested by simulating 18 synthetic,  $M_w=9.3$  events originating at different subduction zones in the Pacific. Results from both the historical and synthetic simulations show that Wake Island is particularly protected from tsunami impact. This may be due to the fact that the island is not located in the main beam of any of the events simulated and also to the absence of a continental shelf that could generate strong wave shoaling.

# Chapter 1

## Background and Objectives

The Pacific Marine Environmental Laboratory (PMEL) of the National Oceanic and Atmospheric Administration (NOAA) Center for Tsunami Research (NCTR) has developed a tsunami forecasting capability for operational use by NOAA's two Tsunami Warning Centers located in Hawaii and Alaska (Titov et al., 2005). The system is designed to efficiently provide basin-wide warning of approaching tsunami waves. The system, termed Short-term Inundation Forecast of Tsunamis (SIFT), combines real-time tsunami event data with numerical models to produce estimates of tsunami wave arrival times and amplitudes at a coastal community of interest. The SIFT system integrates several key components: deep-ocean, real-time observations of tsunamis, a basin-wide pre-computed propagation database of water level and flow velocities based on potential seismic unit sources, an inversion algorithm to refine the tsunami source based on deep-ocean observations during an event, and optimized tsunami forecast models.

Wake Island is an unincorporated territory of the U.S. located approximately 3,700 km (2,300 mi) west of the Hawaiian Islands. Its use is restricted to military operations and there are no indigenous or permanent residents on the island.

The first U.S. settlement on Wake Island dates back to 1899 when the island was selected for the site of a cable station. Following that, the island served as an air and naval base to the U.S. military until World War II, when Wake Island was temporarily captured by the Japanese, only to return to U.S. control after the war. The U.S. built aircraft landing facilities on the island to serve as an emergency landing site for aircraft flying over the Pacific. In August 2006, Wake Island was evacuated of military and civilian personnel due to the approach of category 5 typhoon Ioke. The effects of the typhoon on the island halted subsequent operations. A small group of contractors and military personnel has since returned to the island to conduct clean up and restoration tasks (source: Central Intelligence Agency World Fact Book, 2014).

Wake Island was one of the locations selected for the development of a tsunami warning model because, despite the limited human presence on the island, its low-lying topography makes it nearly impossible for any island residents to find shelter from large tsunami waves. A tsunami forecast model for the island would provide residents with timely and vital information to determine the best course of action in the event of a tsunami.

It can also be argued that the location of Wake Island, with its unique and deep bathymetric surroundings, provides an ideal opportunity for the Tsunami Warning Centers to gauge propagating tsunami waves in deep water. In this regard, the absence of a continental shelf or any other surrounding islands will minimize the interaction of the tsunami wave with the local bathymetry, allowing the island's tide gauge to perform almost as an additional Deep-water



Assessment and Reporting of Tsunamis (DART<sup>®</sup>) system.

The existence of a National Ocean Service tide gauge on the island, established on 29 May 29 1950 and operated by a National Weather Service office located at the U.S. Army base, is crucial for the development of a tsunami forecast model, since it provides historical data for model validation and the possibility of quantitative assessment of model accuracy and performance in future events.

This report details the development of a high-resolution tsunami forecast model for Wake Island, including development of the bathymetric grids, model validation with historic events, and stability testing with a set of synthetic mega-tsunami (Mw 9.3) events. Inundation results from such events are also presented in later sections.

## Chapter 2

# Forecast Methodology

A high-resolution inundation model was used as the basis for the operational forecast model to provide an estimate of wave arrival time, height, and inundation immediately following tsunami generation. Tsunami forecast models are run in real time while the tsunami in question is propagating across the open ocean. These models are designed and tested to perform under very stringent time constraints, given that time is generally the single limiting factor in saving lives and property. The goal is to maximize the amount of time that an at-risk community has to respond to the tsunami threat by providing timely and accurate information.

The tsunami forecast model, based on the Method of Splitting Tsunami (MOST), emerges as the solution in the SIFT system by modeling real-time tsunamis in minutes while employing high-resolution grids constructed by the National Geophysical Data Center (NGDC) or, in limited instances, internally. Each forecast model consists of three telescoped grids with increasing spatial and temporal resolution for simulation of wave inundation onto dry land. The forecast model utilizes the most recent bathymetry and topography available to reproduce the correct wave dynamics during the inundation computation. Forecast models are constructed for at-risk populous coastal communities in the Pacific and Atlantic oceans. Previous and present development of forecast models in the Pacific (Titov et al., 2005; Titov, 2009; Tang et al., 2009; Wei et al., 2008) have validated the accuracy and efficiency of the forecast models currently implemented in the SIFT system for real-time tsunami forecast. The system is also a valuable tool in hindcast research. Tang et al. (2009) provides forecast methodology details.

## Chapter 3

# Model Development

Modeling of coastal communities is accomplished by development of a set of three nested grids that telescope down from a large spatial extent to a grid that finely defines the localized community. The basis for these grids is a high-resolution digital elevation model (DEM) constructed by either NCTR or, more commonly, by NGDC using best available bathymetric, topographic, and coastal shoreline data for an at-risk community. For each community, data are compiled from a variety of sources to produce a digital elevation model referenced to Mean High Water in the vertical and to the World Geodetic System 1984 in the horizontal (<http://ngdc.noaa.gov/mgg/inundation/tsunami/inundation.html>). From these digital elevation models, a set of three high-resolution reference models are constructed and then "optimized" to run in an operationally specified period of time.

The bathymetry and topography used in the development of this forecast model was based on a digital elevation model provided by the NGDC and the author considers it to be an adequate representation of the local topography/bathymetry. As new digital elevation models become available, forecast models will be updated and report updates will be posted at [http://nctr.pmel.noaa.gov/forecast\\_reports](http://nctr.pmel.noaa.gov/forecast_reports).

### 3.1 Forecast area

Wake Island is an atoll comprised of three islets in the central Pacific Ocean. The three islets Wilkes, Peale, and Wake are connected by causeways and sit on a 7.2 km (4.5 mile) long, 3.2 km (2 mile) wide reef enclosing a lagoon that is also the crater of an underwater volcano. Their total land area is 6.5 square km (2.5 square miles) and the maximum elevation is 6 meters (21 feet) above sea level. Figure 1 is a map of Wake Island, showing the relative position of the three islets and the location of the island's tide gauge between Wilkes and Wake Island. (Encyclopedia Britannica, 2014)

### 3.2 Historical events and data

The tide gauge on Wake Island was installed on 29 May 1950 and re-deployed at its current location (166.6177° E, 19.2906° N) along the small boat channel on the southern coast of the island on 20 January 1989. Acceptable quality data from the Wake Island tide gauge were found for 4 of the 10 historic events (see Table 1), used in the validation of the tsunami model for the

island: 1994 Kuril, 1996 Andreanof, 2006 Kuril, and 2007 Kuril. For the other events listed in Table 1, the data were either not available or the signal-to-noise ratio of the time series was too low to accurately identify the tsunami. The original time series were then band-passed filtered between periods of 2 min to 2.5 hr using a Butterworth filter. This frequency band captures tsunami waves while discarding higher frequency components due to the effect of ocean swell and lower frequencies associated with tidal oscillations.

The results of modeling a large number of events in Wake Island suggest that the island is relatively well protected from tsunami inundation. This may be due to its small size and deep bathymetric surroundings or to the presence of a coral reef that almost completely encloses the island, but most likely to a combination of both of these. Few of the tested events and none of the historical ones have caused significant inundation on the island. Moreover, neither of the two largest historical events in the Pacific Ocean since the inception of tide gauge operations at Wake Island, the 1960 Chile and 1964 Gulf of Alaska events, showed large tsunami waves at the gauge. Waves from the 1964 event were on the order of 20–30 cm (peak-to-trough), whereas those for the 1960 event show maximum wave heights of approximately 80 cm. These two events have not been included in the list of simulated historical tsunamis due to the lack of reliable tsunami sources for them; however, their recorded tide gauge data are presented in Figures D.1 and D.2 Supplementary Material (Appendix D) for reference.

### 3.3 Model setup

Setup of the computational grids for the MOST code (Titov, 1998) requires a total of three nested grids for which the outer grid A has the lowest spatial resolution, but covers the largest area, and the inner grid C has the highest spatial resolution, but covers a reduced geographical area. The code makes use of an additional intermediate grid B with medium resolution and spatial coverage. Each interior grid is fully enclosed in the area covered by its immediate exterior grid, and inundation is computed only in the innermost grid (Grid C). The purpose of the set of three nested grids is to ensure that as the tsunami wavelength shrinks when it travels from deep to shallow waters, the model maintains an approximately constant number of grid nodes per wavelength.

During the development of an operational forecast model, a higher-resolution set of grids, referred to as the reference model, is generated first. The purpose of the reference model is to evaluate grid convergence between a high-resolution model and the forecast model, ensuring that the solution obtained with the lower-resolution forecast model is consistent with that computed with the high-resolution reference model.

In the case of Wake Island, due to the absence of a continental shelf, the tsunami will most likely not shorten its wavelength significantly until it reaches the immediate vicinity of the island. Because there are no neighboring coastlines for the tsunami to interact with, there is, therefore, no need for extensive area coverage with A or B grids. However, due to the presence of a shallow coral reef, responsible for the generation of high-frequency waves surrounding the island, the resolution of grid B was kept relatively high (3 arc seconds), even in the forecast model. An effort was made to include almost the entire island within the C grid of the forecast model; however, due to the large area covered by the island and its surrounding reef, the need to maintain a relatively high grid resolution, and the limited amount of processing time to execute an operational forecast model, a decision was made to center the forecast grid C around

the tide gauge location, resulting in the exclusion of part of the coral reef on the western side of the island.

Because reference grid A was designed with smaller coverage than normal due to the absence of a continental shelf, the same grid A was used for both the reference and forecast model without any modification.

Figure 2 shows an aerial view of Wake Island, and Figures 3 and 4 show grid areas and relative position with respect to the island for the reference and forecast models, respectively. Table 2 summarizes the parameters and model setup for each set of grids.

The original bathymetric and topographic grid data used in the development of the Wake Island model were provided by NGDC. Details of data gathering and grid construction techniques used by NGDC in the generation of the original grid are provided by Medley et al. (2009).

## Chapter 4

# Results and discussion

Three types of tests were performed to assess the forecast model convergence, accuracy, and robustness characteristics. To assess model convergence, results obtained with the reference model were compared with those obtained with the forecast model to confirm consistency of results, at least for the leading tsunami waves. This type of test is not, strictly speaking, a grid convergence test such as is used in computational science, since the solution is compared using grids with varying resolution, coverage, and bathymetric information; however, it provides a good estimate of the similarities and discrepancies between the solutions of a more accurate, high-resolution reference model of the area and that of a coarser-resolution run-time optimized forecast model.

The accuracy of both the reference and forecast models is evaluated by comparing modeled and recorded data for a set of historical events.

Robustness tests include the simulation of 18 tsunamis generated by Mw 9.3 earthquakes throughout the Pacific Basin and a single micro-tsunami event ( $\alpha = 0.1$ ). Figures 5 and 6 show the epicenter of the historical events and center of the rupture segment for each of these synthetic events, respectively. The forecast model was verified to run smoothly, without instabilities during 24 hours of simulation for each of these mega-tsunami events.

### 4.1 Model validation

Model validation using historical events is typically done by comparing the modeled signal with the signal recorded by the tide gauge. In the case of Wake Island, the tide gauge is located in a small boat harbor on the south side of the island. The harbor is connected to the open ocean by an approximately 30 m wide, 450 m long channel. Tsunami wave dynamics were hard to capture inside the small boat harbor even at 1/3-arc sec ( $\sim 10$  m) reference grid resolution, most likely due to the difficulty in representing the narrow channel. At forecast model resolution of one arc sec ( $\sim 30$  m), no more than one grid node is available to capture the width of the channel. To ensure accuracy of model prediction at the tide gauge location, an additional time series located outside the small boat harbor at the entrance of the channel ( $166.6140^\circ$  E,  $19.2895^\circ$  N), and referred to henceforth as sample point 2, was selected for comparison.

Comparison results at the tide station for the reference and forecast models are presented in Figures 7 through 16, with Figures 8, 9, 12, and 13 also displaying tide gauge data for those events. Plots of the comparison at sample point 2 are shown in Figures D.3 through D.12 in

Supplementary Material (Appendix D). The results reflect an almost peak-to-peak agreement between the forecast and reference models in most cases. This comparison is particularly good in water level signals taken at sample point 2. The largest discrepancies between the reference and forecast models resulted from the 1946 Unimak event, showing approximately 20% discrepancy in the maximum amplitude of the signal, but almost peak-to-peak correlation even in later waves, and the 2007 Kuril, 2003 Rat Island, and 2006 Tonga events, with good maximum amplitude correlation, but some discrepancies in the simulation of later waves.

The accuracy of both the forecast and reference model was examined for the 1994 Kuril, 1996 Andreanof, 2006 Kuril, and 2007 Kuril in Figures 8, 9, 12, and 13. For all of these cases but the 2006 Kuril event, both the reference and model series were able to capture the arrival time, wave period, and overall magnitude of the event. Results for the 2006 Kuril event showed wave amplitudes approximately half the size of those recorded at the tide gauge.

In addition to tide gauge comparisons, maximum sea level elevation at each point on the grid for every event simulated were computed and compared between the reference and forecast models. Figures 17 through 26 show similarities and discrepancies between models for each of the 10 historical scenarios used. In general, agreement on the southern section of the island was very good. However, the area surrounding the entrance channel to the internal lagoon and separating Peale Island from Wake Island seems to display consistently low values in the forecast runs when compared with the reference runs. A possible solution to this effect could be the extension of the intermediate grid B further north, but this possibility has not been investigated.

## **4.2 Model stability testing using synthetic scenarios**

During model stability testing, 18 mega-tsunami (Mw 9.3) events were simulated using the forecast model. Details of the 18 synthetic events tested can be found in Table 3. Each of these extreme synthetic events is constructed along a 1000 km long x 100 km wide fault plane with uniform slip amount of 29 m along the fault. The output from the code at every time step was visualized and inspected for instabilities. The cause of any instability was corrected and a final set of forecast grids emerged from the process. As in the case of historical events, the maximum water elevation at every point in the computational grid was recorded for each scenario. Although the original purpose of the stability tests is not to provide hazard assessment for the island, it is important to notice that the maximum wave height tends to occur inside the small boat harbor. The highest sea level elevation recorded at this point was 1.4 m (wave amplitude), originating in the Kuril Islands. None of the mega-tsunami events tested on the grids generated substantial flooding on the island. Results are presented in Figures 27 to 44. Time series of the tsunami signal at the Wake Island's tide gauge for the 18 synthetic Mw 9.3 events can be found in Figures D13 through D15 in Appendix D.

In addition to the 18 Mw 9.3 events, the stability of the model to a micro-tsunami (Mw 6.8) event is also tested by making sure that no spurious oscillations develop during the simulation of a small tsunami. For this particular study, the small event was selected off the coast of Chile and was generated by rupture of a single unit source with a slip amount of 0.1 m. This source appears listed in Table 3 as synthetic case 19. During the simulation of this event, no spurious oscillations were observed. Results showing the maximum water elevation at every point for this event are reflected in Figure 45.

## Chapter 5

# Summary and conclusions

A set of tsunami forecast grids for Wake Island have been developed for operational use by the Tsunami Warning Centers. Two sets of grids were developed: a high-resolution set intended to provide reference values, and a forecast set designed to minimize processor run time and to provide real-time tsunami estimates on Wake Island.

During model development, some geographical characteristics unique to Wake Island, such as the presence of a coral reef and the absence of shallow areas near the island, were factored into the grid design. After simulation of 10 historical events and 18 synthetic events, it becomes evident that these unique geographical features may be attenuating the impact of a tsunami on the island. The absence of shallow areas in the vicinity of the island probably prevents a wave from shoaling and gaining elevation as it approaches the coastline, and the presence of a coral reef surrounding the island serves as a natural breakwater, reflecting part of the tsunami energy away from the island. Minimum inundation was observed on the island, most of it located in the narrow channels separating Peale Island from Wake and Wilkes islands.

The presence of the shallow coral reef, however, makes it impossible to sub-sample the grid significantly while still resolving high-frequency waves generated by the reef. This results in Wake Island being one of the highest resolution forecast models developed, which translates into longer execution time, resulting in 4 hr of simulation time performed in just over 15 minutes on an Intel Xeon 3.6 GHz processor.



## **Chapter 6**

# **Acknowledgments**

This research is funded by the NOAA Center for Tsunami Research (NCTR). The authors would like to thank the modeling group of NCTR for their helpful suggestions and discussions. This publication was partially funded by the Joint Institute of the Atmosphere and Ocean (JISAO) under NOAA Cooperative Agreement Numbers NA10OAR4320148 and NA08OAR4320899. This is JISAO contribution number 2090 and PMEL contribution number 3375. Special thanks to Nazila Merati, Yong Wei and Jean Newman for creating Appendix C of this report.

## Chapter 7

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# FIGURES

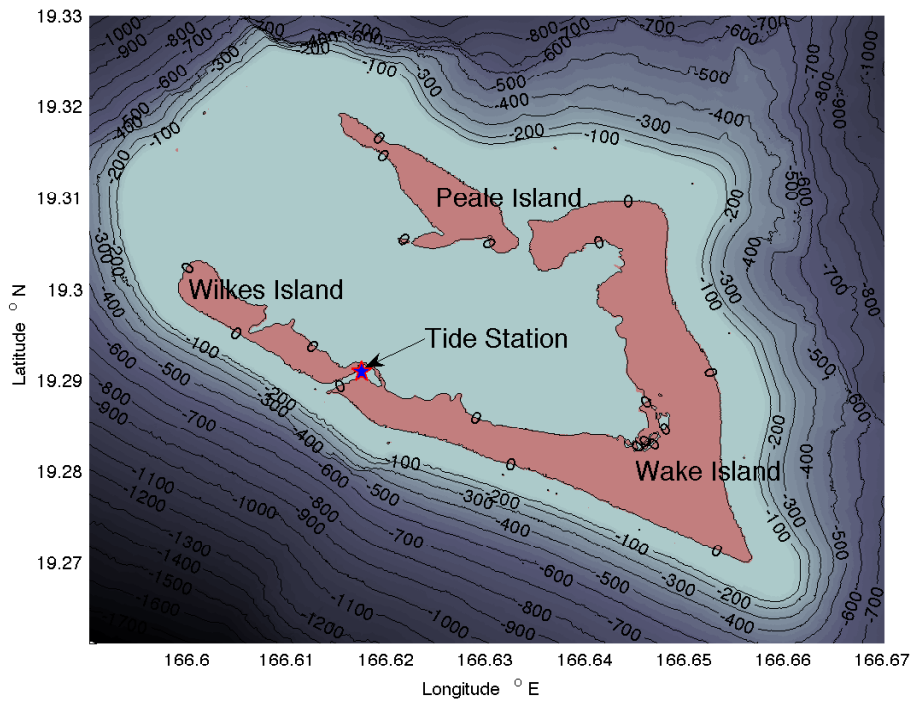


Figure 1: Geographic map of the Wake Island area showing the relative position of the three islands in the atoll (contour lines every 100 m). The star symbol indicates the location of the tide gauge.



Figure 2: Aerial view of Wake Island taken from the northwest showing the causeway between Peale and Wake islets to the right of the image.

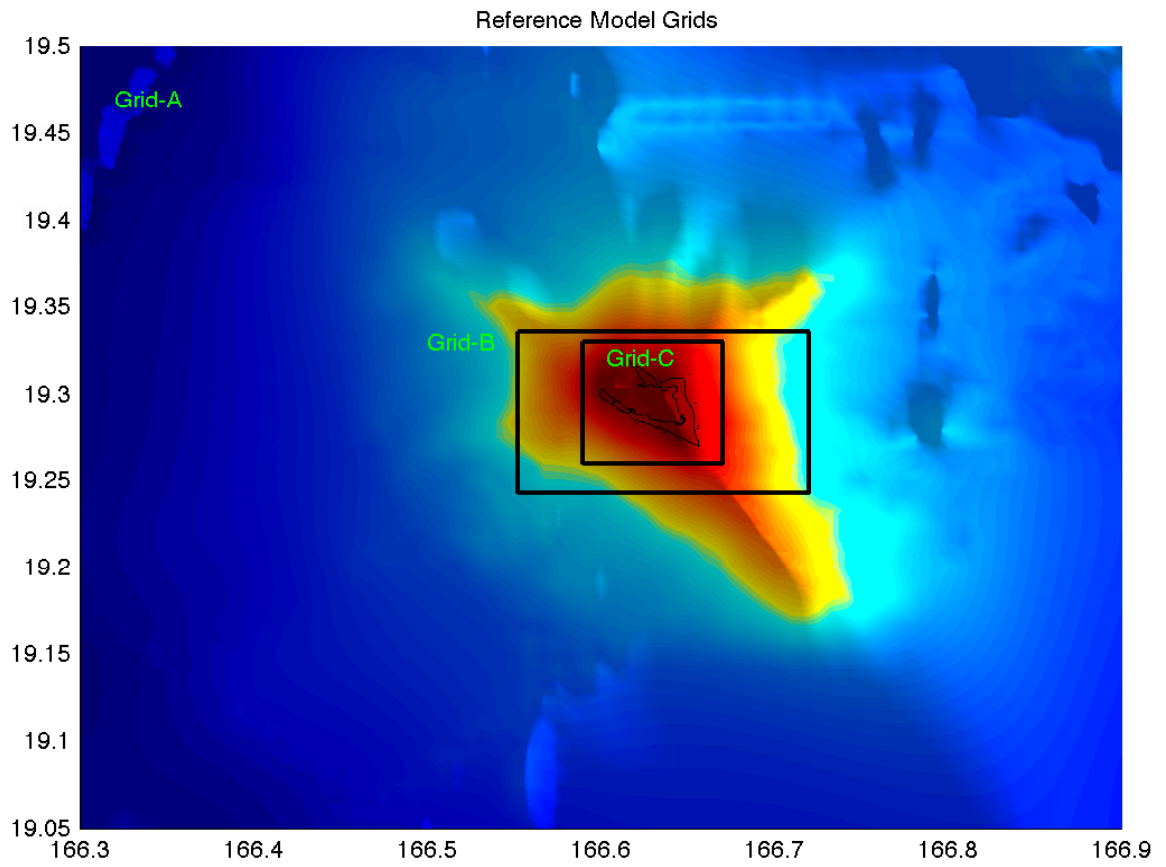


Figure 3: Map of the Wake Island atoll showing the relative position of the reference model grids.

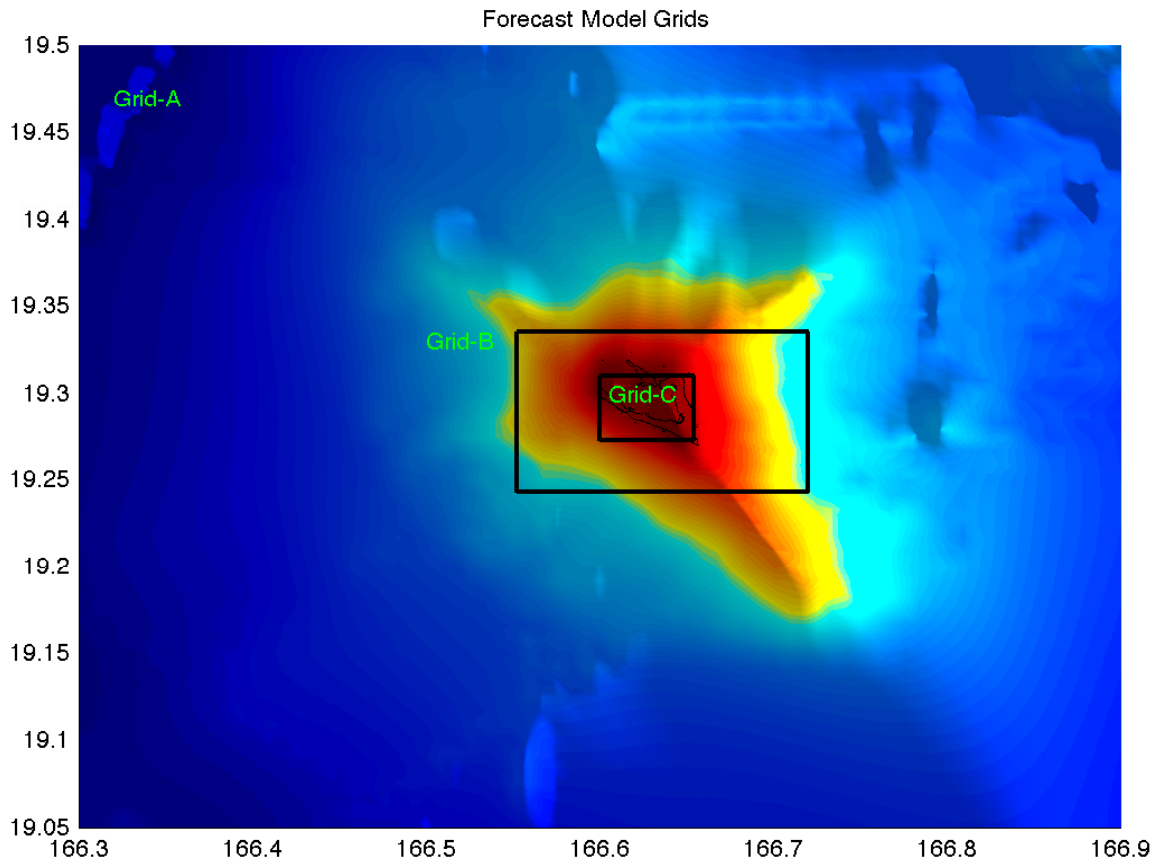


Figure 4: Map of the Wake Island atoll showing the relative position of the forecast model grids.

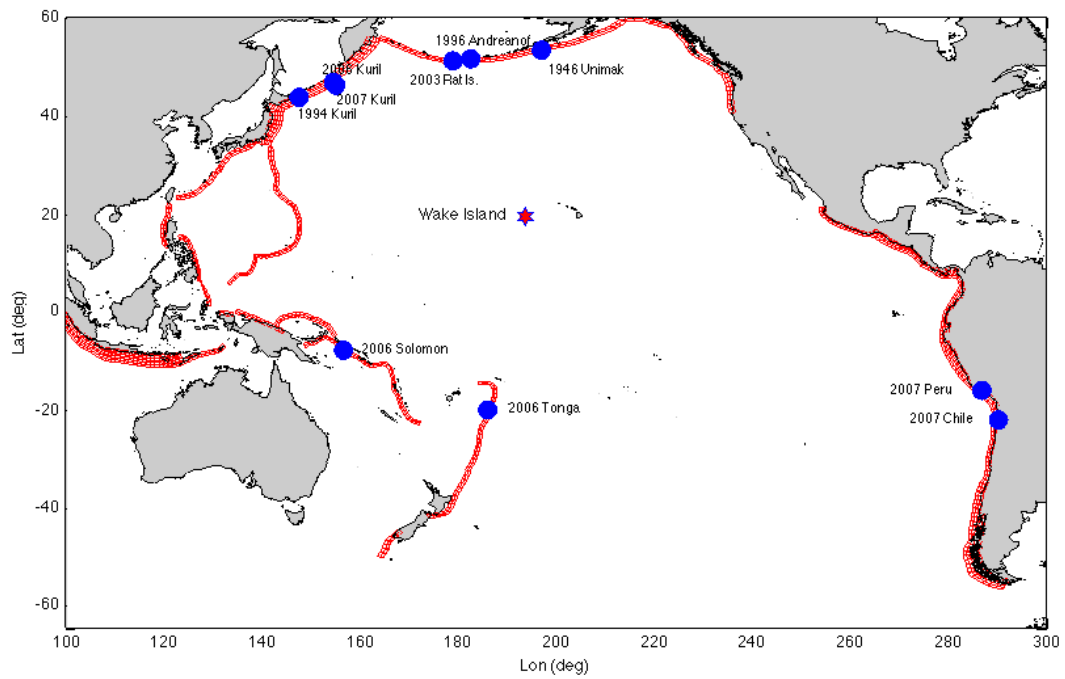


Figure 5: Location of the 10 historical events used in the model validation tests, showing the relative position of Wake Island to the epicenter locations.



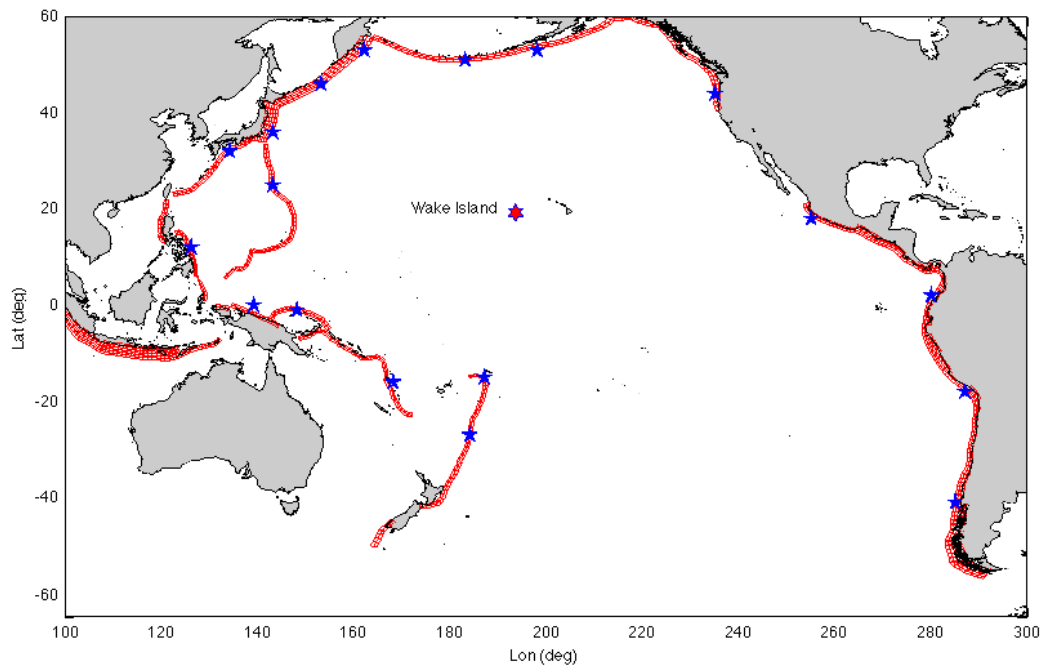


Figure 6: Location of the mid-rupture point of the 18 synthetic ( $M_w=9.3$ ) events used in the model robustness tests, showing the relative position of Wake Island to the epicenter locations.

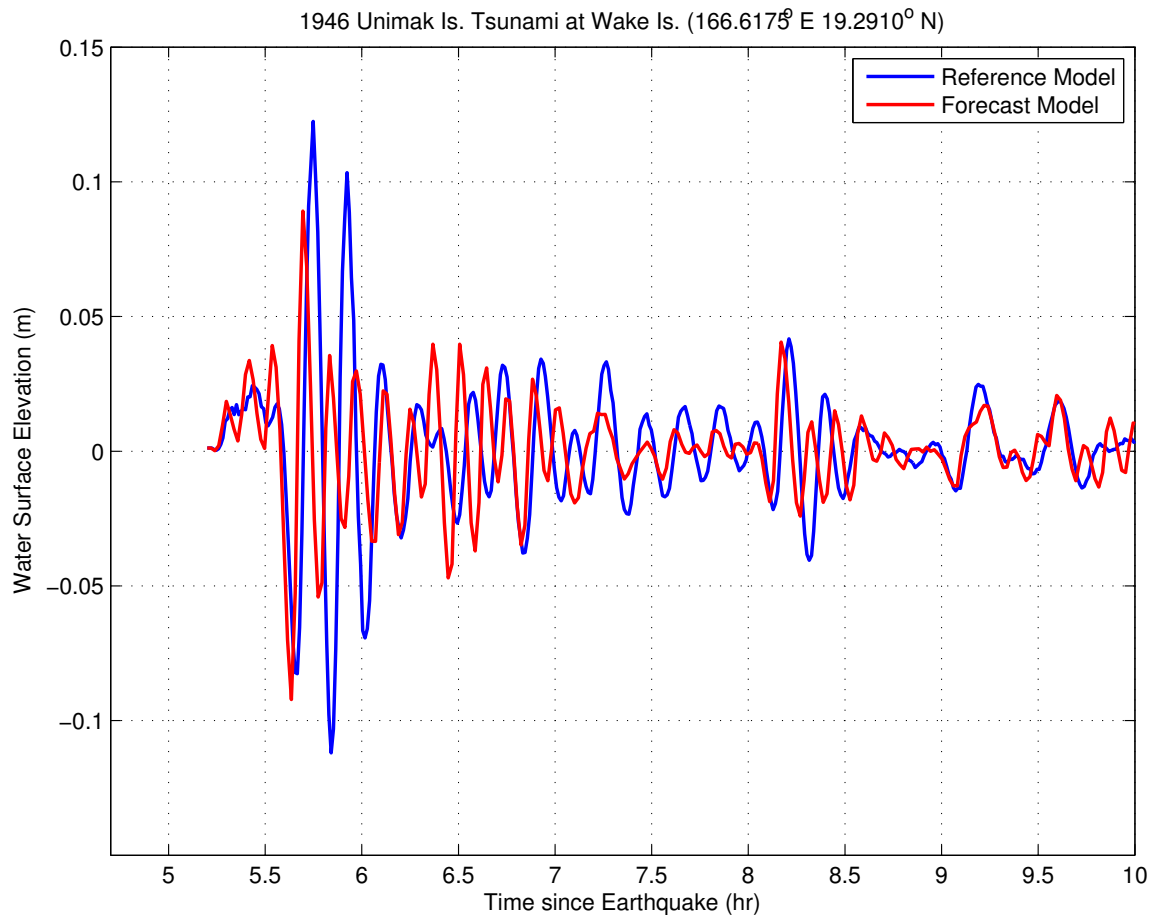


Figure 7: Comparison at the Wake Island tide gauge of the forecast and reference models for the 1946 Unimak Island tsunami.

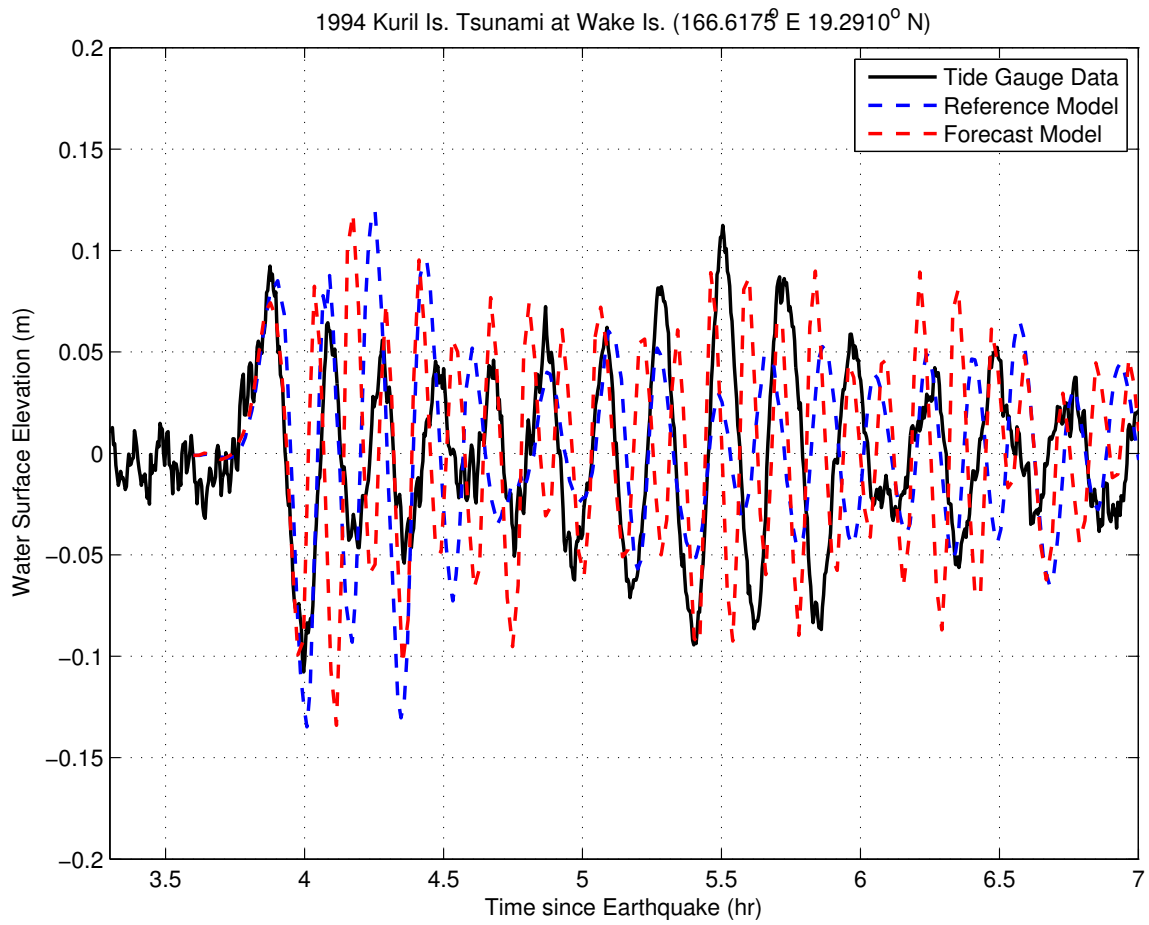


Figure 8: Comparison at the Wake Island tide gauge of the forecast and reference models for the 1994 Kuril Island tsunami with observed data.

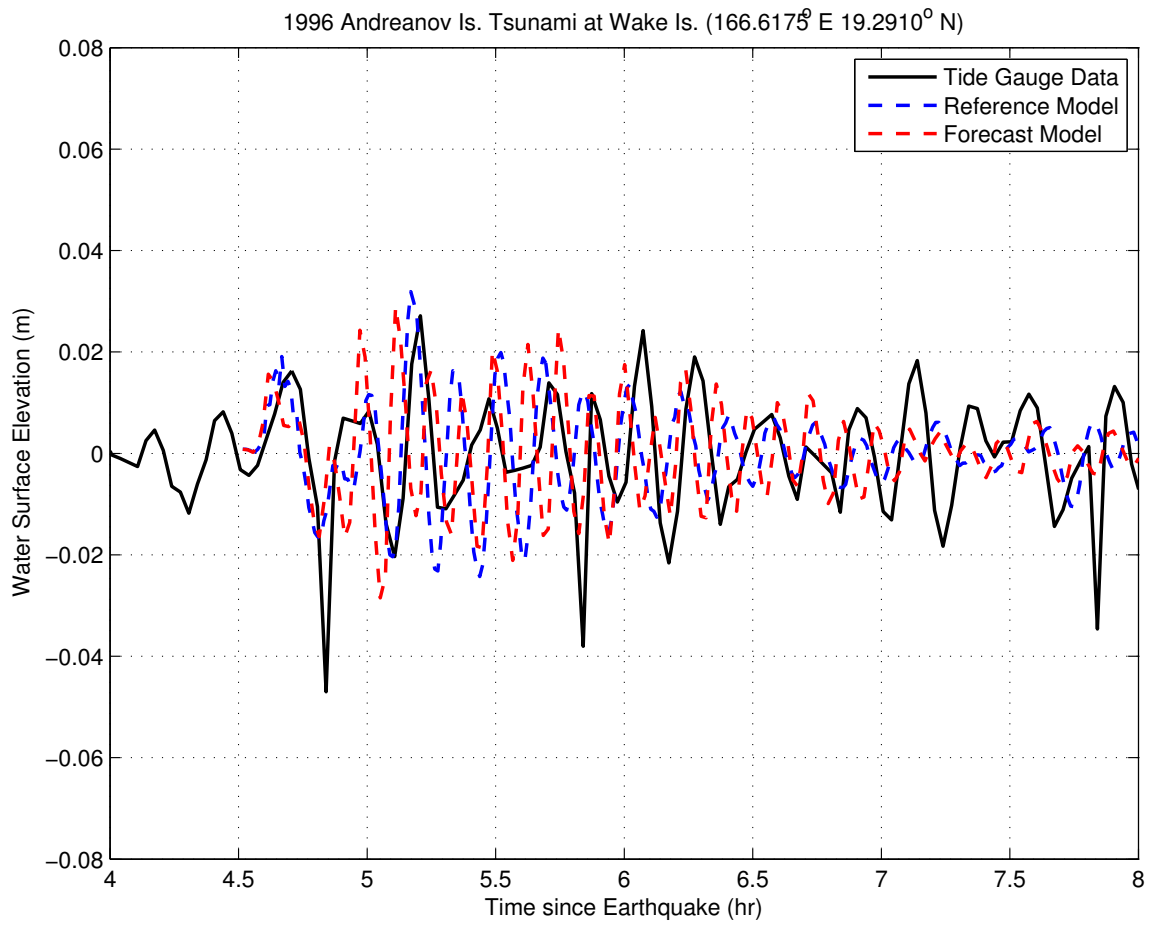


Figure 9: Comparison at the Wake Island tide gauge of the forecast and reference models for the 1996 Andreanof Island tsunami with observed data.

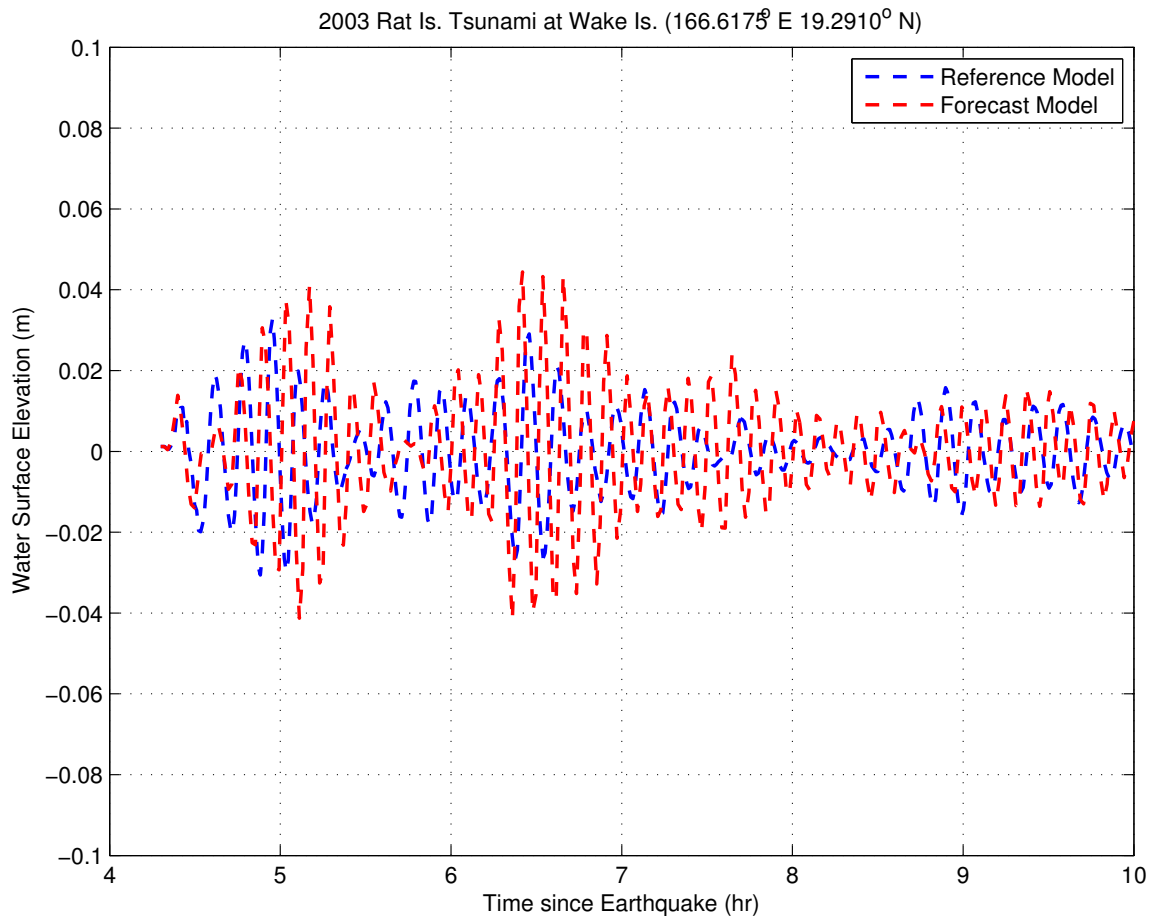


Figure 10: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2003 Rat Island tsunami.

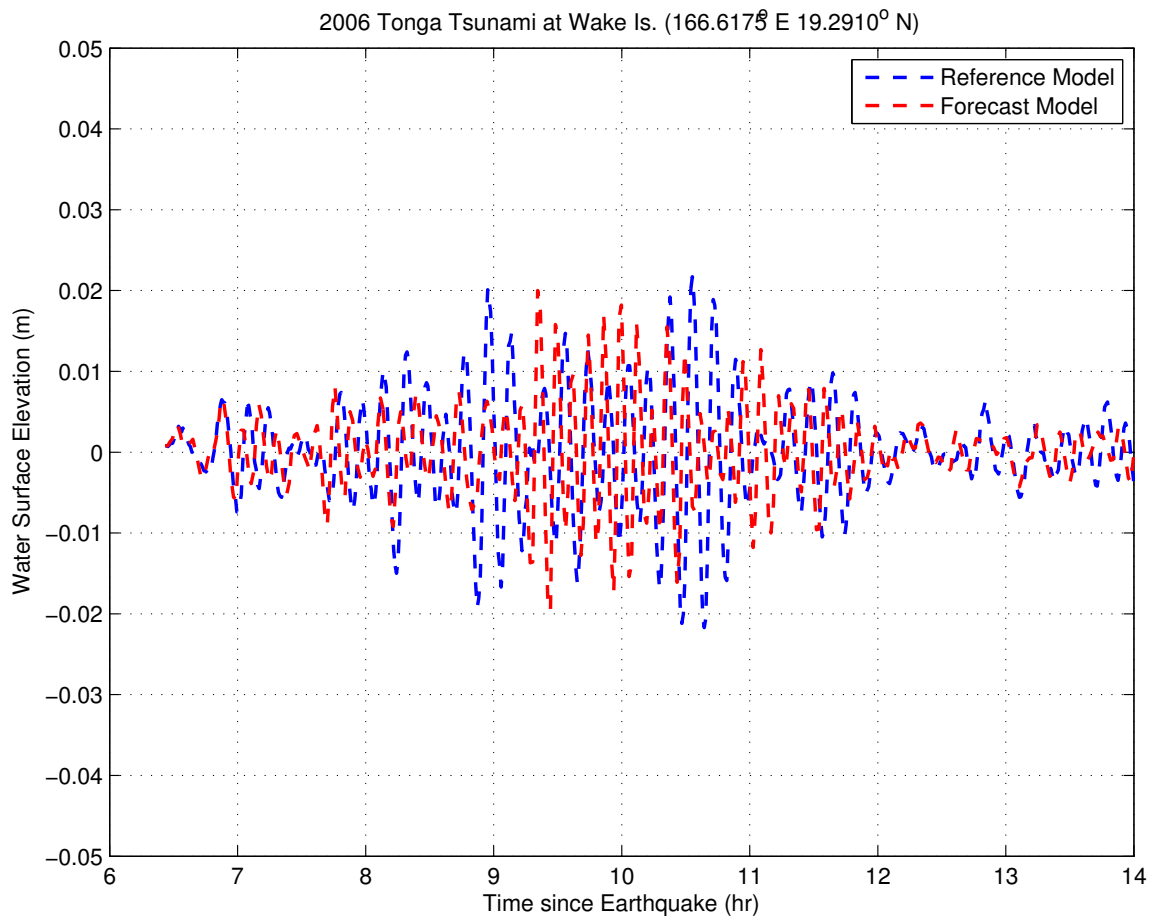


Figure 11: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2006 Tonga tsunami.

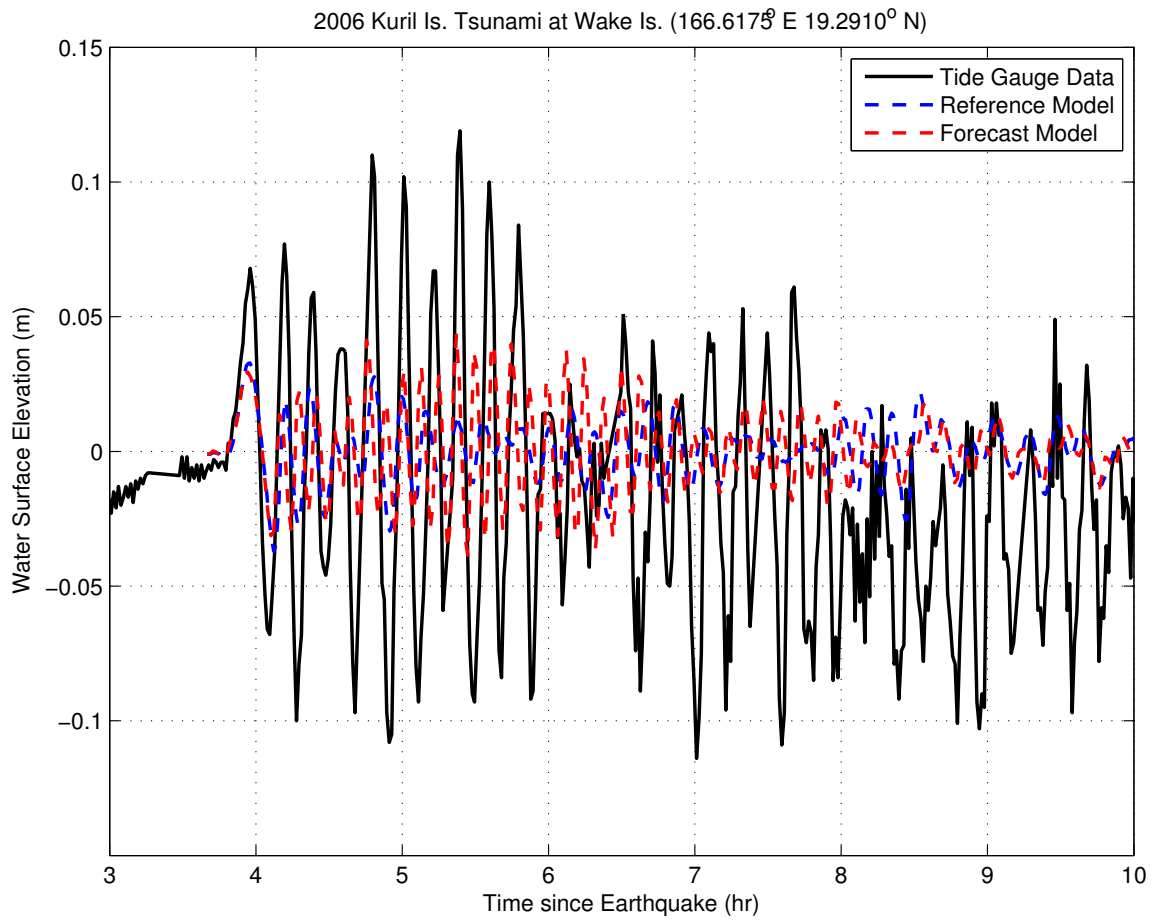


Figure 12: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2006 Kuril Island tsunami with observed data.

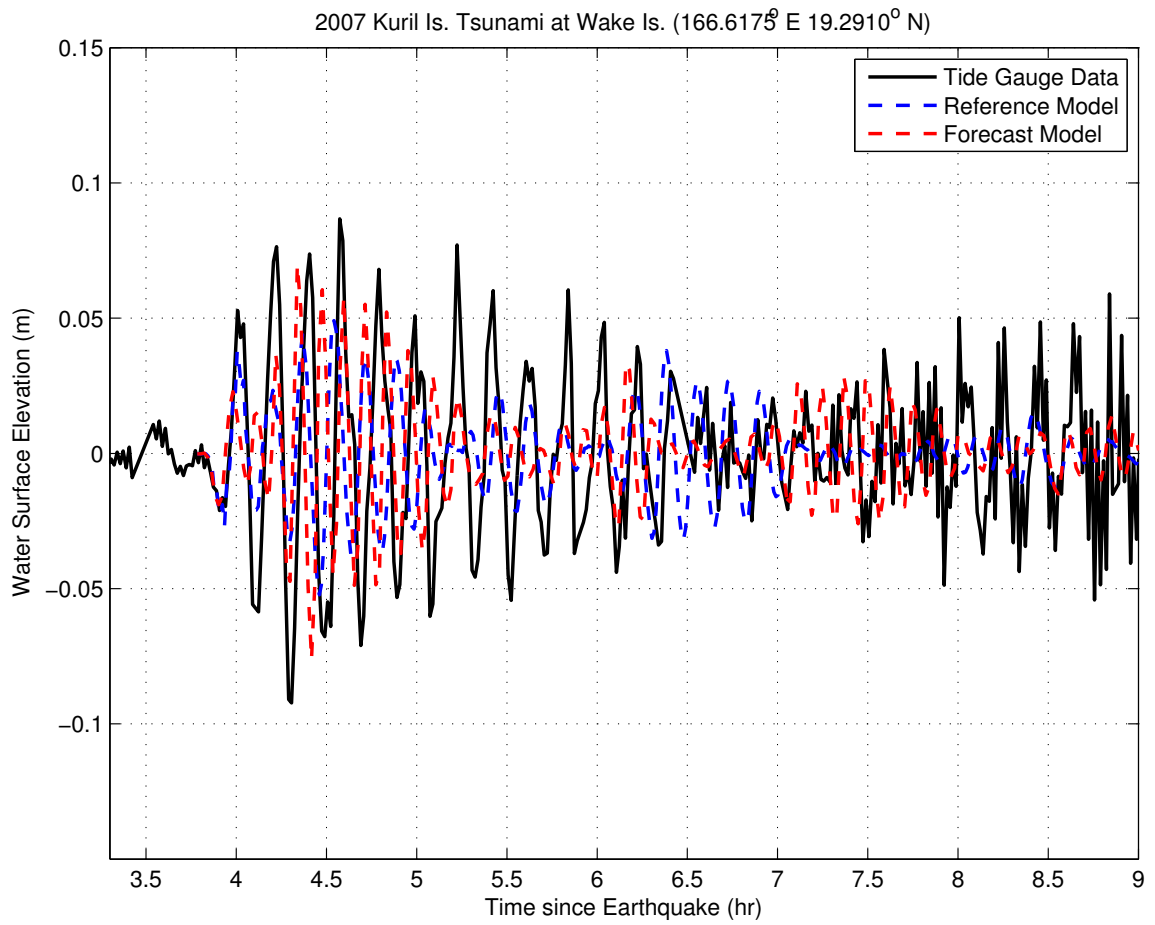


Figure 13: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2007 Kuril Island tsunami with observed data.



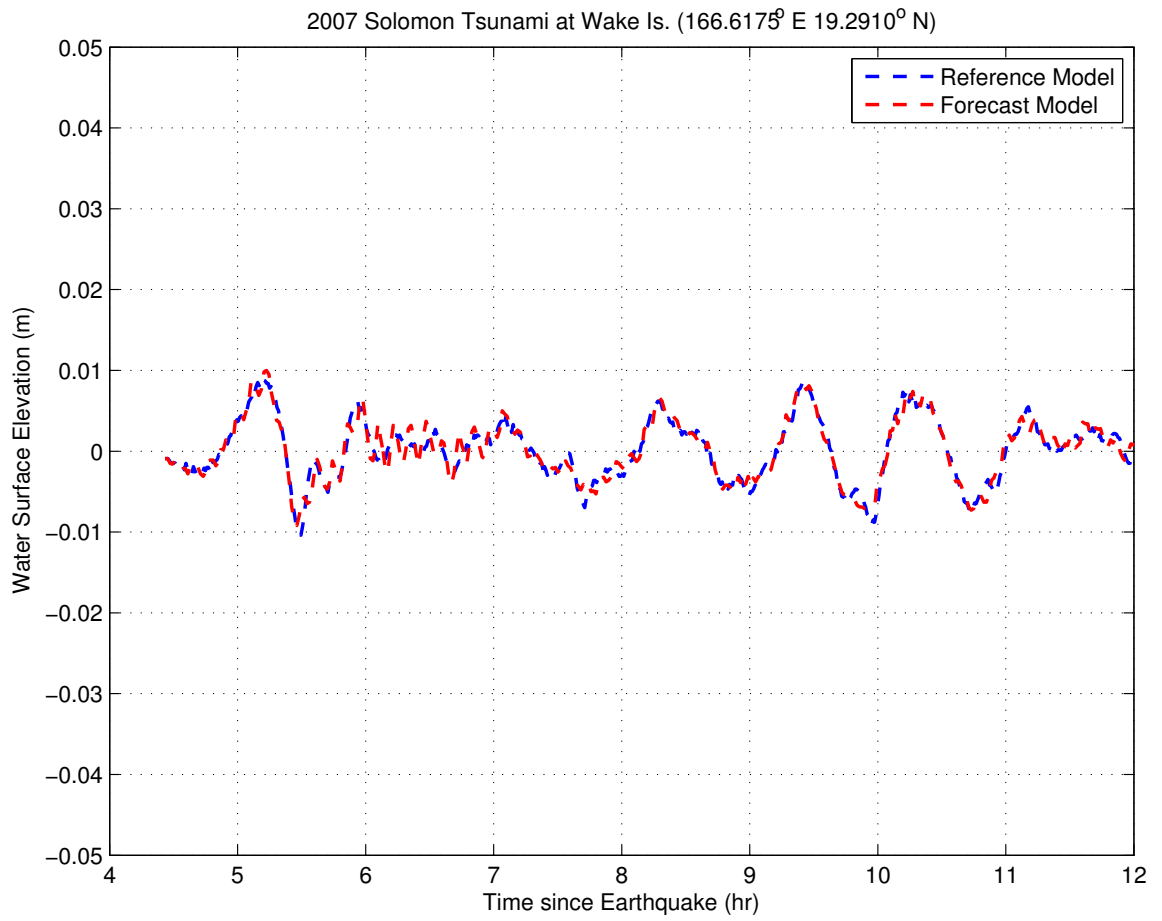


Figure 14: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2007 Solomon Island tsunami.

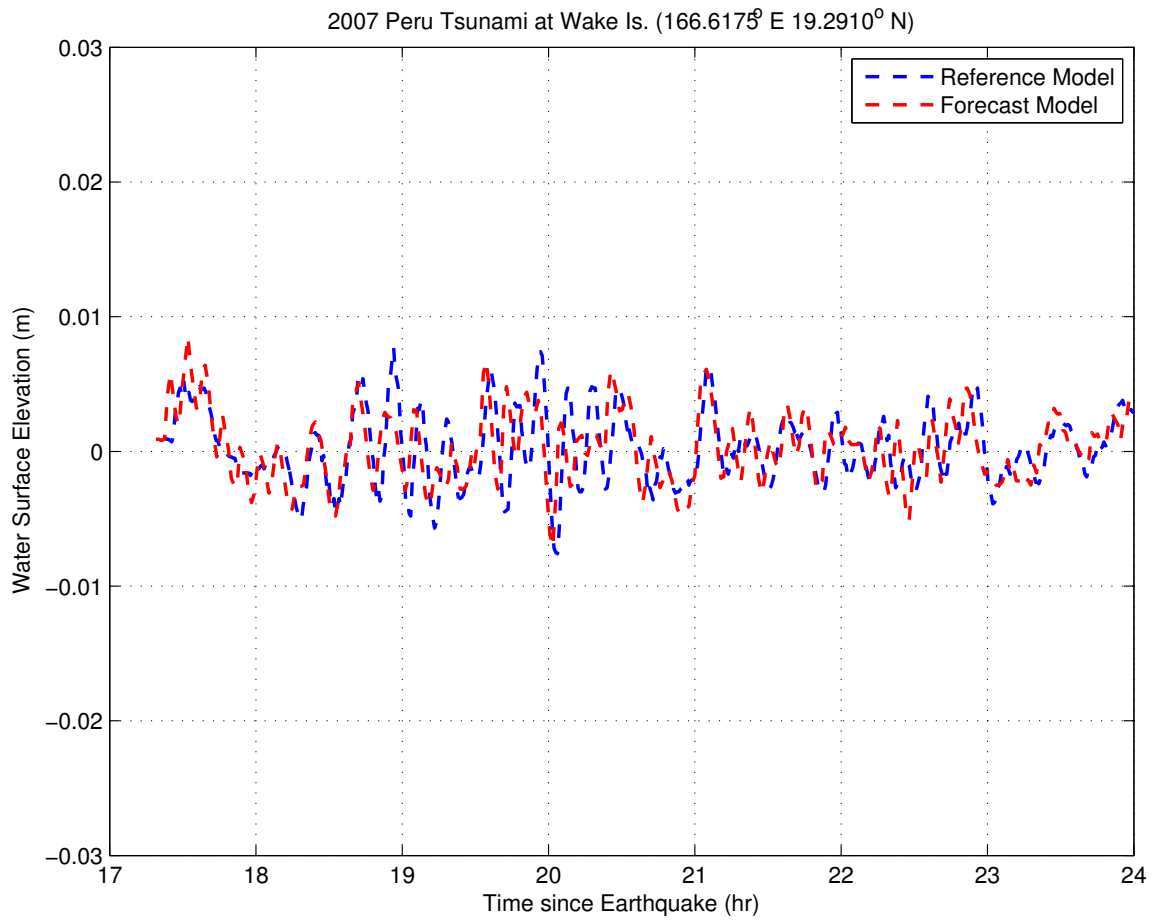


Figure 15: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2007 Peru tsunami.

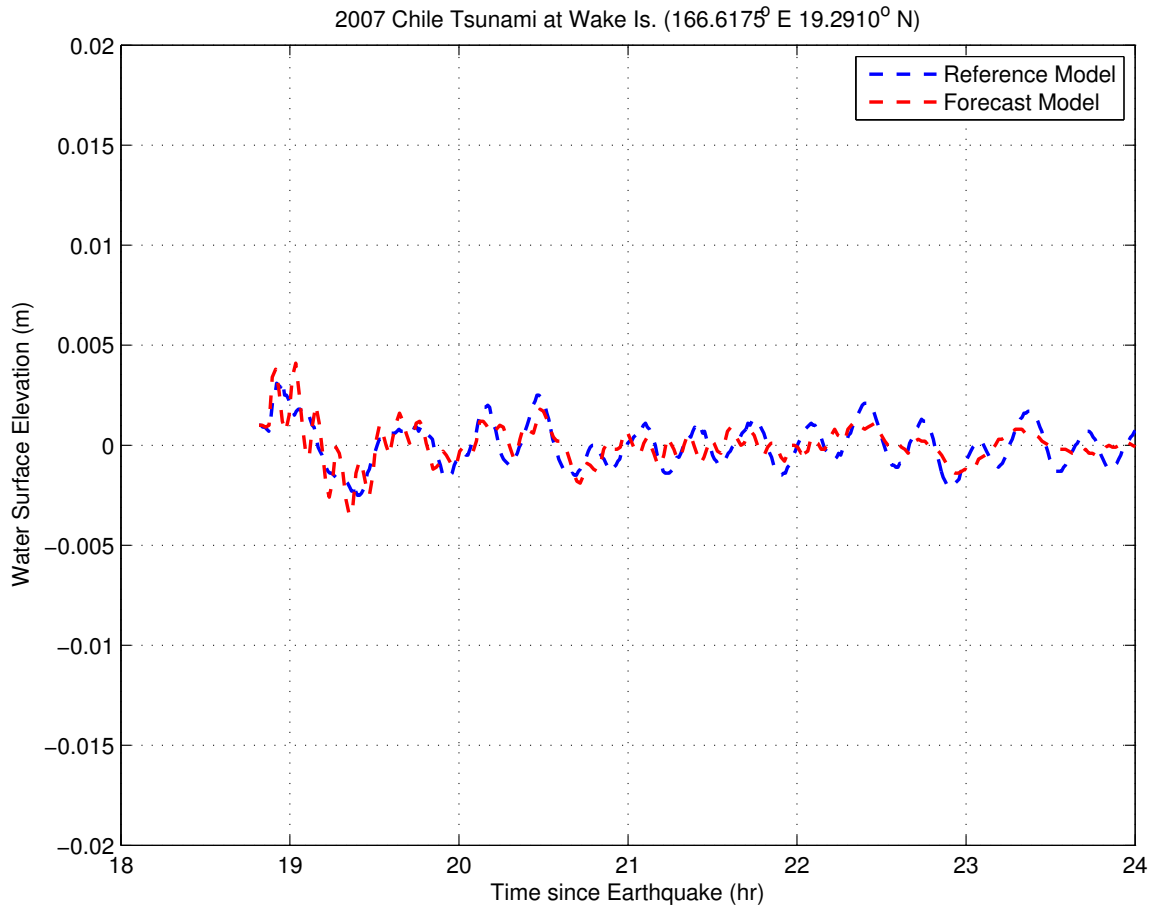


Figure 16: Comparison at the Wake Island tide gauge of the forecast and reference models for the 2007 Chile tsunami.

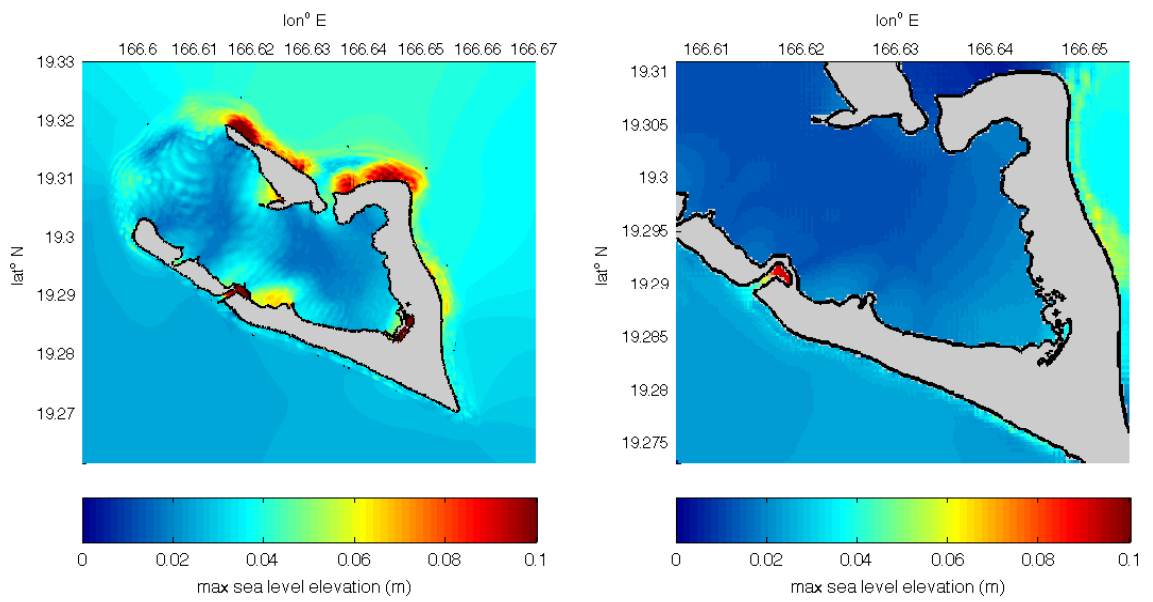


Figure 17: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 1946 Unimak Island tsunami.

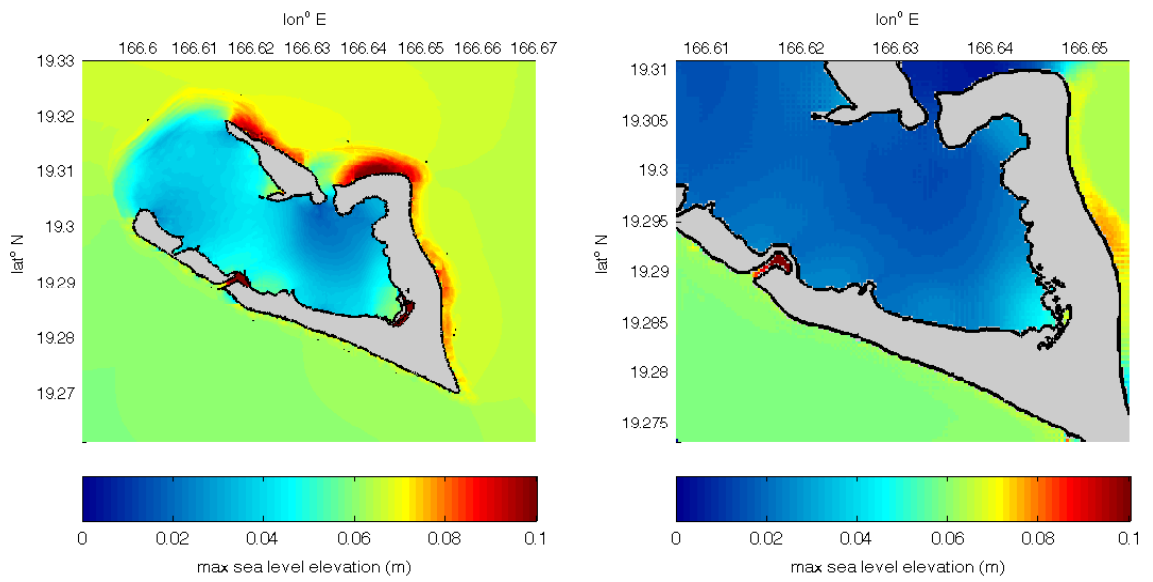


Figure 18: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 1994 Kuril Island tsunami.

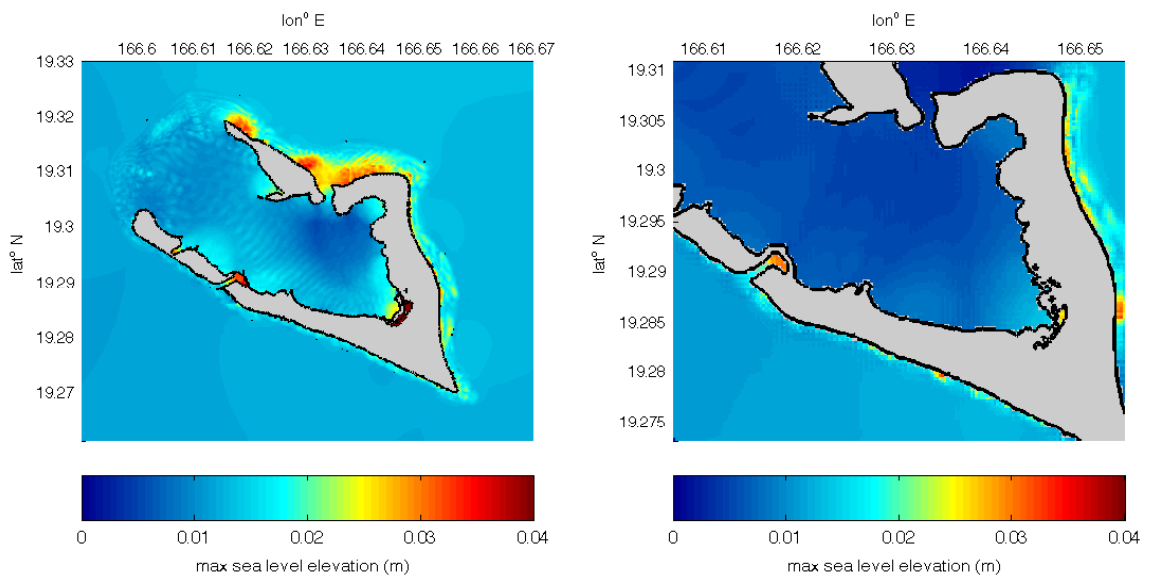


Figure 19: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 1996 Andreanof Island tsunami.

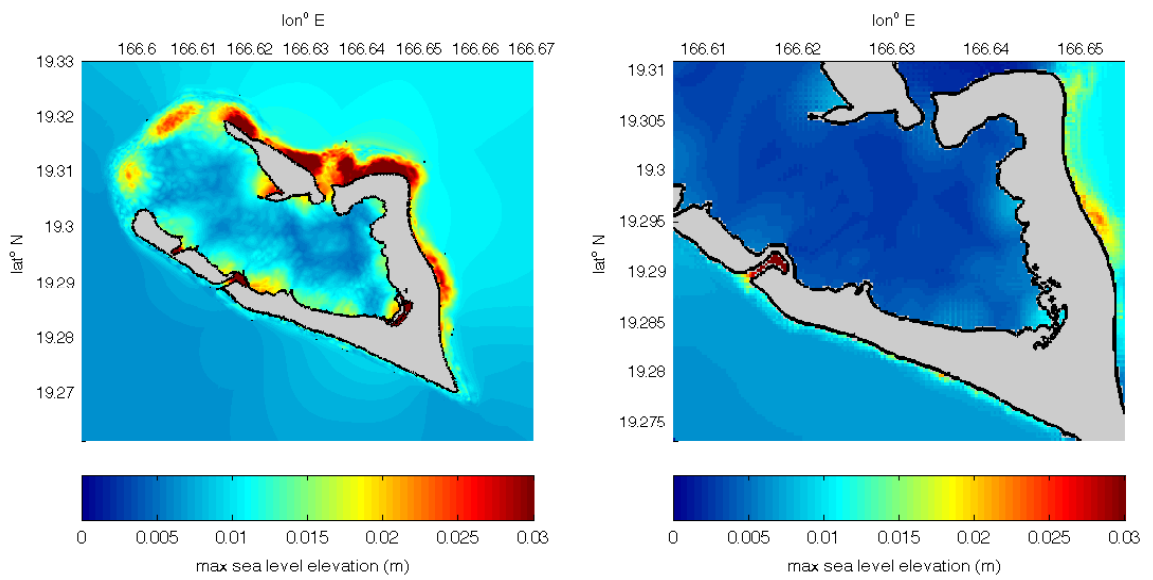


Figure 20: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2003 Rat Island tsunami.

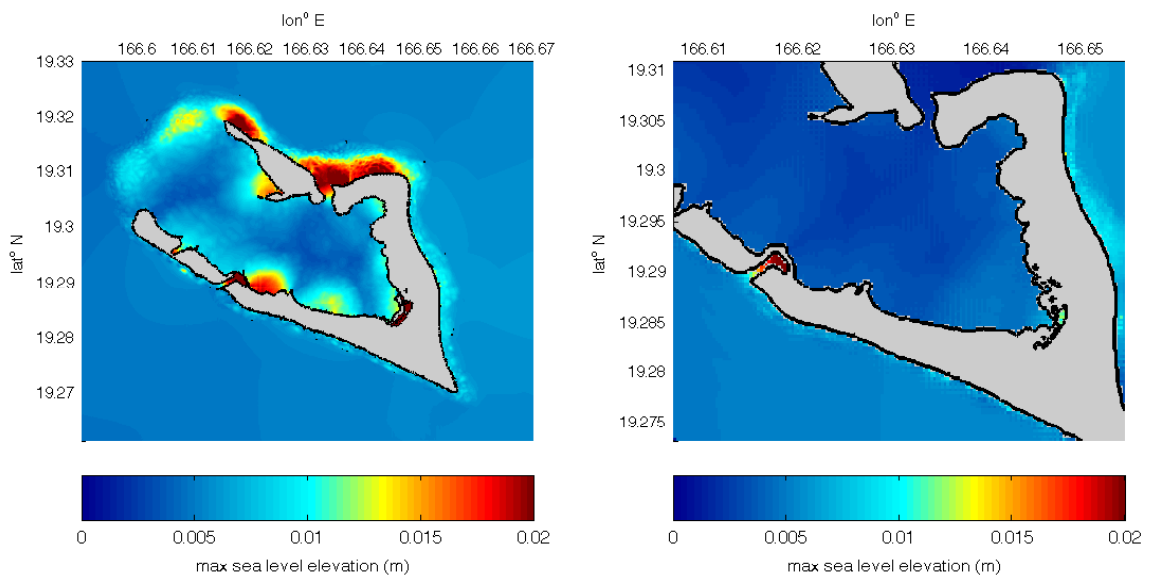


Figure 21: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2006 Tonga Island tsunami.



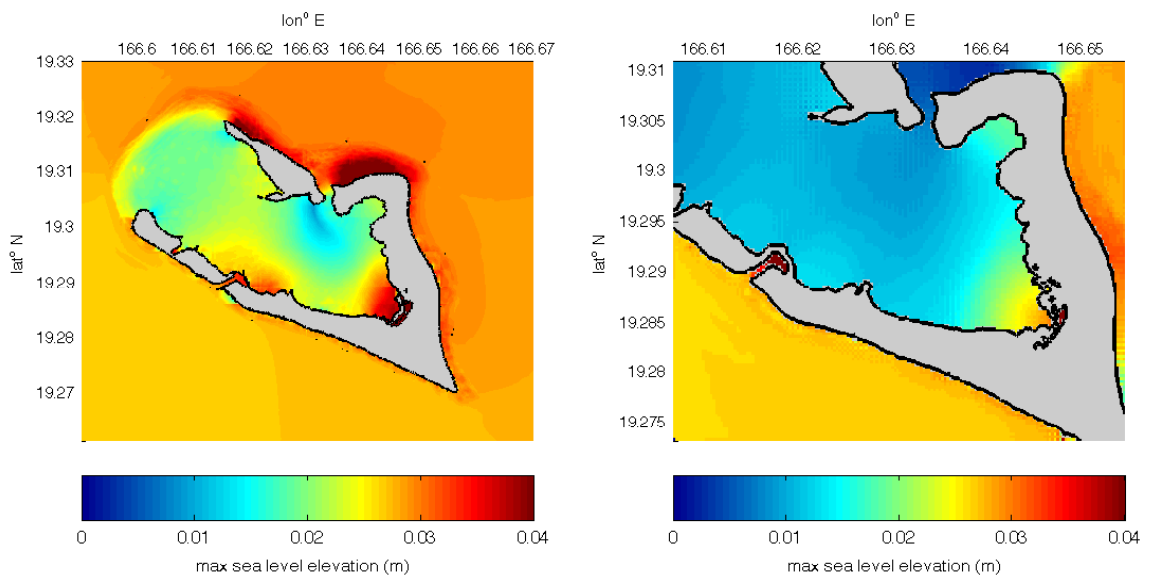


Figure 22: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2006 Kuril Island tsunami.

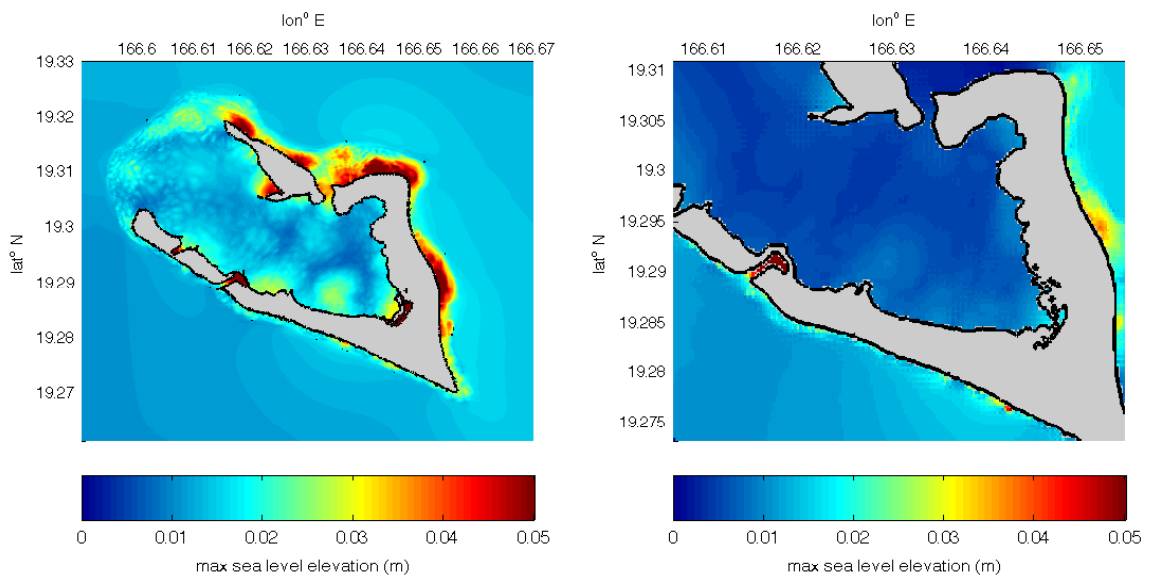


Figure 23: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2007 Kuril Island tsunami.

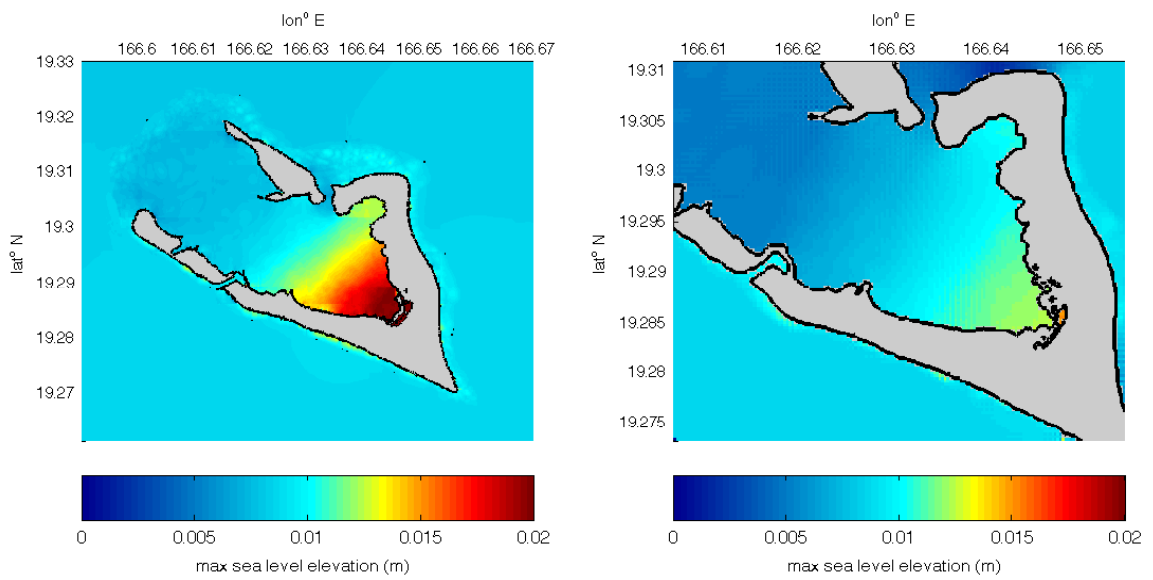


Figure 24: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2007 Solomon Island tsunami.

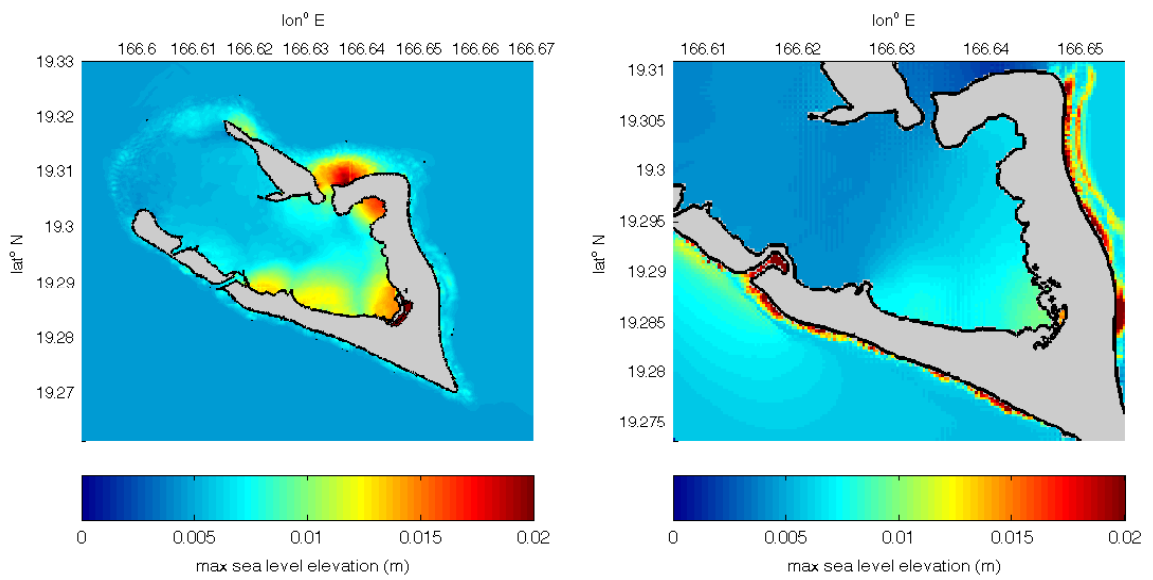


Figure 25: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2007 Peru tsunami.

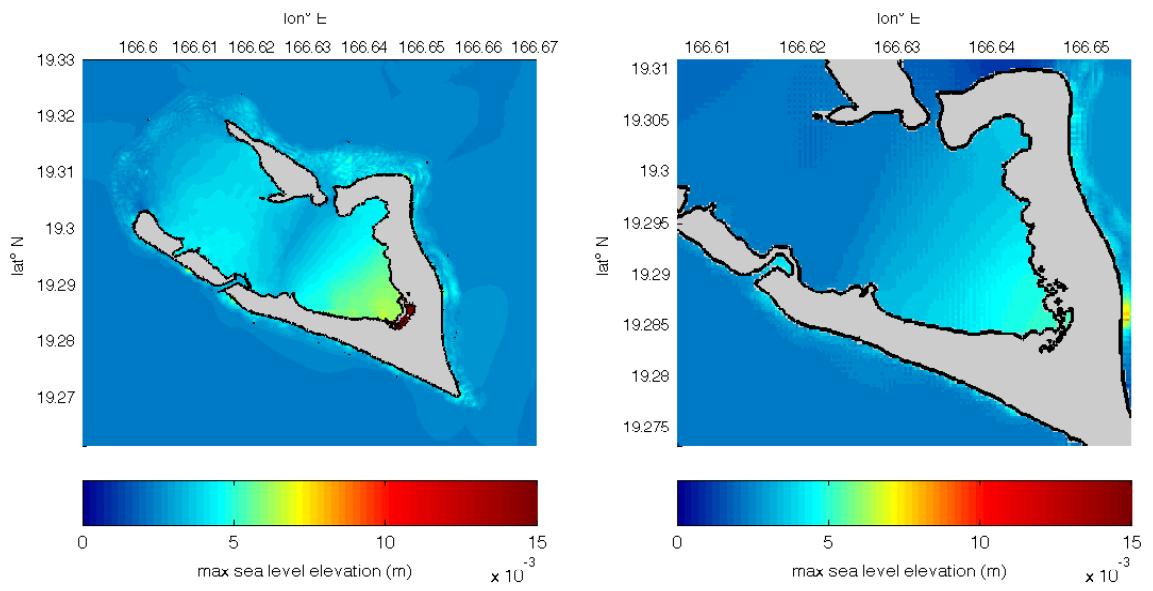


Figure 26: Maximum sea surface elevation computed with the reference (left) and forecast (right) models for the 2007 Chile tsunami.

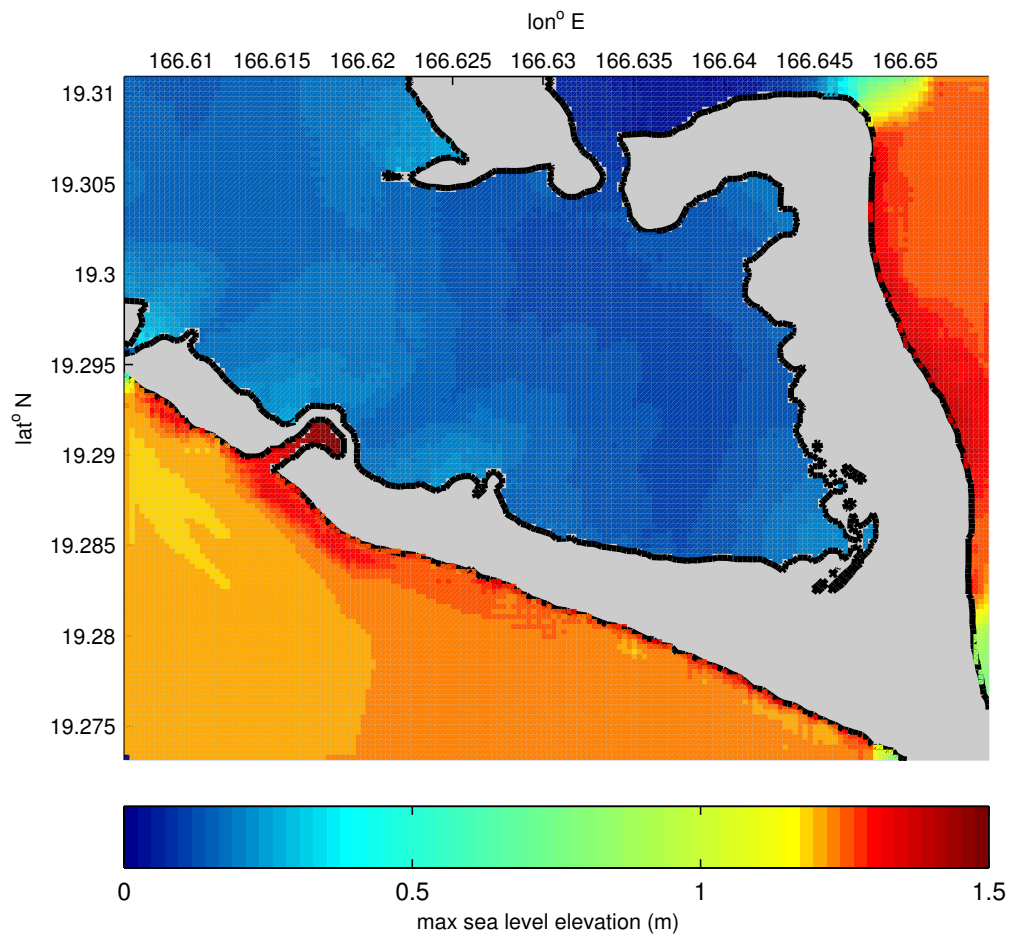


Figure 27: Maximum sea surface elevation computed with the forecast models for synthetic scenario 1 (KISZ 22-31) (Mw=9.3).

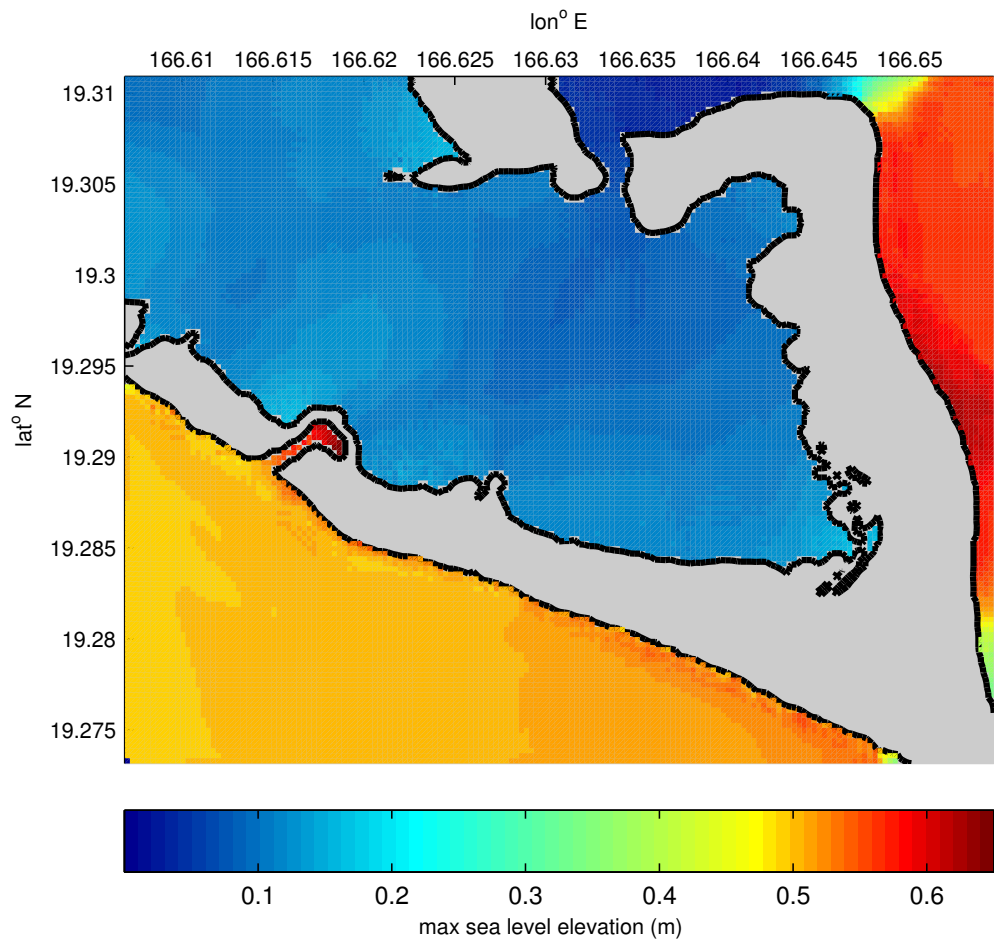


Figure 28: Maximum sea surface elevation computed with the forecast models for synthetic scenario 2 (KISZ 1-10) (Mw=9.3).

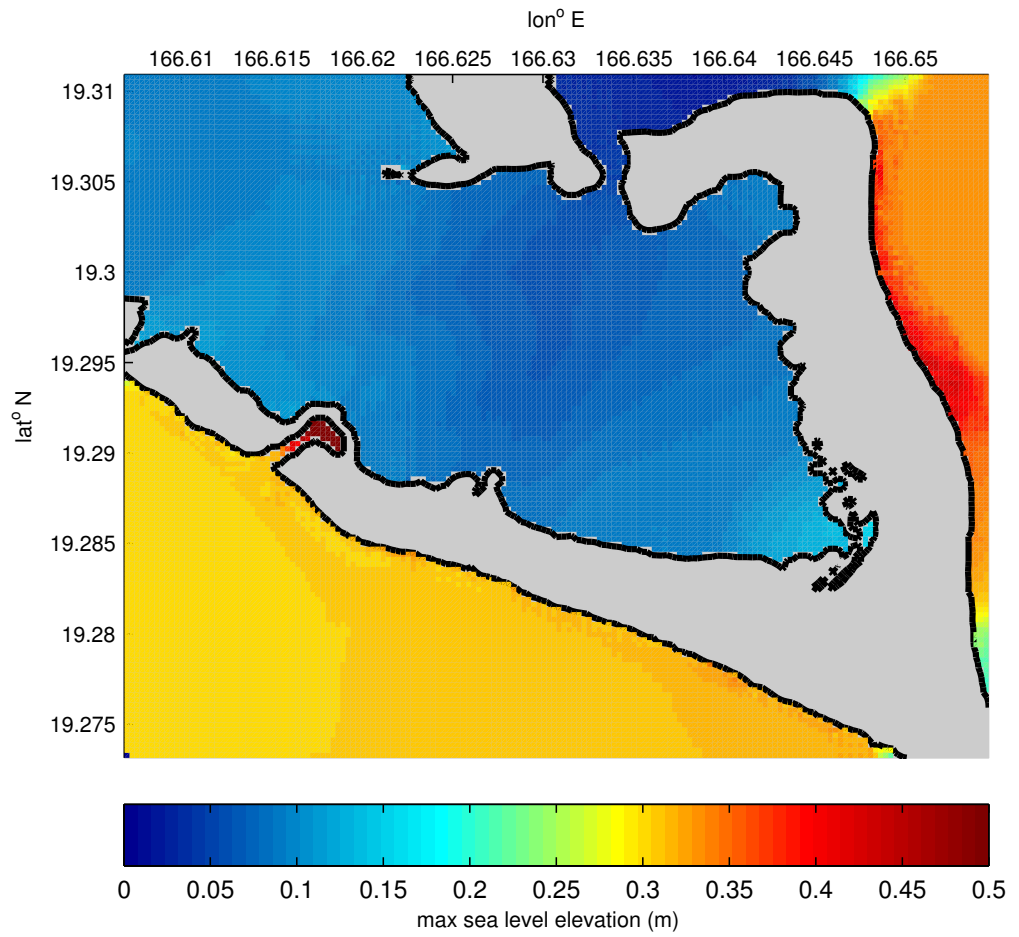


Figure 29: Maximum sea surface elevation computed with the forecast models for synthetic scenario 3 (ACSZ 12-21) (Mw=9.3).



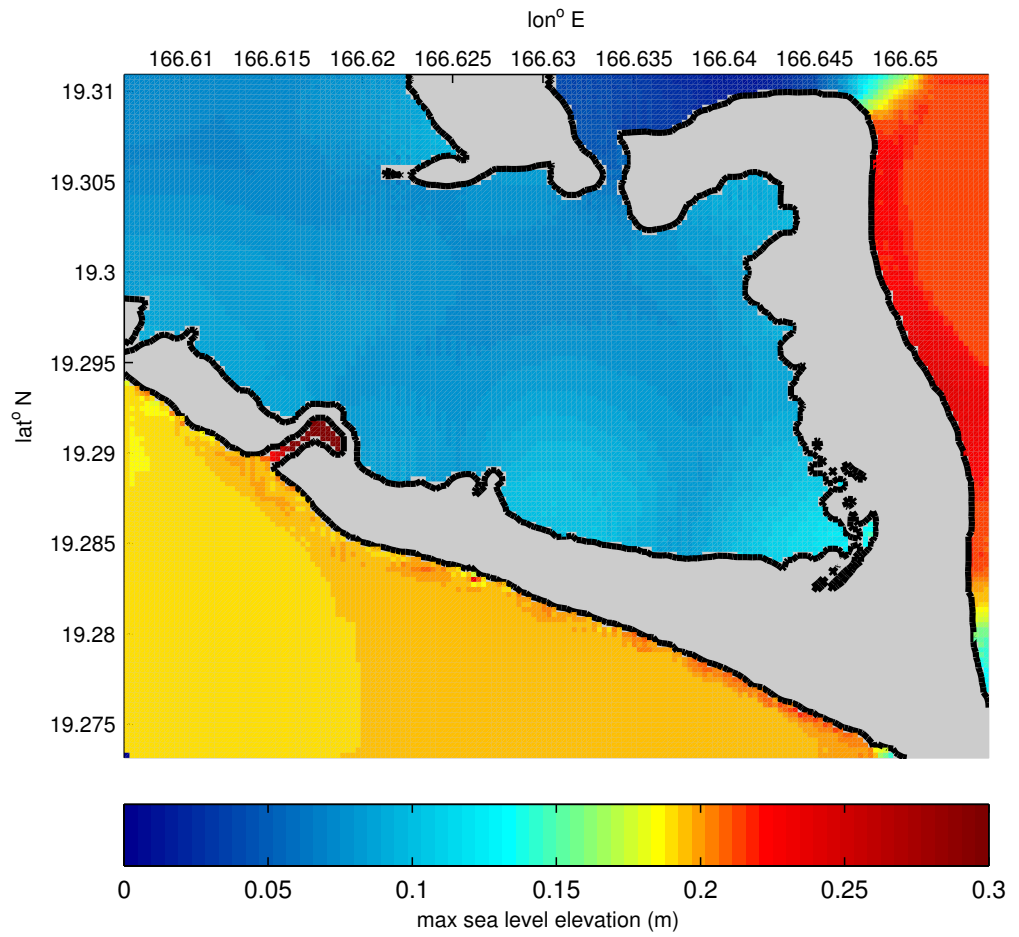


Figure 30: Maximum sea surface elevation computed with the forecast models for synthetic scenario 4 (ACSZ 22-31) (Mw=9.3).

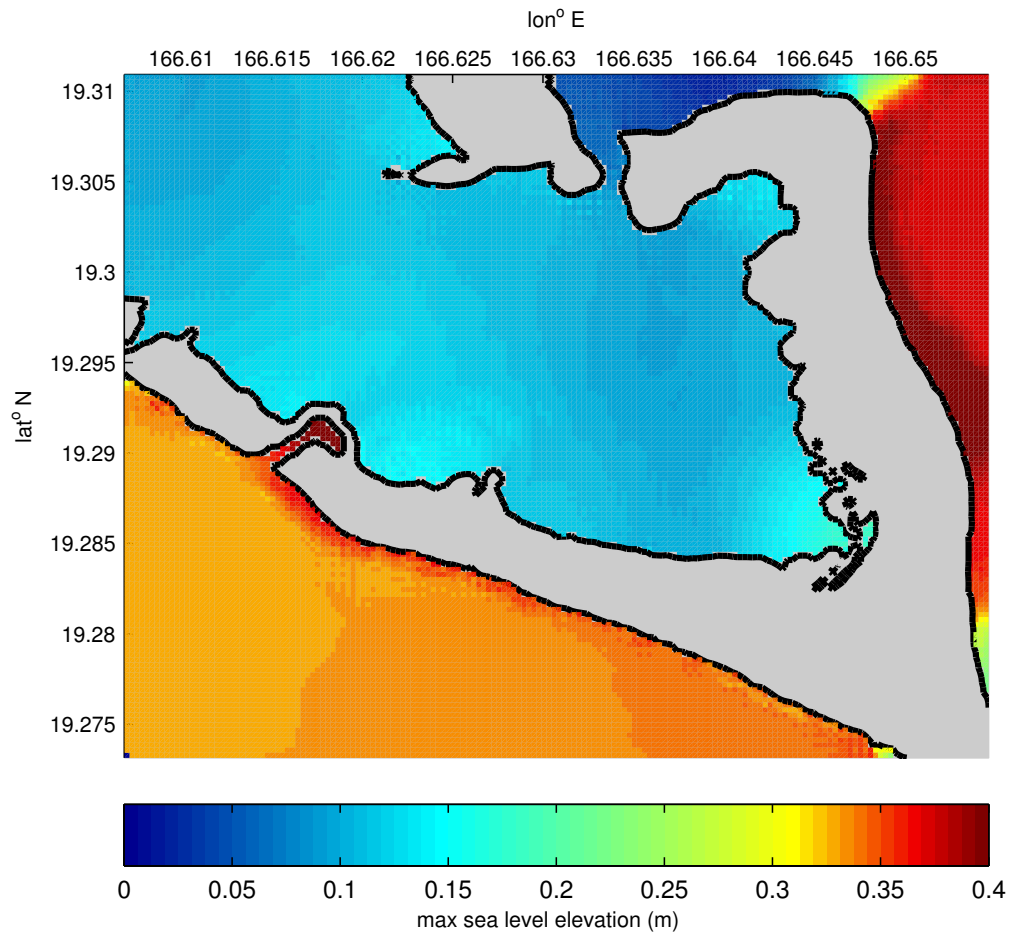


Figure 31: Maximum sea surface elevation computed with the forecast models for synthetic scenario 5 (ACSZ 38-47) (Mw=9.3).

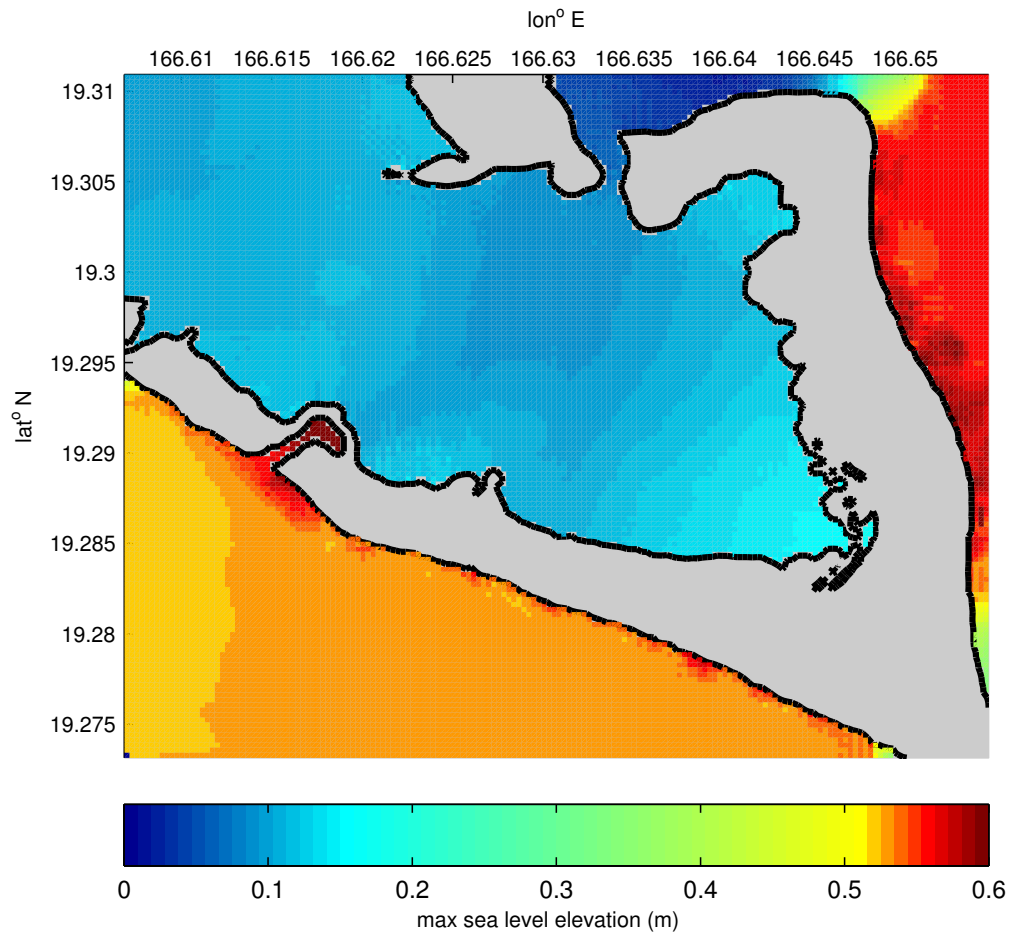


Figure 32: Maximum sea surface elevation computed with the forecast models for synthetic scenario 6 (ACSZ 56-65) (Mw=9.3).

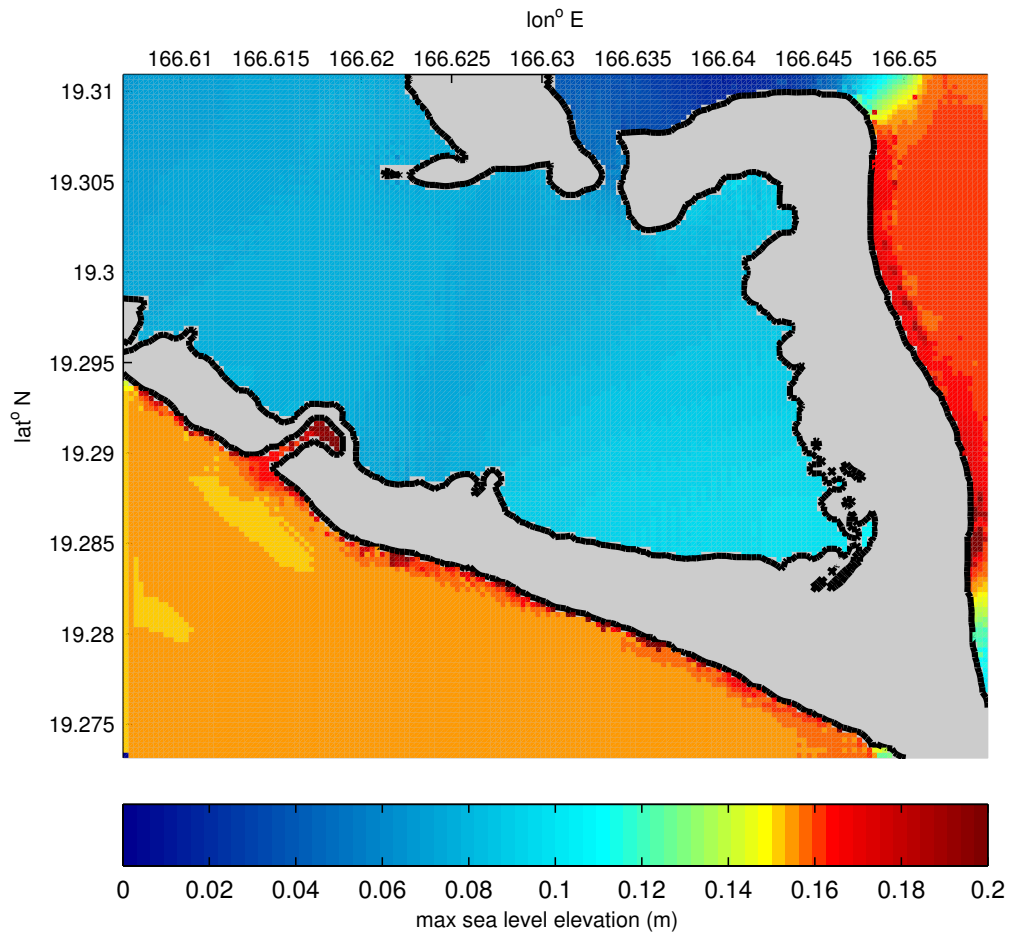


Figure 33: Maximum sea surface elevation computed with the forecast models for synthetic scenario 7 (CSSZ 1-10) (Mw=9.3).

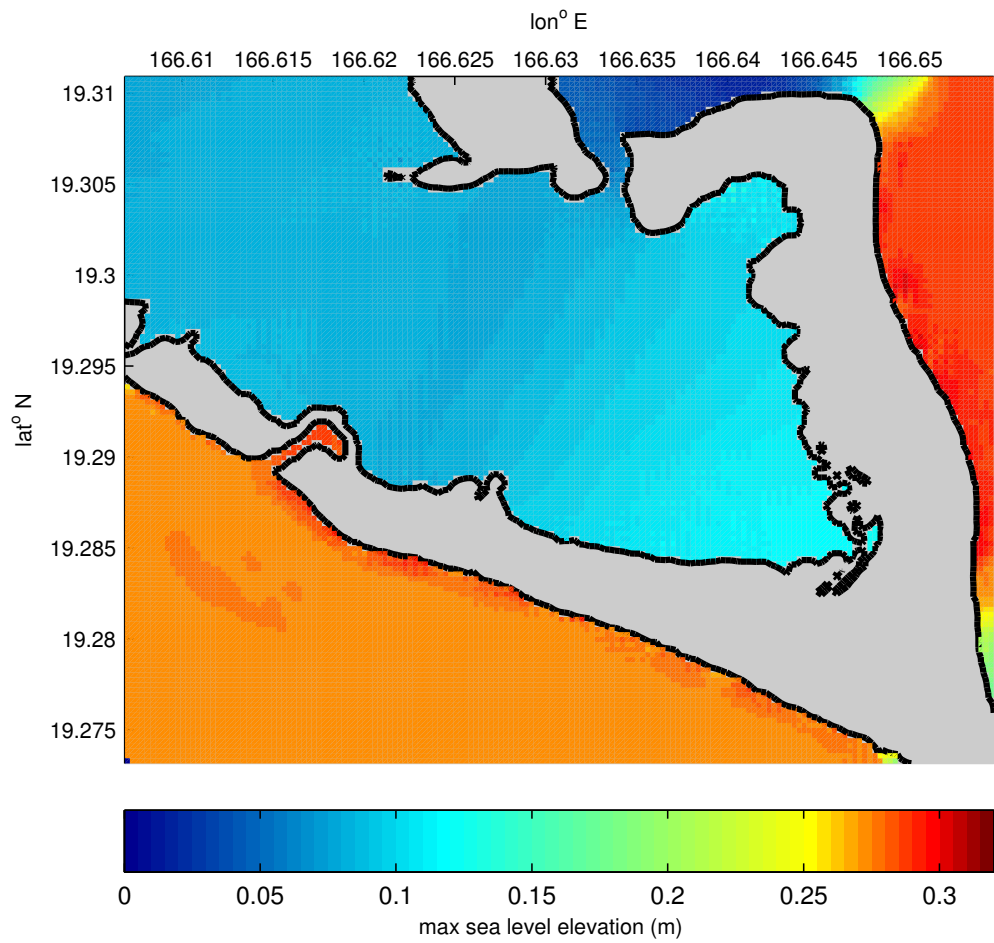


Figure 34: Maximum sea surface elevation computed with the forecast models for synthetic scenario 8 (CSSZ 37-46) (Mw=9.3).

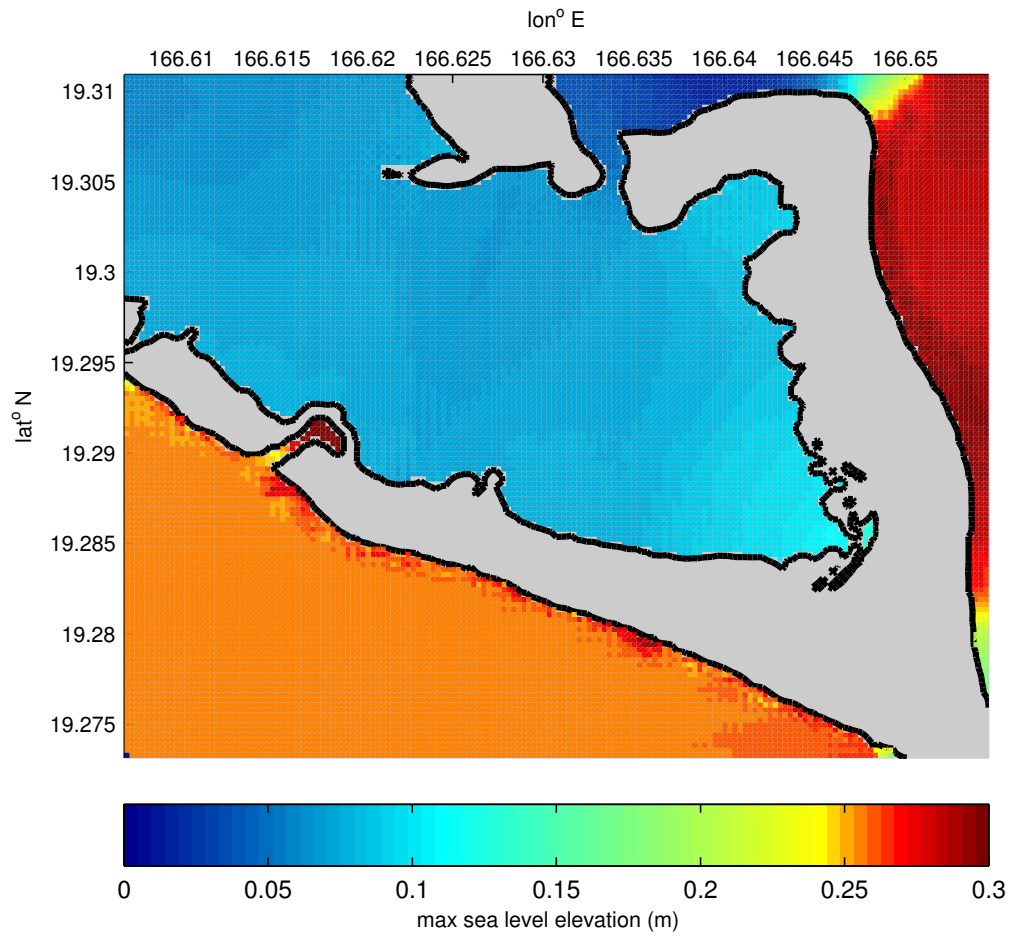


Figure 35: Maximum sea surface elevation computed with the forecast model for synthetic scenario 9 (CSSZ 92-101)(Mw=9.3).

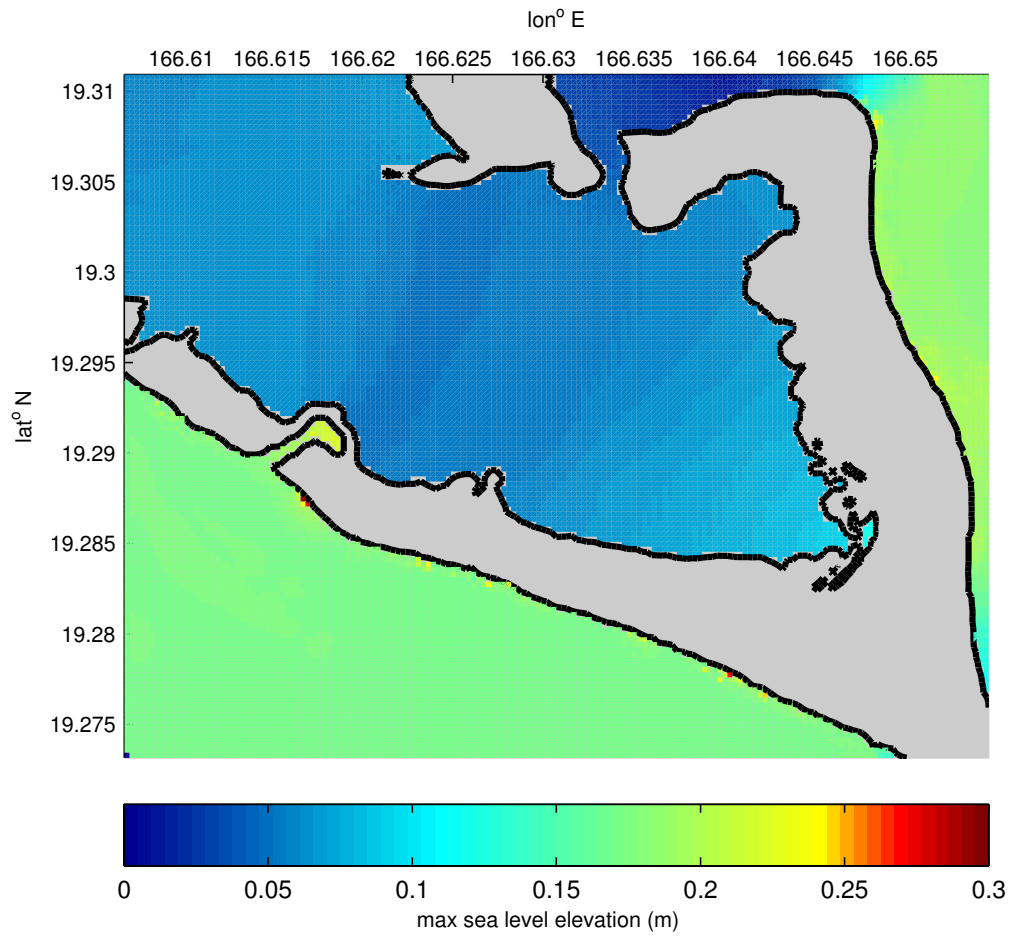


Figure 36: Maximum sea surface elevation computed with the forecast model for synthetic scenario 10 (CSSZ 64-73) (Mw=9.3).

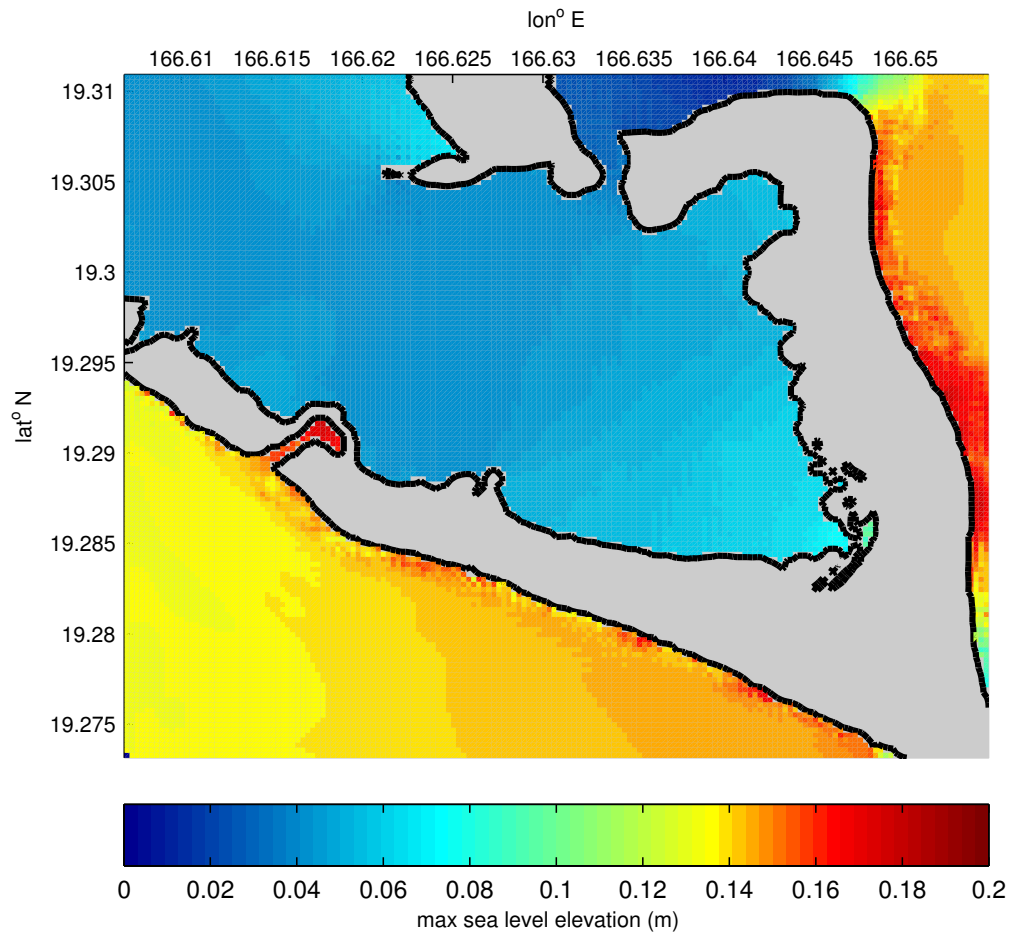


Figure 37: Maximum sea surface elevation computed with the forecast model for synthetic scenario 11 (NTSZ 20-29) (Mw=9.3).



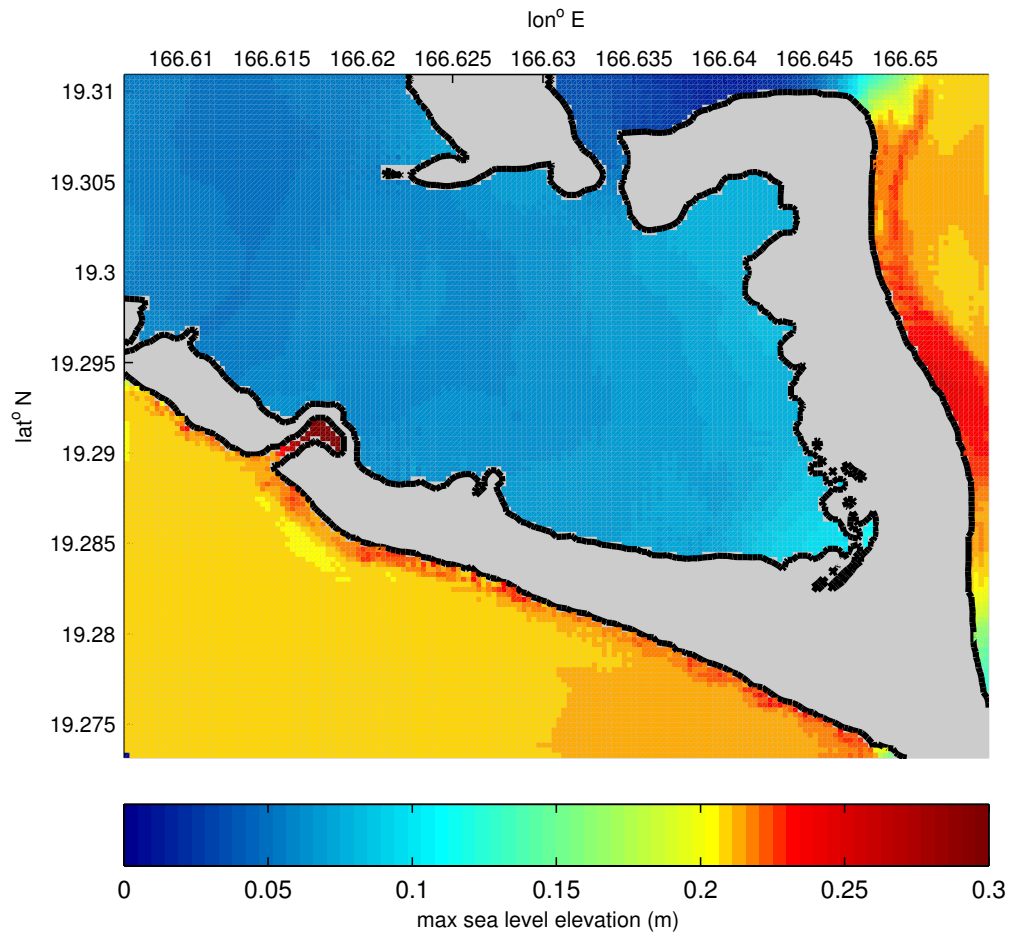


Figure 38: Maximum sea surface elevation computed with the forecast model for synthetic scenario 12 (NTSZ 30-39) (Mw=9.3).

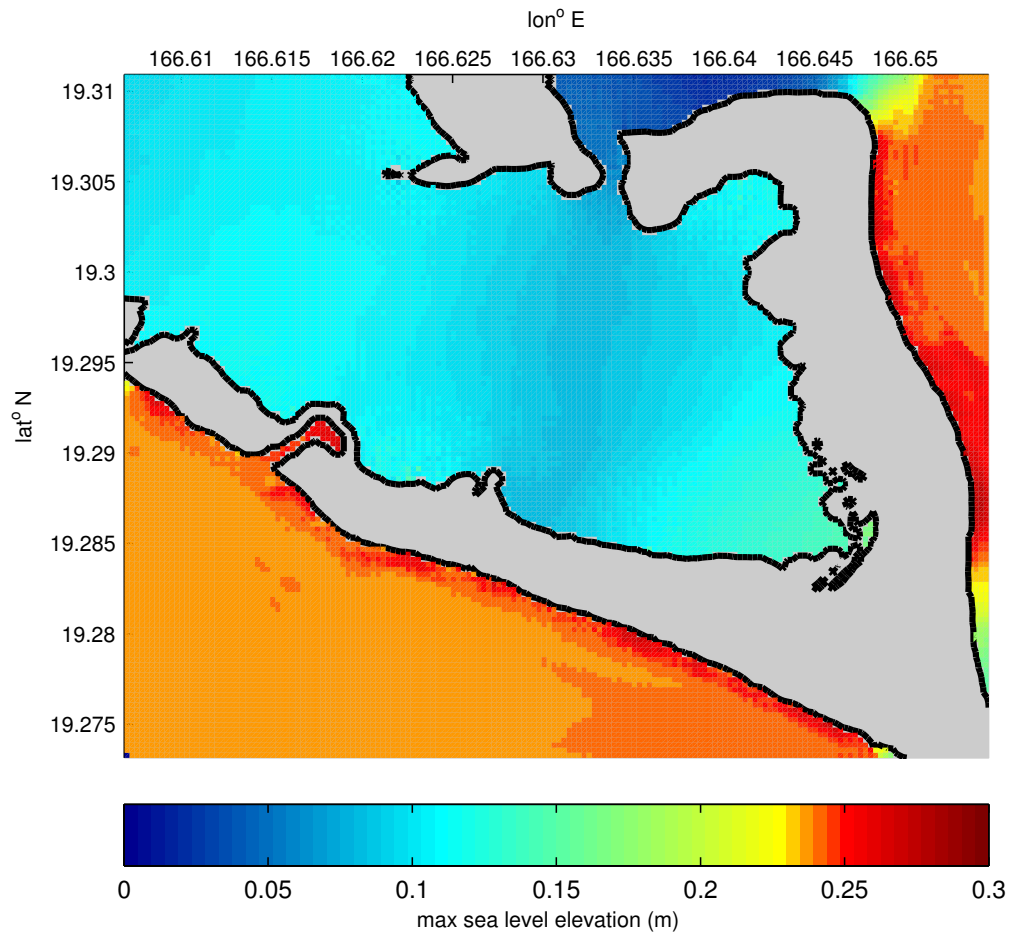


Figure 39: Maximum sea surface elevation computed with the forecast model for synthetic scenario 13 (NVSZ 28-37) (Mw=9.3).

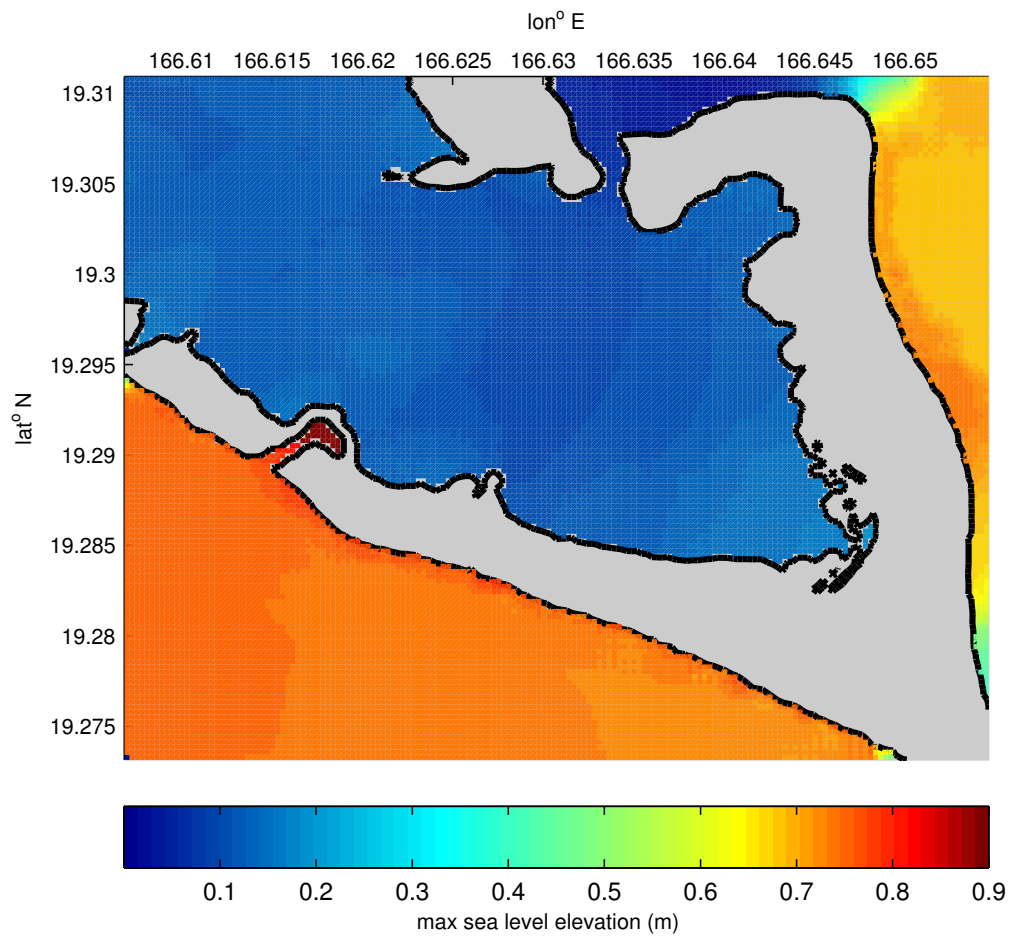


Figure 40: Maximum sea surface elevation computed with the forecast model for synthetic scenario 14 (MOSZ 1-10) (Mw=9.3).

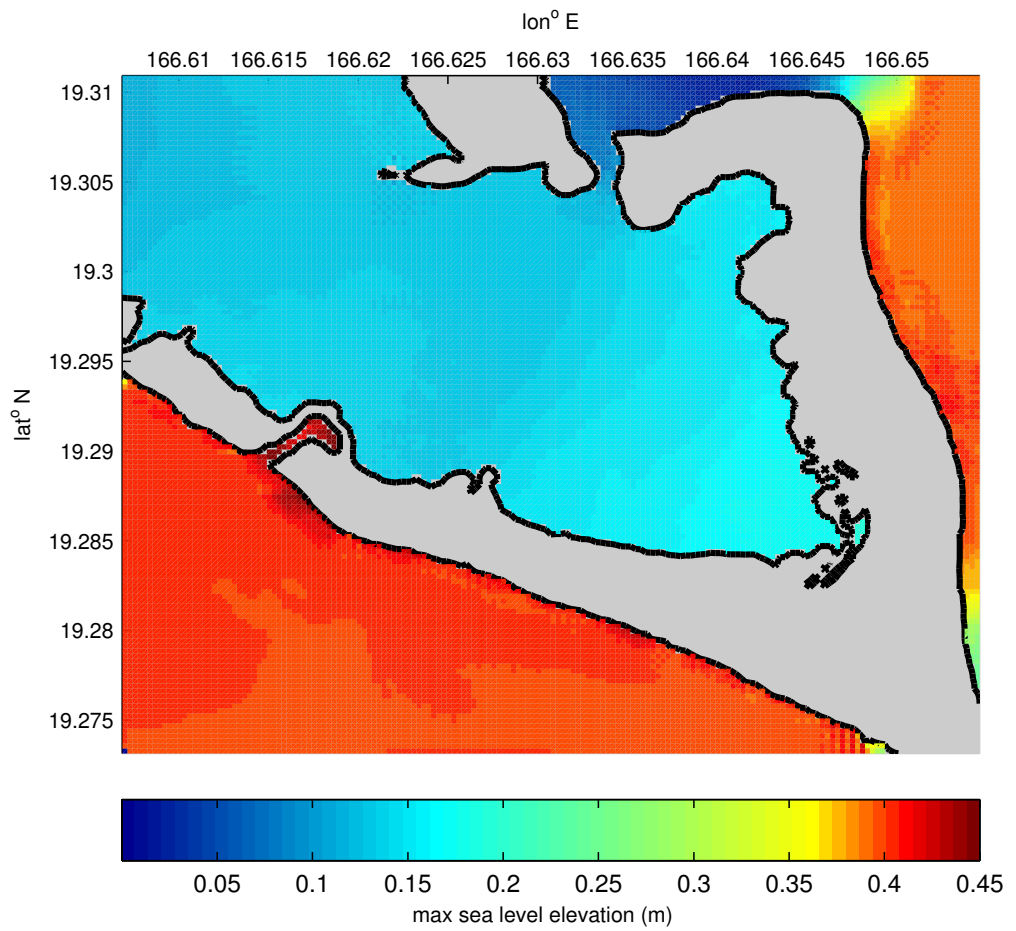


Figure 41: Maximum sea surface elevation computed with the forecast model for synthetic scenario 15 (NGSZ 3-12) ( $M_w=9.3$ ).

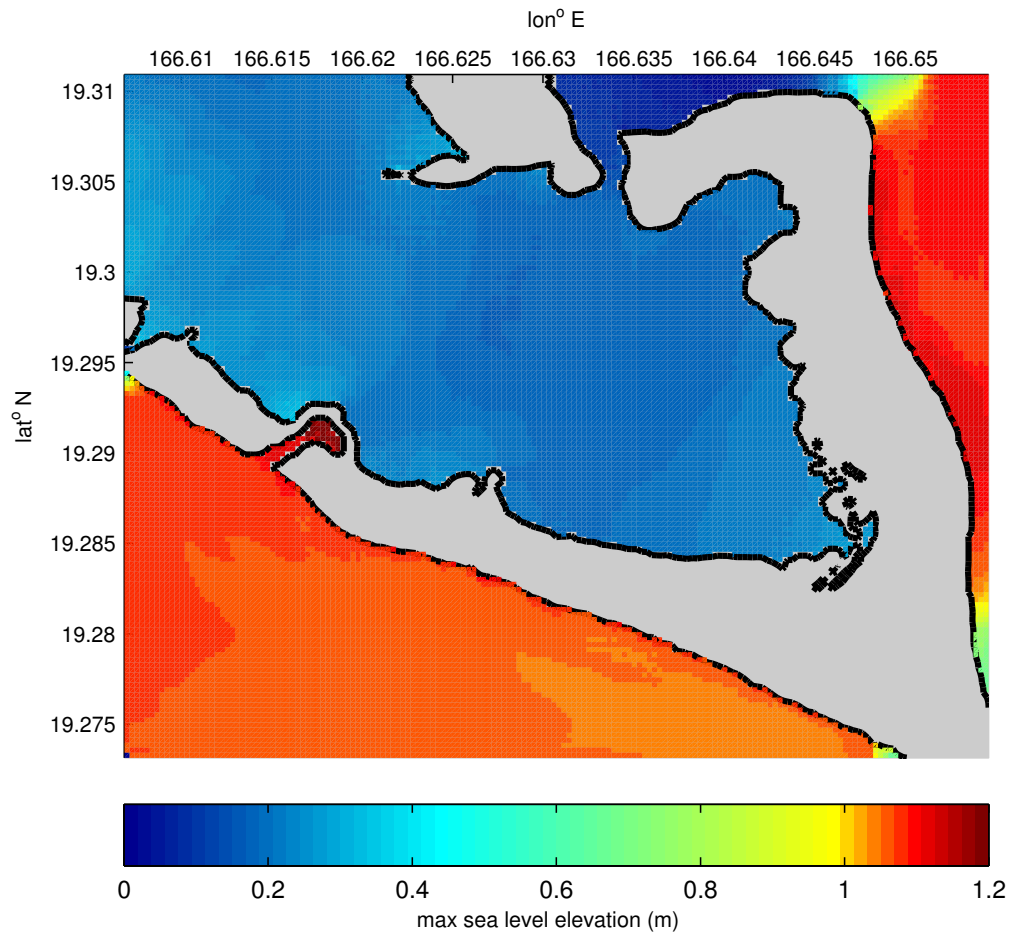


Figure 42: Maximum sea surface elevation computed with the forecast model for synthetic scenario 16 (EPSZ 6-15) (Mw=9.3).

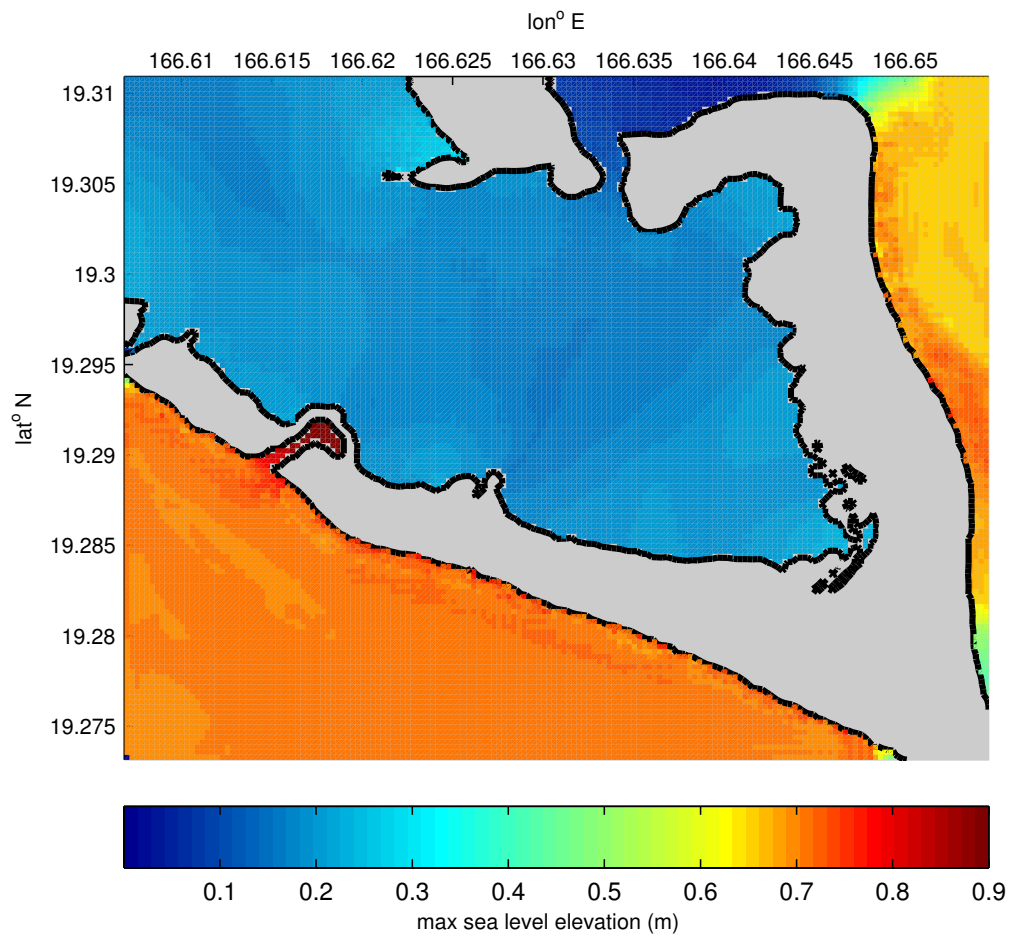


Figure 43: Maximum sea surface elevation computed with the forecast model for synthetic scenario 17 (RNSZ 12-21) (Mw=9.3).

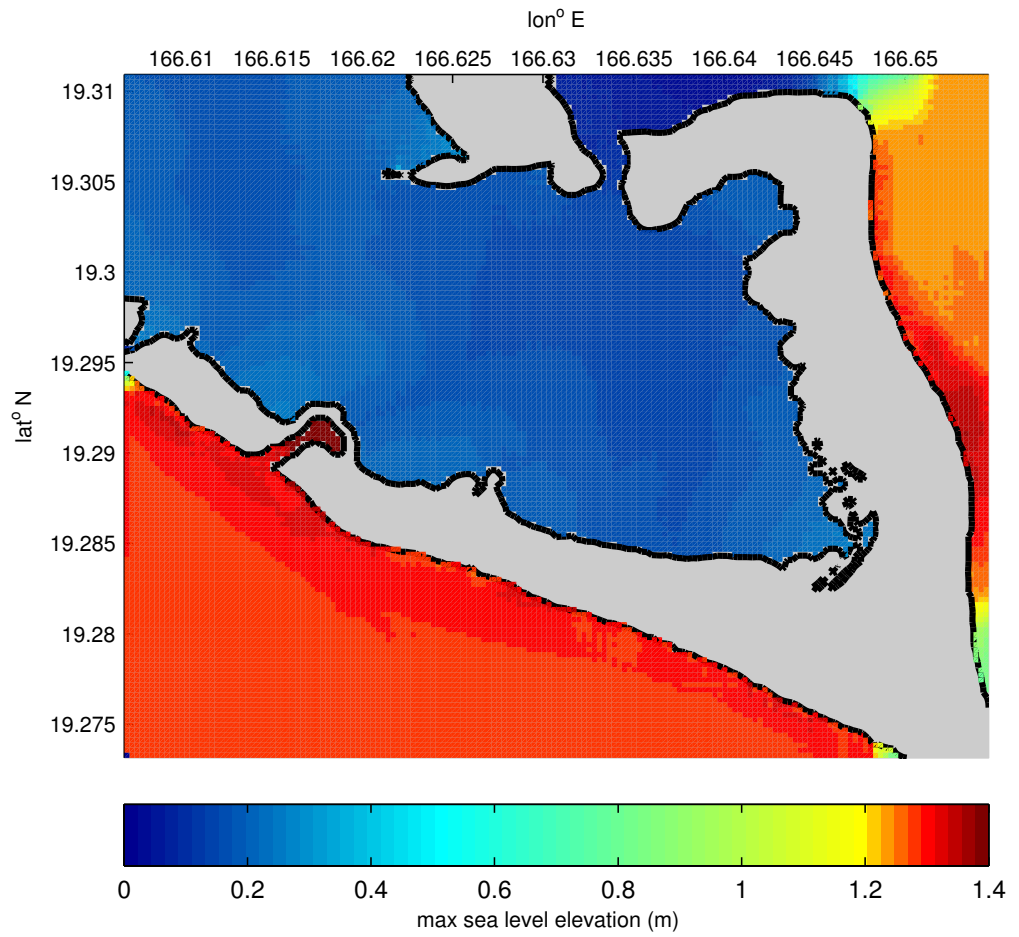


Figure 44: Maximum sea surface elevation computed with the forecast model for synthetic scenario 18 (KISZ 32-41) (Mw=9.3).

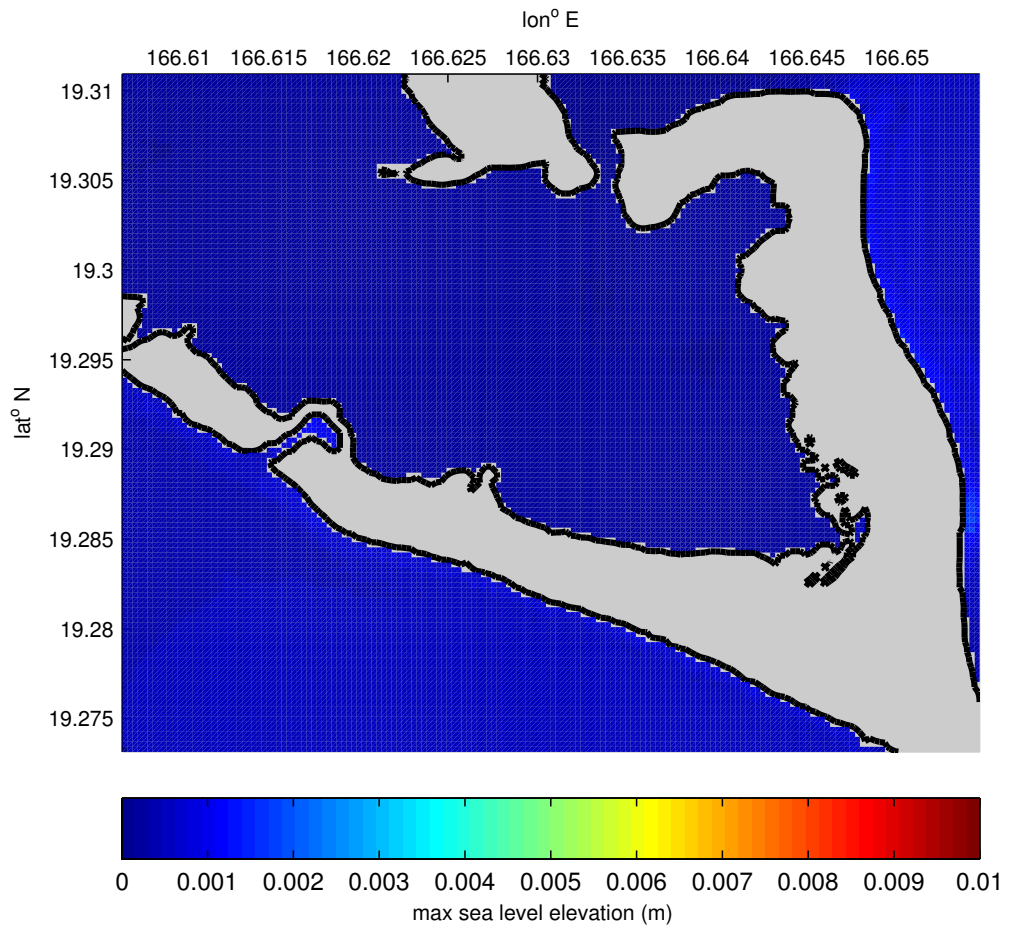


Figure 45: Maximum sea surface elevation computed with the forecast models for the small synthetic micro-tsunami scenario 19 (CSSZ B88) ( $M_w=6.8$ ).



# **TABLES**

Event	Date	Zone	M <sub>w</sub>	Lon(°)	Lat(°)	Source
1946 Unimak	1946.04.01	ACSZ	8.1	163.19W	53.32N	1.6×b22+8.4×b23+17.8×b24
1994 Kuril	1994.10.04	KISZ	8.1	147.32E	43.70N	9.0×a20
1996 Andreanof	1996.06.10	ACSZ	7.9	177.63W	51.56N	2.4×a15+0.8×b16
2003 Rat Island	2003.11.17	ACSZ	7.8	178.74E	51.13N	2.81×b11
2006 Tonga	2006.05.03	NZKT	8.1	174.16W	20.13N	8.44×b29
2006 Kuril	2006.11.15	KISZ	8.1	154.32E	46.75N	4.0×a12+0.5×b12 +2.0×a13+1.5×b13
2007 Kuril	2007.01.13	KISZ	7.9	154.80E	46.18N	-3.82×b13
2007 Solomon	2007.04.01	NTSZ	8.2	156.4E	7.96S	12.0×b10
2007 Peru	2001.06.23	CSSZ	8.0	73.31W	16.14S	0.9×a61+1.25×b61 +5.6×a62+6.97×b62+3.5×z62
2007 Chile	2007.11.14	CSSZ	7.7	69.9W	22.2S	1.65×z73

Table 1: Historical events used for model validation for Wake Island.

Model Setup	Reference Model			Forecast Model		
	Grid A	Grid B	Grid C	Grid A	Grid B	Grid C
W	E166.30	E166.470	E166.5901	E166.30	E166.5525	E166.6069
E	E166.90	E166.820	E166.6701	E166.90	E166.7192	E166.6546
S	N19.50	N19.40	N19.33	N19.50	N19.3358	E19.3109
N	N19.05	N19.17	N19.2613	N19.05	N19.2433	E19.2731
$dx$	30"	3"	1/3"	30"	3"	1"
$dy$	30"	3"	1/3"	30"	3"	1"
$nx \times ny$	73x55	421x277	865x743	73x55	201x112	173x137
$dt$ (sec)	3.5	0.3	0.07	3.24	0.54	0.27
$D_{min}$	5 m			1 m		
Fric. ( $m^2$ )	0.00125			0.00125		
CPU Time	~ 789 min for 4-hour simulation			~ 9 min for 4-hour simulation		
Warning Pt.	E166.6175, N19.2910					

Table 2: MOST setup parameters for reference and forecast models for Wake Island.

Scenario Number	Scenario Name	Source Zone	Tsunami Source	$\alpha$ [m]	Max [m]	Min [m]
<b>Mega-tsunami Scenario</b>						
1	KISZ 22-31	Kamchatka-Yap-Mariana-Izu-	A22-A31, B22-B31	29	1.44	-1.13
2	KISZ 1-10	Kamchatka-Yap-Mariana-Izu-	A1-A10, B1-B10	29	0.60	-0.77
3	ACSZ 12-21	Aleutian-Alaska-Cascadia	A12-A21, B12-B21	29	0.54	-0.52
4	ACSZ 22-31	Aleutian-Alaska-Cascadia	A22-A31, B22-B31	29	0.33	-0.26
5	ACSZ 38-47	Aleutian-Alaska-Cascadia	A38-A47, B38-B47	29	0.43	-0.74
6	ACSZ 56-65	Aleutian-Alaska-Cascadia	A56-A65, B56-B65	29	0.62	-0.50
7	CSSZ 1-10	Central and South America	A1-A10, B1-B10	29	0.20	-0.17
8	CSSZ 37-46	Central and South America	A37-A46, B37-B46	29	0.29	-0.12
9	CSSZ 92-101	Central and South America	A92-A101, B92-	29	0.32	-0.33
10	CSSZ 64-73	Central and South America	A64-A73, B64-B73	29	0.21	-0.20
11	NTSZ 20-29	New Zealand-Kermadec-Tonga	A20-A29, B20-B29	29	0.17	-0.21
12	NTSZ 30-39	New Zealand-Kermadec-Tonga	A30-A39, B30-B39	29	0.35	-0.36
13	NVSZ 28-37	New Britain-Solomons-Vanuatu	A28-A37, B28-B37	29	0.26	-0.29
14	MOSZ 1-10	ManusOCB	A1-A10, B1-B10	29	0.93	-1.02
15	NGSZ 3-12	North New Guinea	A3-A12, B3-B12	29	0.43	-0.68
16	EPSZ 6-15	East Philippines	A6-A15, B6-B15	29	1.19	-1.29
17	RNSZ 12-21	Ryukus-Kyushu-Nankai	A12-A21, B12-B21	29	1.00	-1.38
18	KISZ 32-41	Kamchatka-Yap-Mariana-Izu-	A32-A41, B32-B41	29	1.45	-1.76
<b>Micro-tsunami Scenario</b>						
19	CSSZ B88	Central and South America	B88	0.1		

Table 3: Synthetic tsunami sources used in the forecast model robustness test for Wake Island.

# Appendix A

Development of the Wake Island tsunami forecast model occurred prior to parameter changes that were made to reflect modifications to the MOST model code. As a result, the input file for both the tsunami forecast model and the high-resolution reference inundation model in MOST have been updated accordingly. Appendix A1 and A2 provide the updated files for Wake Island.

## A.1 Reference model \*.in file for Wake Island

```
0.001 Minimum amplitude of input offshore wave (m)
5 Input minimum depth for offshore (m)
0.1 Input "dry land" depth for inundation (m)
0.0009 Input friction coefficient (n **2)
1 let a and b run up
100.0 max eta before blow up (m)
0.13 Input time step (sec)
360000 Input number of steps
25 Compute "A" arrays every nth time step, n=
3 Compute "B" arrays every nth time step, n=
300 Input number of steps between snapshots
1 ...Starting from
1 ...Saving grid every nth node, n=?
rsyn02_run2d/RIM_A.corr
rsyn02_run2d/RIM_B.corr.2
rsyn02_run2d/RIM_C_2_3.corr999.5e
../SRCS/wake_srcs/
./rsyn02_run2d/
1 1 1 1 NetCDF output for A, B, C, SIFT
1 Timeseries locations:
3 147 212
```

## A.2 Forecast model \*.in file for Wake Island

```
0.001 Minimum amplitude of input offshore wave (m)
1 Input minimum depth for offshore (m)
```

0.1 Input "dry land" depth for inundation (m)  
0.00125 Input friction coefficient (n \*\*2)  
1 let a and b run up  
100.0 max eta before blow up (m)  
0.27 Input time step (sec)  
320000 Input number of steps  
12 Compute "A" arrays every nth time step, n=  
2 Compute "B" arrays every nth time step, n=  
264 Input number of steps between snapshots  
1 ...Starting from  
1 ...Saving grid every nth node, n=?  
wake\_run2d/Wake\_A  
wake\_run2d/Wake\_B  
wake\_run2d/Wake\_C  
./  
./  
1 1 1 NetCDF output for A, B, C, SIFT  
1 Timeseries locations:  
3 39 73 wake 166.61740740328 19.29092592254 depth m: 6.00 WAK Wake Island, UM

## **Appendix B**

# **Propagation Database: Pacific Ocean Unit Sources**

The NOAA Propagation Database presented in this section is the most current version available as of March 2013. The database may have been updated since this date.





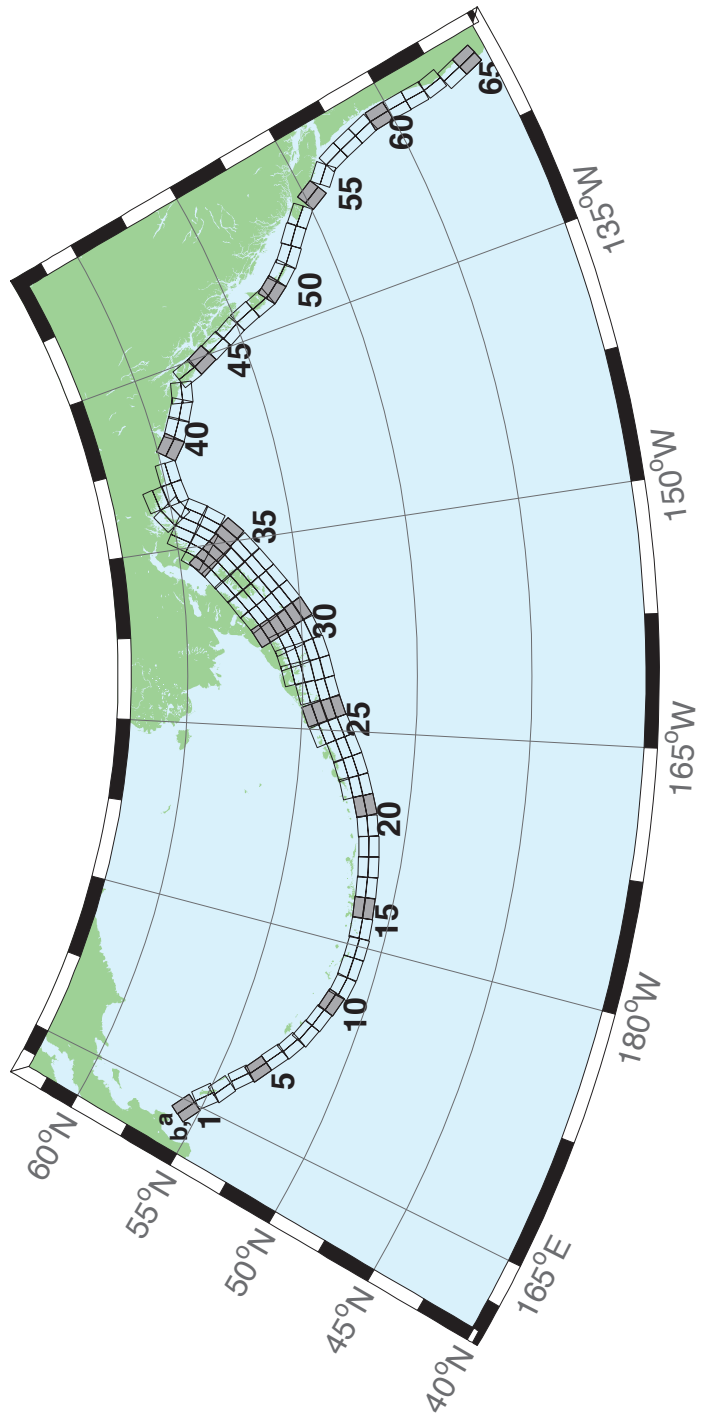


Figure B.1: Aleutian–Alaska–Cascadia Subduction Zone unit sources.

Table B.1: Earthquake parameters for Aleutian–Alaska–Cascadia Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
acsz-1a	Aleutian–Alaska–Cascadia	164.7994	55.9606	299	17	19.61
acsz-1b	Aleutian–Alaska–Cascadia	164.4310	55.5849	299	17	5
acsz-2a	Aleutian–Alaska–Cascadia	166.3418	55.4016	310.2	17	19.61
acsz-2b	Aleutian–Alaska–Cascadia	165.8578	55.0734	310.2	17	5
acsz-3a	Aleutian–Alaska–Cascadia	167.2939	54.8919	300.2	23.36	24.82
acsz-3b	Aleutian–Alaska–Cascadia	166.9362	54.5356	300.2	23.36	5
acsz-4a	Aleutian–Alaska–Cascadia	168.7131	54.2852	310.2	38.51	25.33
acsz-4b	Aleutian–Alaska–Cascadia	168.3269	54.0168	310.2	24	5
acsz-5a	Aleutian–Alaska–Cascadia	169.7447	53.7808	302.8	37.02	23.54
acsz-5b	Aleutian–Alaska–Cascadia	169.4185	53.4793	302.8	21.77	5
acsz-6a	Aleutian–Alaska–Cascadia	171.0144	53.3054	303.2	35.31	22.92
acsz-6b	Aleutian–Alaska–Cascadia	170.6813	52.9986	303.2	21	5
acsz-7a	Aleutian–Alaska–Cascadia	172.1500	52.8528	298.2	35.56	20.16
acsz-7b	Aleutian–Alaska–Cascadia	171.8665	52.5307	298.2	17.65	5
acsz-8a	Aleutian–Alaska–Cascadia	173.2726	52.4579	290.8	37.92	20.35
acsz-8b	Aleutian–Alaska–Cascadia	173.0681	52.1266	290.8	17.88	5
acsz-9a	Aleutian–Alaska–Cascadia	174.5866	52.1434	289	39.09	21.05
acsz-9b	Aleutian–Alaska–Cascadia	174.4027	51.8138	289	18.73	5
acsz-10a	Aleutian–Alaska–Cascadia	175.8784	51.8526	286.1	40.51	20.87
acsz-10b	Aleutian–Alaska–Cascadia	175.7265	51.5245	286.1	18.51	5
acsz-11a	Aleutian–Alaska–Cascadia	177.1140	51.6488	280	15	17.94
acsz-11b	Aleutian–Alaska–Cascadia	176.9937	51.2215	280	15	5
acsz-12a	Aleutian–Alaska–Cascadia	178.4500	51.5690	273	15	17.94
acsz-12b	Aleutian–Alaska–Cascadia	178.4130	51.1200	273	15	5
acsz-13a	Aleutian–Alaska–Cascadia	179.8550	51.5340	271	15	17.94
acsz-13b	Aleutian–Alaska–Cascadia	179.8420	51.0850	271	15	5
acsz-14a	Aleutian–Alaska–Cascadia	181.2340	51.5780	267	15	17.94
acsz-14b	Aleutian–Alaska–Cascadia	181.2720	51.1290	267	15	5
acsz-15a	Aleutian–Alaska–Cascadia	182.6380	51.6470	265	15	17.94
acsz-15b	Aleutian–Alaska–Cascadia	182.7000	51.2000	265	15	5
acsz-16a	Aleutian–Alaska–Cascadia	184.0550	51.7250	264	15	17.94
acsz-16b	Aleutian–Alaska–Cascadia	184.1280	51.2780	264	15	5
acsz-17a	Aleutian–Alaska–Cascadia	185.4560	51.8170	262	15	17.94
acsz-17b	Aleutian–Alaska–Cascadia	185.5560	51.3720	262	15	5
acsz-18a	Aleutian–Alaska–Cascadia	186.8680	51.9410	261	15	17.94
acsz-18b	Aleutian–Alaska–Cascadia	186.9810	51.4970	261	15	5
acsz-19a	Aleutian–Alaska–Cascadia	188.2430	52.1280	257	15	17.94
acsz-19b	Aleutian–Alaska–Cascadia	188.4060	51.6900	257	15	5
acsz-20a	Aleutian–Alaska–Cascadia	189.5810	52.3550	251	15	17.94
acsz-20b	Aleutian–Alaska–Cascadia	189.8180	51.9300	251	15	5
acsz-21a	Aleutian–Alaska–Cascadia	190.9570	52.6470	251	15	17.94
acsz-21b	Aleutian–Alaska–Cascadia	191.1960	52.2220	251	15	5
acsz-21z	Aleutian–Alaska–Cascadia	190.7399	53.0443	250.8	15	30.88
acsz-22a	Aleutian–Alaska–Cascadia	192.2940	52.9430	247	15	17.94
acsz-22b	Aleutian–Alaska–Cascadia	192.5820	52.5300	247	15	5
acsz-22z	Aleutian–Alaska–Cascadia	192.0074	53.3347	247.8	15	30.88
acsz-23a	Aleutian–Alaska–Cascadia	193.6270	53.3070	245	15	17.94
acsz-23b	Aleutian–Alaska–Cascadia	193.9410	52.9000	245	15	5
acsz-23z	Aleutian–Alaska–Cascadia	193.2991	53.6768	244.6	15	30.88
acsz-24a	Aleutian–Alaska–Cascadia	194.9740	53.6870	245	15	17.94
acsz-24b	Aleutian–Alaska–Cascadia	195.2910	53.2800	245	15	5
acsz-24y	Aleutian–Alaska–Cascadia	194.3645	54.4604	244.4	15	43.82
acsz-24z	Aleutian–Alaska–Cascadia	194.6793	54.0674	244.6	15	30.88
acsz-25a	Aleutian–Alaska–Cascadia	196.4340	54.0760	250	15	17.94
acsz-25b	Aleutian–Alaska–Cascadia	196.6930	53.6543	250	15	5
acsz-25y	Aleutian–Alaska–Cascadia	195.9009	54.8572	247.9	15	43.82
acsz-25z	Aleutian–Alaska–Cascadia	196.1761	54.4536	248.1	15	30.88
acsz-26a	Aleutian–Alaska–Cascadia	197.8970	54.3600	253	15	17.94
acsz-26b	Aleutian–Alaska–Cascadia	198.1200	53.9300	253	15	5
acsz-26y	Aleutian–Alaska–Cascadia	197.5498	55.1934	253.1	15	43.82

Continued on next page

Table B.1 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
acsz-26z	Aleutian-Alaska-Cascadia	197.7620	54.7770	253.3	15	30.88
acsz-27a	Aleutian-Alaska-Cascadia	199.4340	54.5960	256	15	17.94
acsz-27b	Aleutian-Alaska-Cascadia	199.6200	54.1600	256	15	5
acsz-27x	Aleutian-Alaska-Cascadia	198.9736	55.8631	256.5	15	56.24
acsz-27y	Aleutian-Alaska-Cascadia	199.1454	55.4401	256.6	15	43.82
acsz-27z	Aleutian-Alaska-Cascadia	199.3135	55.0170	256.8	15	30.88
acsz-28a	Aleutian-Alaska-Cascadia	200.8820	54.8300	253	15	17.94
acsz-28b	Aleutian-Alaska-Cascadia	201.1080	54.4000	253	15	5
acsz-28x	Aleutian-Alaska-Cascadia	200.1929	56.0559	252.5	15	56.24
acsz-28y	Aleutian-Alaska-Cascadia	200.4167	55.6406	252.7	15	43.82
acsz-28z	Aleutian-Alaska-Cascadia	200.6360	55.2249	252.9	15	30.88
acsz-29a	Aleutian-Alaska-Cascadia	202.2610	55.1330	247	15	17.94
acsz-29b	Aleutian-Alaska-Cascadia	202.5650	54.7200	247	15	5
acsz-29x	Aleutian-Alaska-Cascadia	201.2606	56.2861	245.7	15	56.24
acsz-29y	Aleutian-Alaska-Cascadia	201.5733	55.8888	246	15	43.82
acsz-29z	Aleutian-Alaska-Cascadia	201.8797	55.4908	246.2	15	30.88
acsz-30a	Aleutian-Alaska-Cascadia	203.6040	55.5090	240	15	17.94
acsz-30b	Aleutian-Alaska-Cascadia	203.9970	55.1200	240	15	5
acsz-30w	Aleutian-Alaska-Cascadia	201.9901	56.9855	239.5	15	69.12
acsz-30x	Aleutian-Alaska-Cascadia	202.3851	56.6094	239.8	15	56.24
acsz-30y	Aleutian-Alaska-Cascadia	202.7724	56.2320	240.2	15	43.82
acsz-30z	Aleutian-Alaska-Cascadia	203.1521	55.8534	240.5	15	30.88
acsz-31a	Aleutian-Alaska-Cascadia	204.8950	55.9700	236	15	17.94
acsz-31b	Aleutian-Alaska-Cascadia	205.3400	55.5980	236	15	5
acsz-31w	Aleutian-Alaska-Cascadia	203.0825	57.3740	234.5	15	69.12
acsz-31x	Aleutian-Alaska-Cascadia	203.5408	57.0182	234.9	15	56.24
acsz-31y	Aleutian-Alaska-Cascadia	203.9904	56.6607	235.3	15	43.82
acsz-31z	Aleutian-Alaska-Cascadia	204.4315	56.3016	235.7	15	30.88
acsz-32a	Aleutian-Alaska-Cascadia	206.2080	56.4730	236	15	17.94
acsz-32b	Aleutian-Alaska-Cascadia	206.6580	56.1000	236	15	5
acsz-32w	Aleutian-Alaska-Cascadia	204.4129	57.8908	234.3	15	69.12
acsz-32x	Aleutian-Alaska-Cascadia	204.8802	57.5358	234.7	15	56.24
acsz-32y	Aleutian-Alaska-Cascadia	205.3385	57.1792	235.1	15	43.82
acsz-32z	Aleutian-Alaska-Cascadia	205.7880	56.8210	235.5	15	30.88
acsz-33a	Aleutian-Alaska-Cascadia	207.5370	56.9750	236	15	17.94
acsz-33b	Aleutian-Alaska-Cascadia	207.9930	56.6030	236	15	5
acsz-33w	Aleutian-Alaska-Cascadia	205.7126	58.3917	234.2	15	69.12
acsz-33x	Aleutian-Alaska-Cascadia	206.1873	58.0371	234.6	15	56.24
acsz-33y	Aleutian-Alaska-Cascadia	206.6527	57.6808	235	15	43.82
acsz-33z	Aleutian-Alaska-Cascadia	207.1091	57.3227	235.4	15	30.88
acsz-34a	Aleutian-Alaska-Cascadia	208.9371	57.5124	236	15	17.94
acsz-34b	Aleutian-Alaska-Cascadia	209.4000	57.1400	236	15	5
acsz-34w	Aleutian-Alaska-Cascadia	206.9772	58.8804	233.5	15	69.12
acsz-34x	Aleutian-Alaska-Cascadia	207.4677	58.5291	233.9	15	56.24
acsz-34y	Aleutian-Alaska-Cascadia	207.9485	58.1760	234.3	15	43.82
acsz-34z	Aleutian-Alaska-Cascadia	208.4198	57.8213	234.7	15	30.88
acsz-35a	Aleutian-Alaska-Cascadia	210.2597	58.0441	230	15	17.94
acsz-35b	Aleutian-Alaska-Cascadia	210.8000	57.7000	230	15	5
acsz-35w	Aleutian-Alaska-Cascadia	208.0204	59.3199	228.8	15	69.12
acsz-35x	Aleutian-Alaska-Cascadia	208.5715	58.9906	229.3	15	56.24
acsz-35y	Aleutian-Alaska-Cascadia	209.1122	58.6590	229.7	15	43.82
acsz-35z	Aleutian-Alaska-Cascadia	209.6425	58.3252	230.2	15	30.88
acsz-36a	Aleutian-Alaska-Cascadia	211.3249	58.6565	218	15	17.94
acsz-36b	Aleutian-Alaska-Cascadia	212.0000	58.3800	218	15	5
acsz-36w	Aleutian-Alaska-Cascadia	208.5003	59.5894	215.6	15	69.12
acsz-36x	Aleutian-Alaska-Cascadia	209.1909	59.3342	216.2	15	56.24
acsz-36y	Aleutian-Alaska-Cascadia	209.8711	59.0753	216.8	15	43.82
acsz-36z	Aleutian-Alaska-Cascadia	210.5412	58.8129	217.3	15	30.88
acsz-37a	Aleutian-Alaska-Cascadia	212.2505	59.2720	213.7	15	17.94
acsz-37b	Aleutian-Alaska-Cascadia	212.9519	59.0312	213.7	15	5
acsz-37x	Aleutian-Alaska-Cascadia	210.1726	60.0644	213	15	56.24
acsz-37y	Aleutian-Alaska-Cascadia	210.8955	59.8251	213.7	15	43.82

Continued on next page

Table B.1 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
acsz-37z	Aleutian-Alaska-Cascadia	211.6079	59.5820	214.3	15	30.88
acsz-38a	Aleutian-Alaska-Cascadia	214.6555	60.1351	260.1	0	15
acsz-38b	Aleutian-Alaska-Cascadia	214.8088	59.6927	260.1	0	15
acsz-38y	Aleutian-Alaska-Cascadia	214.3737	60.9838	259	0	15
acsz-38z	Aleutian-Alaska-Cascadia	214.5362	60.5429	259	0	15
acsz-39a	Aleutian-Alaska-Cascadia	216.5607	60.2480	267	0	15
acsz-39b	Aleutian-Alaska-Cascadia	216.6068	59.7994	267	0	15
acsz-40a	Aleutian-Alaska-Cascadia	219.3069	59.7574	310.9	0	15
acsz-40b	Aleutian-Alaska-Cascadia	218.7288	59.4180	310.9	0	15
acsz-41a	Aleutian-Alaska-Cascadia	220.4832	59.3390	300.7	0	15
acsz-41b	Aleutian-Alaska-Cascadia	220.0382	58.9529	300.7	0	15
acsz-42a	Aleutian-Alaska-Cascadia	221.8835	58.9310	298.9	0	15
acsz-42b	Aleutian-Alaska-Cascadia	221.4671	58.5379	298.9	0	15
acsz-43a	Aleutian-Alaska-Cascadia	222.9711	58.6934	282.3	0	15
acsz-43b	Aleutian-Alaska-Cascadia	222.7887	58.2546	282.3	0	15
acsz-44a	Aleutian-Alaska-Cascadia	224.9379	57.9054	340.9	12	11.09
acsz-44b	Aleutian-Alaska-Cascadia	224.1596	57.7617	340.9	7	5
acsz-45a	Aleutian-Alaska-Cascadia	225.4994	57.1634	334.1	12	11.09
acsz-45b	Aleutian-Alaska-Cascadia	224.7740	56.9718	334.1	7	5
acsz-46a	Aleutian-Alaska-Cascadia	226.1459	56.3552	334.1	12	11.09
acsz-46b	Aleutian-Alaska-Cascadia	225.4358	56.1636	334.1	7	5
acsz-47a	Aleutian-Alaska-Cascadia	226.7731	55.5830	332.3	12	11.09
acsz-47b	Aleutian-Alaska-Cascadia	226.0887	55.3785	332.3	7	5
acsz-48a	Aleutian-Alaska-Cascadia	227.4799	54.6763	339.4	12	11.09
acsz-48b	Aleutian-Alaska-Cascadia	226.7713	54.5217	339.4	7	5
acsz-49a	Aleutian-Alaska-Cascadia	227.9482	53.8155	341.2	12	11.09
acsz-49b	Aleutian-Alaska-Cascadia	227.2462	53.6737	341.2	7	5
acsz-50a	Aleutian-Alaska-Cascadia	228.3970	53.2509	324.5	12	11.09
acsz-50b	Aleutian-Alaska-Cascadia	227.8027	52.9958	324.5	7	5
acsz-51a	Aleutian-Alaska-Cascadia	229.1844	52.6297	318.4	12	11.09
acsz-51b	Aleutian-Alaska-Cascadia	228.6470	52.3378	318.4	7	5
acsz-52a	Aleutian-Alaska-Cascadia	230.0306	52.0768	310.9	12	11.09
acsz-52b	Aleutian-Alaska-Cascadia	229.5665	51.7445	310.9	7	5
acsz-53a	Aleutian-Alaska-Cascadia	231.1735	51.5258	310.9	12	11.09
acsz-53b	Aleutian-Alaska-Cascadia	230.7150	51.1935	310.9	7	5
acsz-54a	Aleutian-Alaska-Cascadia	232.2453	50.8809	314.1	12	11.09
acsz-54b	Aleutian-Alaska-Cascadia	231.7639	50.5655	314.1	7	5
acsz-55a	Aleutian-Alaska-Cascadia	233.3066	49.9032	333.7	12	11.09
acsz-55b	Aleutian-Alaska-Cascadia	232.6975	49.7086	333.7	7	5
acsz-56a	Aleutian-Alaska-Cascadia	234.0588	49.1702	315	11	12.82
acsz-56b	Aleutian-Alaska-Cascadia	233.5849	48.8584	315	9	5
acsz-57a	Aleutian-Alaska-Cascadia	234.9041	48.2596	341	11	12.82
acsz-57b	Aleutian-Alaska-Cascadia	234.2797	48.1161	341	9	5
acsz-58a	Aleutian-Alaska-Cascadia	235.3021	47.3812	344	11	12.82
acsz-58b	Aleutian-Alaska-Cascadia	234.6776	47.2597	344	9	5
acsz-59a	Aleutian-Alaska-Cascadia	235.6432	46.5082	345	11	12.82
acsz-59b	Aleutian-Alaska-Cascadia	235.0257	46.3941	345	9	5
acsz-60a	Aleutian-Alaska-Cascadia	235.8640	45.5429	356	11	12.82
acsz-60b	Aleutian-Alaska-Cascadia	235.2363	45.5121	356	9	5
acsz-61a	Aleutian-Alaska-Cascadia	235.9106	44.6227	359	11	12.82
acsz-61b	Aleutian-Alaska-Cascadia	235.2913	44.6150	359	9	5
acsz-62a	Aleutian-Alaska-Cascadia	235.9229	43.7245	359	11	12.82
acsz-62b	Aleutian-Alaska-Cascadia	235.3130	43.7168	359	9	5
acsz-63a	Aleutian-Alaska-Cascadia	236.0220	42.9020	350	11	12.82
acsz-63b	Aleutian-Alaska-Cascadia	235.4300	42.8254	350	9	5
acsz-64a	Aleutian-Alaska-Cascadia	235.9638	41.9818	345	11	12.82
acsz-64b	Aleutian-Alaska-Cascadia	235.3919	41.8677	345	9	5
acsz-65a	Aleutian-Alaska-Cascadia	236.2643	41.1141	345	11	12.82
acsz-65b	Aleutian-Alaska-Cascadia	235.7000	41.0000	345	9	5
acsz-238a	Aleutian-Alaska-Cascadia	213.2878	59.8406	236.8	15	17.94
acsz-238y	Aleutian-Alaska-Cascadia	212.3424	60.5664	236.8	15	43.82
acsz-238z	Aleutian-Alaska-Cascadia	212.8119	60.2035	236.8	15	30.88





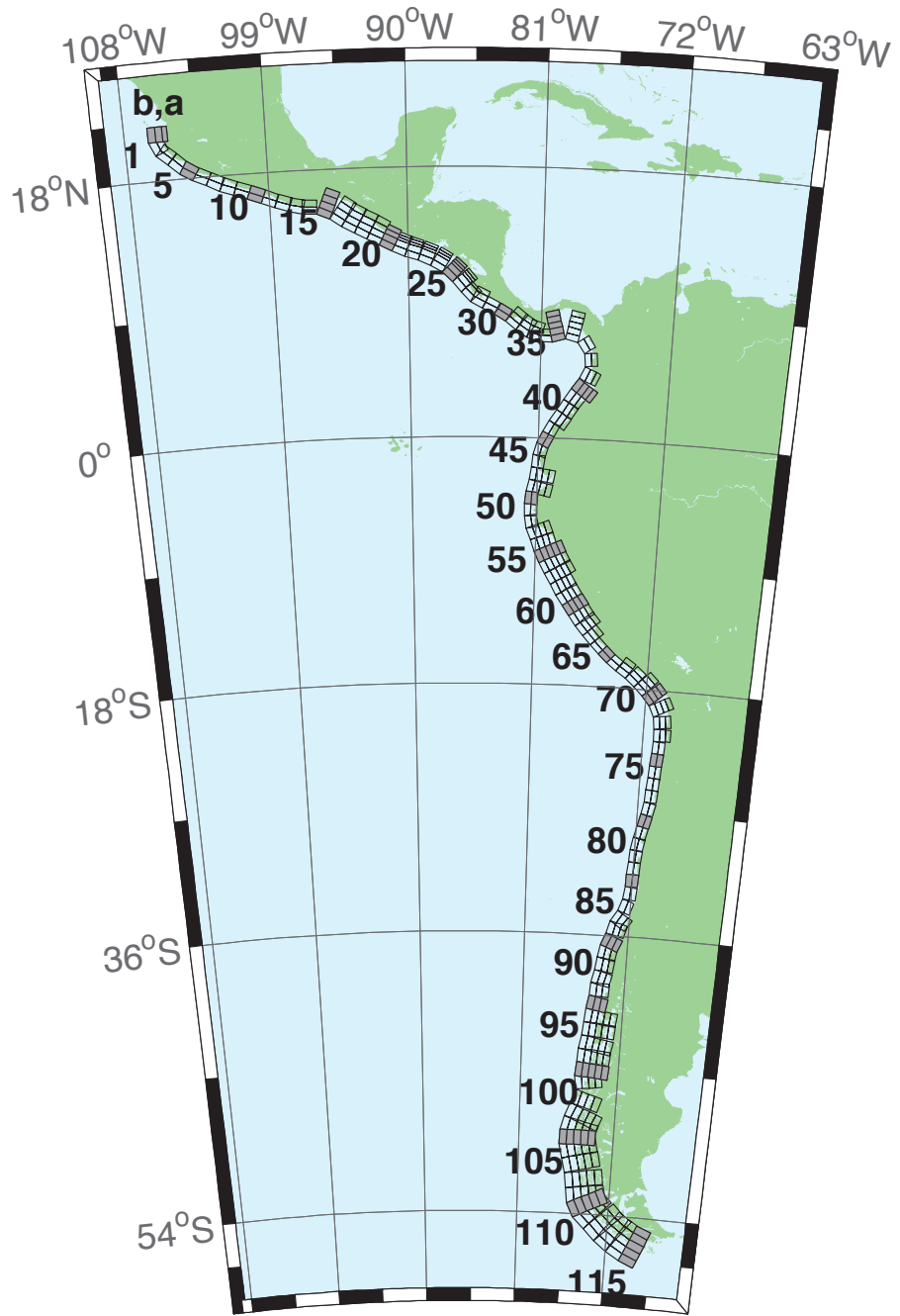


Figure B.2: Central and South America Subduction Zone unit sources.

Table B.2: Earthquake parameters for Central and South America Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-1a	Central and South America	254.4573	20.8170	359	19	15.4
cssz-1b	Central and South America	254.0035	20.8094	359	12	5
cssz-1z	Central and South America	254.7664	20.8222	359	50	31.67
cssz-2a	Central and South America	254.5765	20.2806	336.8	19	15.4
cssz-2b	Central and South America	254.1607	20.1130	336.8	12	5
cssz-3a	Central and South America	254.8789	19.8923	310.6	18.31	15.27
cssz-3b	Central and South America	254.5841	19.5685	310.6	11.85	5
cssz-4a	Central and South America	255.6167	19.2649	313.4	17.62	15.12
cssz-4b	Central and South America	255.3056	18.9537	313.4	11.68	5
cssz-5a	Central and South America	256.2240	18.8148	302.7	16.92	15
cssz-5b	Central and South America	255.9790	18.4532	302.7	11.54	5
cssz-6a	Central and South America	256.9425	18.4383	295.1	16.23	14.87
cssz-6b	Central and South America	256.7495	18.0479	295.1	11.38	5
cssz-7a	Central and South America	257.8137	18.0339	296.9	15.54	14.74
cssz-7b	Central and South America	257.6079	17.6480	296.9	11.23	5
cssz-8a	Central and South America	258.5779	17.7151	290.4	14.85	14.61
cssz-8b	Central and South America	258.4191	17.3082	290.4	11.08	5
cssz-9a	Central and South America	259.4578	17.4024	290.5	14.15	14.47
cssz-9b	Central and South America	259.2983	16.9944	290.5	10.92	5
cssz-10a	Central and South America	260.3385	17.0861	290.8	13.46	14.34
cssz-10b	Central and South America	260.1768	16.6776	290.8	10.77	5
cssz-11a	Central and South America	261.2255	16.7554	291.8	12.77	14.21
cssz-11b	Central and South America	261.0556	16.3487	291.8	10.62	5
cssz-12a	Central and South America	262.0561	16.4603	288.9	12.08	14.08
cssz-12b	Central and South America	261.9082	16.0447	288.9	10.46	5
cssz-13a	Central and South America	262.8638	16.2381	283.2	11.38	13.95
cssz-13b	Central and South America	262.7593	15.8094	283.2	10.31	5
cssz-14a	Central and South America	263.6066	16.1435	272.1	10.69	13.81
cssz-14b	Central and South America	263.5901	15.7024	272.1	10.15	5
cssz-15a	Central and South America	264.8259	15.8829	293	10	13.68
cssz-15b	Central and South America	264.6462	15.4758	293	10	5
cssz-15y	Central and South America	265.1865	16.6971	293	10	31.05
cssz-15z	Central and South America	265.0060	16.2900	293	10	22.36
cssz-16a	Central and South America	265.7928	15.3507	304.9	15	15.82
cssz-16b	Central and South America	265.5353	14.9951	304.9	12.5	5
cssz-16y	Central and South America	266.3092	16.0619	304.9	15	41.7
cssz-16z	Central and South America	266.0508	15.7063	304.9	15	28.76
cssz-17a	Central and South America	266.4947	14.9019	299.5	20	17.94
cssz-17b	Central and South America	266.2797	14.5346	299.5	15	5
cssz-17y	Central and South America	266.9259	15.6365	299.5	20	52.14
cssz-17z	Central and South America	266.7101	15.2692	299.5	20	35.04
cssz-18a	Central and South America	267.2827	14.4768	298	21.5	17.94
cssz-18b	Central and South America	267.0802	14.1078	298	15	5
cssz-18y	Central and South America	267.6888	15.2148	298	21.5	54.59
cssz-18z	Central and South America	267.4856	14.8458	298	21.5	36.27
cssz-19a	Central and South America	268.0919	14.0560	297.6	23	17.94
cssz-19b	Central and South America	267.8943	13.6897	297.6	15	5
cssz-19y	Central and South America	268.4880	14.7886	297.6	23	57.01
cssz-19z	Central and South America	268.2898	14.4223	297.6	23	37.48
cssz-20a	Central and South America	268.8929	13.6558	296.2	24	17.94
cssz-20b	Central and South America	268.7064	13.2877	296.2	15	5
cssz-20y	Central and South America	269.1796	14.2206	296.2	45.5	73.94
cssz-20z	Central and South America	269.0362	13.9382	296.2	45.5	38.28
cssz-21a	Central and South America	269.6797	13.3031	292.6	25	17.94
cssz-21b	Central and South America	269.5187	12.9274	292.6	15	5
cssz-21x	Central and South America	269.8797	13.7690	292.6	68	131.8
cssz-21y	Central and South America	269.8130	13.6137	292.6	68	85.43
cssz-21z	Central and South America	269.7463	13.4584	292.6	68	39.07
cssz-22a	Central and South America	270.4823	13.0079	288.6	25	17.94
cssz-22b	Central and South America	270.3492	12.6221	288.6	15	5

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Table B.2 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-22x	Central and South America	270.6476	13.4864	288.6	68	131.8
cssz-22y	Central and South America	270.5925	13.3269	288.6	68	85.43
cssz-22z	Central and South America	270.5374	13.1674	288.6	68	39.07
cssz-23a	Central and South America	271.3961	12.6734	292.4	25	17.94
cssz-23b	Central and South America	271.2369	12.2972	292.4	15	5
cssz-23x	Central and South America	271.5938	13.1399	292.4	68	131.8
cssz-23y	Central and South America	271.5279	12.9844	292.4	68	85.43
cssz-23z	Central and South America	271.4620	12.8289	292.4	68	39.07
cssz-24a	Central and South America	272.3203	12.2251	300.2	25	17.94
cssz-24b	Central and South America	272.1107	11.8734	300.2	15	5
cssz-24x	Central and South America	272.5917	12.6799	300.2	67	131.1
cssz-24y	Central and South America	272.5012	12.5283	300.2	67	85.1
cssz-24z	Central and South America	272.4107	12.3767	300.2	67	39.07
cssz-25a	Central and South America	273.2075	11.5684	313.8	25	17.94
cssz-25b	Central and South America	272.9200	11.2746	313.8	15	5
cssz-25x	Central and South America	273.5950	11.9641	313.8	66	130.4
cssz-25y	Central and South America	273.4658	11.8322	313.8	66	84.75
cssz-25z	Central and South America	273.3366	11.7003	313.8	66	39.07
cssz-26a	Central and South America	273.8943	10.8402	320.4	25	17.94
cssz-26b	Central and South America	273.5750	10.5808	320.4	15	5
cssz-26x	Central and South America	274.3246	11.1894	320.4	66	130.4
cssz-26y	Central and South America	274.1811	11.0730	320.4	66	84.75
cssz-26z	Central and South America	274.0377	10.9566	320.4	66	39.07
cssz-27a	Central and South America	274.4569	10.2177	316.1	25	17.94
cssz-27b	Central and South America	274.1590	9.9354	316.1	15	5
cssz-27z	Central and South America	274.5907	10.3444	316.1	66	39.07
cssz-28a	Central and South America	274.9586	9.8695	297.1	22	14.54
cssz-28b	Central and South America	274.7661	9.4988	297.1	11	5
cssz-28z	Central and South America	275.1118	10.1643	297.1	42.5	33.27
cssz-29a	Central and South America	275.7686	9.4789	296.6	19	11.09
cssz-29b	Central and South America	275.5759	9.0992	296.6	7	5
cssz-30a	Central and South America	276.6346	8.9973	302.2	19	9.36
cssz-30b	Central and South America	276.4053	8.6381	302.2	5	5
cssz-31a	Central and South America	277.4554	8.4152	309.1	19	7.62
cssz-31b	Central and South America	277.1851	8.0854	309.1	3	5
cssz-31z	Central and South America	277.7260	8.7450	309.1	19	23.9
cssz-32a	Central and South America	278.1112	7.9425	303	18.67	8.49
cssz-32b	Central and South America	277.8775	7.5855	303	4	5
cssz-32z	Central and South America	278.3407	8.2927	303	21.67	24.49
cssz-33a	Central and South America	278.7082	7.6620	287.6	18.33	10.23
cssz-33b	Central and South America	278.5785	7.2555	287.6	6	5
cssz-33z	Central and South America	278.8328	8.0522	287.6	24.33	25.95
cssz-34a	Central and South America	279.3184	7.5592	269.5	18	17.94
cssz-34b	Central and South America	279.3223	7.1320	269.5	15	5
cssz-35a	Central and South America	280.0039	7.6543	255.9	17.67	14.54
cssz-35b	Central and South America	280.1090	7.2392	255.9	11	5
cssz-35x	Central and South America	279.7156	8.7898	255.9	29.67	79.22
cssz-35y	Central and South America	279.8118	8.4113	255.9	29.67	54.47
cssz-35z	Central and South America	279.9079	8.0328	255.9	29.67	29.72
cssz-36a	Central and South America	281.2882	7.6778	282.5	17.33	11.09
cssz-36b	Central and South America	281.1948	7.2592	282.5	7	5
cssz-36x	Central and South America	281.5368	8.7896	282.5	32.33	79.47
cssz-36y	Central and South America	281.4539	8.4190	282.5	32.33	52.73
cssz-36z	Central and South America	281.3710	8.0484	282.5	32.33	25.99
cssz-37a	Central and South America	282.5252	6.8289	326.9	17	10.23
cssz-37b	Central and South America	282.1629	6.5944	326.9	6	5
cssz-38a	Central and South America	282.9469	5.5973	355.4	17	10.23
cssz-38b	Central and South America	282.5167	5.5626	355.4	6	5
cssz-39a	Central and South America	282.7236	4.3108	24.13	17	10.23
cssz-39b	Central and South America	282.3305	4.4864	24.13	6	5
cssz-39z	Central and South America	283.0603	4.1604	24.13	35	24.85
cssz-40a	Central and South America	282.1940	3.3863	35.28	17	10.23

Continued on next page

Table B.2 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-40b	Central and South America	281.8427	3.6344	35.28	6	5
cssz-40y	Central and South America	282.7956	2.9613	35.28	35	53.52
cssz-40z	Central and South America	282.4948	3.1738	35.28	35	24.85
cssz-41a	Central and South America	281.6890	2.6611	34.27	17	10.23
cssz-41b	Central and South America	281.3336	2.9030	34.27	6	5
cssz-41z	Central and South America	281.9933	2.4539	34.27	35	24.85
cssz-42a	Central and South America	281.2266	1.9444	31.29	17	10.23
cssz-42b	Central and South America	280.8593	2.1675	31.29	6	5
cssz-42z	Central and South America	281.5411	1.7533	31.29	35	24.85
cssz-43a	Central and South America	280.7297	1.1593	33.3	17	10.23
cssz-43b	Central and South America	280.3706	1.3951	33.3	6	5
cssz-43z	Central and South America	281.0373	0.9573	33.3	35	24.85
cssz-44a	Central and South America	280.3018	0.4491	28.8	17	10.23
cssz-44b	Central and South America	279.9254	0.6560	28.8	6	5
cssz-45a	Central and South America	279.9083	-0.3259	26.91	10	8.49
cssz-45b	Central and South America	279.5139	-0.1257	26.91	4	5
cssz-46a	Central and South America	279.6461	-0.9975	15.76	10	8.49
cssz-46b	Central and South America	279.2203	-0.8774	15.76	4	5
cssz-47a	Central and South America	279.4972	-1.7407	6.9	10	8.49
cssz-47b	Central and South America	279.0579	-1.6876	6.9	4	5
cssz-48a	Central and South America	279.3695	-2.6622	8.96	10	8.49
cssz-48b	Central and South America	278.9321	-2.5933	8.96	4	5
cssz-48y	Central and South America	280.2444	-2.8000	8.96	10	25.85
cssz-48z	Central and South America	279.8070	-2.7311	8.96	10	17.17
cssz-49a	Central and South America	279.1852	-3.6070	13.15	10	8.49
cssz-49b	Central and South America	278.7536	-3.5064	13.15	4	5
cssz-49y	Central and South America	280.0486	-3.8082	13.15	10	25.85
cssz-49z	Central and South America	279.6169	-3.7076	13.15	10	17.17
cssz-50a	Central and South America	279.0652	-4.3635	4.78	10.33	9.64
cssz-50b	Central and South America	278.6235	-4.3267	4.78	5.33	5
cssz-51a	Central and South America	279.0349	-5.1773	359.4	10.67	10.81
cssz-51b	Central and South America	278.5915	-5.1817	359.4	6.67	5
cssz-52a	Central and South America	279.1047	-5.9196	349.8	11	11.96
cssz-52b	Central and South America	278.6685	-5.9981	349.8	8	5
cssz-53a	Central and South America	279.3044	-6.6242	339.2	10.25	11.74
cssz-53b	Central and South America	278.8884	-6.7811	339.2	7.75	5
cssz-53y	Central and South America	280.1024	-6.3232	339.2	19.25	37.12
cssz-53z	Central and South America	279.7035	-6.4737	339.2	19.25	20.64
cssz-54a	Central and South America	279.6256	-7.4907	340.8	9.5	11.53
cssz-54b	Central and South America	279.2036	-7.6365	340.8	7.5	5
cssz-54y	Central and South America	280.4267	-7.2137	340.8	20.5	37.29
cssz-54z	Central and South America	280.0262	-7.3522	340.8	20.5	19.78
cssz-55a	Central and South America	279.9348	-8.2452	335.4	8.75	11.74
cssz-55b	Central and South America	279.5269	-8.4301	335.4	7.75	5
cssz-55x	Central and South America	281.0837	-7.7238	335.4	21.75	56.4
cssz-55y	Central and South America	280.7009	-7.8976	335.4	21.75	37.88
cssz-55z	Central and South America	280.3180	-8.0714	335.4	21.75	19.35
cssz-56a	Central and South America	280.3172	-8.9958	331.6	8	11.09
cssz-56b	Central and South America	279.9209	-9.2072	331.6	7	5
cssz-56x	Central and South America	281.4212	-8.4063	331.6	23	57.13
cssz-56y	Central and South America	281.0534	-8.6028	331.6	23	37.59
cssz-56z	Central and South America	280.6854	-8.7993	331.6	23	18.05
cssz-57a	Central and South America	280.7492	-9.7356	328.7	8.6	10.75
cssz-57b	Central and South America	280.3640	-9.9663	328.7	6.6	5
cssz-57x	Central and South America	281.8205	-9.0933	328.7	23.4	57.94
cssz-57y	Central and South America	281.4636	-9.3074	328.7	23.4	38.08
cssz-57z	Central and South America	281.1065	-9.5215	328.7	23.4	18.22
cssz-58a	Central and South America	281.2275	-10.5350	330.5	9.2	10.4
cssz-58b	Central and South America	280.8348	-10.7532	330.5	6.2	5
cssz-58y	Central and South America	281.9548	-10.1306	330.5	23.8	38.57
cssz-58z	Central and South America	281.5913	-10.3328	330.5	23.8	18.39
cssz-59a	Central and South America	281.6735	-11.2430	326.2	9.8	10.05

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Table B.2 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-59b	Central and South America	281.2982	-11.4890	326.2	5.8	5
cssz-59y	Central and South America	282.3675	-10.7876	326.2	24.2	39.06
cssz-59z	Central and South America	282.0206	-11.0153	326.2	24.2	18.56
cssz-60a	Central and South America	282.1864	-11.9946	326.5	10.4	9.71
cssz-60b	Central and South America	281.8096	-12.2384	326.5	5.4	5
cssz-60y	Central and South America	282.8821	-11.5438	326.5	24.6	39.55
cssz-60z	Central and South America	282.5344	-11.7692	326.5	24.6	18.73
cssz-61a	Central and South America	282.6944	-12.7263	325.5	11	9.36
cssz-61b	Central and South America	282.3218	-12.9762	325.5	5	5
cssz-61y	Central and South America	283.3814	-12.2649	325.5	25	40.03
cssz-61z	Central and South America	283.0381	-12.4956	325.5	25	18.9
cssz-62a	Central and South America	283.1980	-13.3556	319	11	9.79
cssz-62b	Central and South America	282.8560	-13.6451	319	5.5	5
cssz-62y	Central and South America	283.8178	-12.8300	319	27	42.03
cssz-62z	Central and South America	283.5081	-13.0928	319	27	19.33
cssz-63a	Central and South America	283.8032	-14.0147	317.9	11	10.23
cssz-63b	Central and South America	283.4661	-14.3106	317.9	6	5
cssz-63z	Central and South America	284.1032	-13.7511	317.9	29	19.77
cssz-64a	Central and South America	284.4144	-14.6482	315.7	13	11.96
cssz-64b	Central and South America	284.0905	-14.9540	315.7	8	5
cssz-65a	Central and South America	285.0493	-15.2554	313.2	15	13.68
cssz-65b	Central and South America	284.7411	-15.5715	313.2	10	5
cssz-66a	Central and South America	285.6954	-15.7816	307.7	14.5	13.68
cssz-66b	Central and South America	285.4190	-16.1258	307.7	10	5
cssz-67a	Central and South America	286.4127	-16.2781	304.3	14	13.68
cssz-67b	Central and South America	286.1566	-16.6381	304.3	10	5
cssz-67z	Central and South America	286.6552	-15.9365	304.3	23	25.78
cssz-68a	Central and South America	287.2481	-16.9016	311.8	14	13.68
cssz-68b	Central and South America	286.9442	-17.2264	311.8	10	5
cssz-68z	Central and South America	287.5291	-16.6007	311.8	26	25.78
cssz-69a	Central and South America	287.9724	-17.5502	314.9	14	13.68
cssz-69b	Central and South America	287.6496	-17.8590	314.9	10	5
cssz-69y	Central and South America	288.5530	-16.9934	314.9	29	50.02
cssz-69z	Central and South America	288.2629	-17.2718	314.9	29	25.78
cssz-70a	Central and South America	288.6731	-18.2747	320.4	14	13.25
cssz-70b	Central and South America	288.3193	-18.5527	320.4	9.5	5
cssz-70y	Central and South America	289.3032	-17.7785	320.4	30	50.35
cssz-70z	Central and South America	288.9884	-18.0266	320.4	30	25.35
cssz-71a	Central and South America	289.3089	-19.1854	333.2	14	12.82
cssz-71b	Central and South America	288.8968	-19.3820	333.2	9	5
cssz-71y	Central and South America	290.0357	-18.8382	333.2	31	50.67
cssz-71z	Central and South America	289.6725	-19.0118	333.2	31	24.92
cssz-72a	Central and South America	289.6857	-20.3117	352.4	14	12.54
cssz-72b	Central and South America	289.2250	-20.3694	352.4	8.67	5
cssz-72z	Central and South America	290.0882	-20.2613	352.4	32	24.63
cssz-73a	Central and South America	289.7731	-21.3061	358.9	14	12.24
cssz-73b	Central and South America	289.3053	-21.3142	358.9	8.33	5
cssz-73z	Central and South America	290.1768	-21.2991	358.9	33	24.34
cssz-74a	Central and South America	289.7610	-22.2671	3.06	14	11.96
cssz-74b	Central and South America	289.2909	-22.2438	3.06	8	5
cssz-75a	Central and South America	289.6982	-23.1903	4.83	14.09	11.96
cssz-75b	Central and South America	289.2261	-23.1536	4.83	8	5
cssz-76a	Central and South America	289.6237	-24.0831	4.67	14.18	11.96
cssz-76b	Central and South America	289.1484	-24.0476	4.67	8	5
cssz-77a	Central and South America	289.5538	-24.9729	4.3	14.27	11.96
cssz-77b	Central and South America	289.0750	-24.9403	4.3	8	5
cssz-78a	Central and South America	289.4904	-25.8621	3.86	14.36	11.96
cssz-78b	Central and South America	289.0081	-25.8328	3.86	8	5
cssz-79a	Central and South America	289.3491	-26.8644	11.34	14.45	11.96
cssz-79b	Central and South America	288.8712	-26.7789	11.34	8	5
cssz-80a	Central and South America	289.1231	-27.7826	14.16	14.54	11.96
cssz-80b	Central and South America	288.6469	-27.6762	14.16	8	5

Continued on next page

Table B.2 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-81a	Central and South America	288.8943	-28.6409	13.19	14.63	11.96
cssz-81b	Central and South America	288.4124	-28.5417	13.19	8	5
cssz-82a	Central and South America	288.7113	-29.4680	9.68	14.72	11.96
cssz-82b	Central and South America	288.2196	-29.3950	9.68	8	5
cssz-83a	Central and South America	288.5944	-30.2923	5.36	14.81	11.96
cssz-83b	Central and South America	288.0938	-30.2517	5.36	8	5
cssz-84a	Central and South America	288.5223	-31.1639	3.8	14.9	11.96
cssz-84b	Central and South America	288.0163	-31.1351	3.8	8	5
cssz-85a	Central and South America	288.4748	-32.0416	2.55	15	11.96
cssz-85b	Central and South America	287.9635	-32.0223	2.55	8	5
cssz-86a	Central and South America	288.3901	-33.0041	7.01	15	11.96
cssz-86b	Central and South America	287.8768	-32.9512	7.01	8	5
cssz-87a	Central and South America	288.1050	-34.0583	19.4	15	11.96
cssz-87b	Central and South America	287.6115	-33.9142	19.4	8	5
cssz-88a	Central and South America	287.5309	-35.0437	32.81	15	11.96
cssz-88b	Central and South America	287.0862	-34.8086	32.81	8	5
cssz-88z	Central and South America	287.9308	-35.2545	32.81	30	24.9
cssz-89a	Central and South America	287.2380	-35.5993	14.52	16.67	11.96
cssz-89b	Central and South America	286.7261	-35.4914	14.52	8	5
cssz-89z	Central and South America	287.7014	-35.6968	14.52	30	26.3
cssz-90a	Central and South America	286.8442	-36.5645	22.64	18.33	11.96
cssz-90b	Central and South America	286.3548	-36.4004	22.64	8	5
cssz-90z	Central and South America	287.2916	-36.7142	22.64	30	27.68
cssz-91a	Central and South America	286.5925	-37.2488	10.9	20	11.96
cssz-91b	Central and South America	286.0721	-37.1690	10.9	8	5
cssz-91z	Central and South America	287.0726	-37.3224	10.9	30	29.06
cssz-92a	Central and South America	286.4254	-38.0945	8.23	20	11.96
cssz-92b	Central and South America	285.8948	-38.0341	8.23	8	5
cssz-92z	Central and South America	286.9303	-38.1520	8.23	26.67	29.06
cssz-93a	Central and South America	286.2047	-39.0535	13.46	20	11.96
cssz-93b	Central and South America	285.6765	-38.9553	13.46	8	5
cssz-93z	Central and South America	286.7216	-39.1495	13.46	23.33	29.06
cssz-94a	Central and South America	286.0772	-39.7883	3.4	20	11.96
cssz-94b	Central and South America	285.5290	-39.7633	3.4	8	5
cssz-94z	Central and South America	286.6255	-39.8133	3.4	20	29.06
cssz-95a	Central and South America	285.9426	-40.7760	9.84	20	11.96
cssz-95b	Central and South America	285.3937	-40.7039	9.84	8	5
cssz-95z	Central and South America	286.4921	-40.8481	9.84	20	29.06
cssz-96a	Central and South America	285.7839	-41.6303	7.6	20	11.96
cssz-96b	Central and South America	285.2245	-41.5745	7.6	8	5
cssz-96x	Central and South America	287.4652	-41.7977	7.6	20	63.26
cssz-96y	Central and South America	286.9043	-41.7419	7.6	20	46.16
cssz-96z	Central and South America	286.3439	-41.6861	7.6	20	29.06
cssz-97a	Central and South America	285.6695	-42.4882	5.3	20	11.96
cssz-97b	Central and South America	285.0998	-42.4492	5.3	8	5
cssz-97x	Central and South America	287.3809	-42.6052	5.3	20	63.26
cssz-97y	Central and South America	286.8101	-42.5662	5.3	20	46.16
cssz-97z	Central and South America	286.2396	-42.5272	5.3	20	29.06
cssz-98a	Central and South America	285.5035	-43.4553	10.53	20	11.96
cssz-98b	Central and South America	284.9322	-43.3782	10.53	8	5
cssz-98x	Central and South America	287.2218	-43.6866	10.53	20	63.26
cssz-98y	Central and South America	286.6483	-43.6095	10.53	20	46.16
cssz-98z	Central and South America	286.0755	-43.5324	10.53	20	29.06
cssz-99a	Central and South America	285.3700	-44.2595	4.86	20	11.96
cssz-99b	Central and South America	284.7830	-44.2237	4.86	8	5
cssz-99x	Central and South America	287.1332	-44.3669	4.86	20	63.26
cssz-99y	Central and South America	286.5451	-44.3311	4.86	20	46.16
cssz-99z	Central and South America	285.9574	-44.2953	4.86	20	29.06
cssz-100a	Central and South America	285.2713	-45.1664	5.68	20	11.96
cssz-100b	Central and South America	284.6758	-45.1246	5.68	8	5
cssz-100x	Central and South America	287.0603	-45.2918	5.68	20	63.26
cssz-100y	Central and South America	286.4635	-45.2500	5.68	20	46.16

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Table B.2 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-100z	Central and South America	285.8672	-45.2082	5.68	20	29.06
cssz-101a	Central and South America	285.3080	-45.8607	352.6	20	9.36
cssz-101b	Central and South America	284.7067	-45.9152	352.6	5	5
cssz-101y	Central and South America	286.5089	-45.7517	352.6	20	43.56
cssz-101z	Central and South America	285.9088	-45.8062	352.6	20	26.46
cssz-102a	Central and South America	285.2028	-47.1185	17.72	5	9.36
cssz-102b	Central and South America	284.5772	-46.9823	17.72	5	5
cssz-102y	Central and South America	286.4588	-47.3909	17.72	5	18.07
cssz-102z	Central and South America	285.8300	-47.2547	17.72	5	13.72
cssz-103a	Central and South America	284.7075	-48.0396	23.37	7.5	11.53
cssz-103b	Central and South America	284.0972	-47.8630	23.37	7.5	5
cssz-103x	Central and South America	286.5511	-48.5694	23.37	7.5	31.11
cssz-103y	Central and South America	285.9344	-48.3928	23.37	7.5	24.58
cssz-103z	Central and South America	285.3199	-48.2162	23.37	7.5	18.05
cssz-104a	Central and South America	284.3440	-48.7597	14.87	10	13.68
cssz-104b	Central and South America	283.6962	-48.6462	14.87	10	5
cssz-104x	Central and South America	286.2962	-49.1002	14.87	10	39.73
cssz-104y	Central and South America	285.6440	-48.9867	14.87	10	31.05
cssz-104z	Central and South America	284.9933	-48.8732	14.87	10	22.36
cssz-105a	Central and South America	284.2312	-49.4198	0.25	9.67	13.4
cssz-105b	Central and South America	283.5518	-49.4179	0.25	9.67	5
cssz-105x	Central and South America	286.2718	-49.4255	0.25	9.67	38.59
cssz-105y	Central and South America	285.5908	-49.4236	0.25	9.67	30.2
cssz-105z	Central and South America	284.9114	-49.4217	0.25	9.67	21.8
cssz-106a	Central and South America	284.3730	-50.1117	347.5	9.25	13.04
cssz-106b	Central and South America	283.6974	-50.2077	347.5	9.25	5
cssz-106x	Central and South America	286.3916	-49.8238	347.5	9.25	37.16
cssz-106y	Central and South America	285.7201	-49.9198	347.5	9.25	29.11
cssz-106z	Central and South America	285.0472	-50.0157	347.5	9.25	21.07
cssz-107a	Central and South America	284.7130	-50.9714	346.5	9	12.82
cssz-107b	Central and South America	284.0273	-51.0751	346.5	9	5
cssz-107x	Central and South America	286.7611	-50.6603	346.5	9	36.29
cssz-107y	Central and South America	286.0799	-50.7640	346.5	9	28.47
cssz-107z	Central and South America	285.3972	-50.8677	346.5	9	20.64
cssz-108a	Central and South America	285.0378	-51.9370	352	8.67	12.54
cssz-108b	Central and South America	284.3241	-51.9987	352	8.67	5
cssz-108x	Central and South America	287.1729	-51.7519	352	8.67	35.15
cssz-108y	Central and South America	286.4622	-51.8136	352	8.67	27.61
cssz-108z	Central and South America	285.7505	-51.8753	352	8.67	20.07
cssz-109a	Central and South America	285.2635	-52.8439	353.1	8.33	12.24
cssz-109b	Central and South America	284.5326	-52.8974	353.1	8.33	5
cssz-109x	Central and South America	287.4508	-52.6834	353.1	8.33	33.97
cssz-109y	Central and South America	286.7226	-52.7369	353.1	8.33	26.73
cssz-109z	Central and South America	285.9935	-52.7904	353.1	8.33	19.49
cssz-110a	Central and South America	285.5705	-53.4139	334.2	8	11.96
cssz-110b	Central and South America	284.8972	-53.6076	334.2	8	5
cssz-110x	Central and South America	287.5724	-52.8328	334.2	8	32.83
cssz-110y	Central and South America	286.9081	-53.0265	334.2	8	25.88
cssz-110z	Central and South America	286.2408	-53.2202	334.2	8	18.92
cssz-111a	Central and South America	286.1627	-53.8749	313.8	8	11.96
cssz-111b	Central and South America	285.6382	-54.1958	313.8	8	5
cssz-111x	Central and South America	287.7124	-52.9122	313.8	8	32.83
cssz-111y	Central and South America	287.1997	-53.2331	313.8	8	25.88
cssz-111z	Central and South America	286.6832	-53.5540	313.8	8	18.92
cssz-112a	Central and South America	287.3287	-54.5394	316.4	8	11.96
cssz-112b	Central and South America	286.7715	-54.8462	316.4	8	5
cssz-112x	Central and South America	288.9756	-53.6190	316.4	8	32.83
cssz-112y	Central and South America	288.4307	-53.9258	316.4	8	25.88
cssz-112z	Central and South America	287.8817	-54.2326	316.4	8	18.92
cssz-113a	Central and South America	288.3409	-55.0480	307.6	8	11.96
cssz-113b	Central and South America	287.8647	-55.4002	307.6	8	5
cssz-113x	Central and South America	289.7450	-53.9914	307.6	8	32.83
cssz-113y	Central and South America	289.2810	-54.3436	307.6	8	25.88
cssz-113z	Central and South America	288.8130	-54.6958	307.6	8	18.92
cssz-114a	Central and South America	289.5342	-55.5026	301.5	8	11.96

Continued on next page

**Table B.2 – continued**

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
cssz-114b	Central and South America	289.1221	-55.8819	301.5	8	5
cssz-114x	Central and South America	290.7472	-54.3647	301.5	8	32.83
cssz-114y	Central and South America	290.3467	-54.7440	301.5	8	25.88
cssz-114z	Central and South America	289.9424	-55.1233	301.5	8	18.92
cssz-115a	Central and South America	290.7682	-55.8485	292.7	8	11.96
cssz-115b	Central and South America	290.4608	-56.2588	292.7	8	5
cssz-115x	Central and South America	291.6714	-54.6176	292.7	8	32.83
cssz-115y	Central and South America	291.3734	-55.0279	292.7	8	25.88
cssz-115z	Central and South America	291.0724	-55.4382	292.7	8	18.92

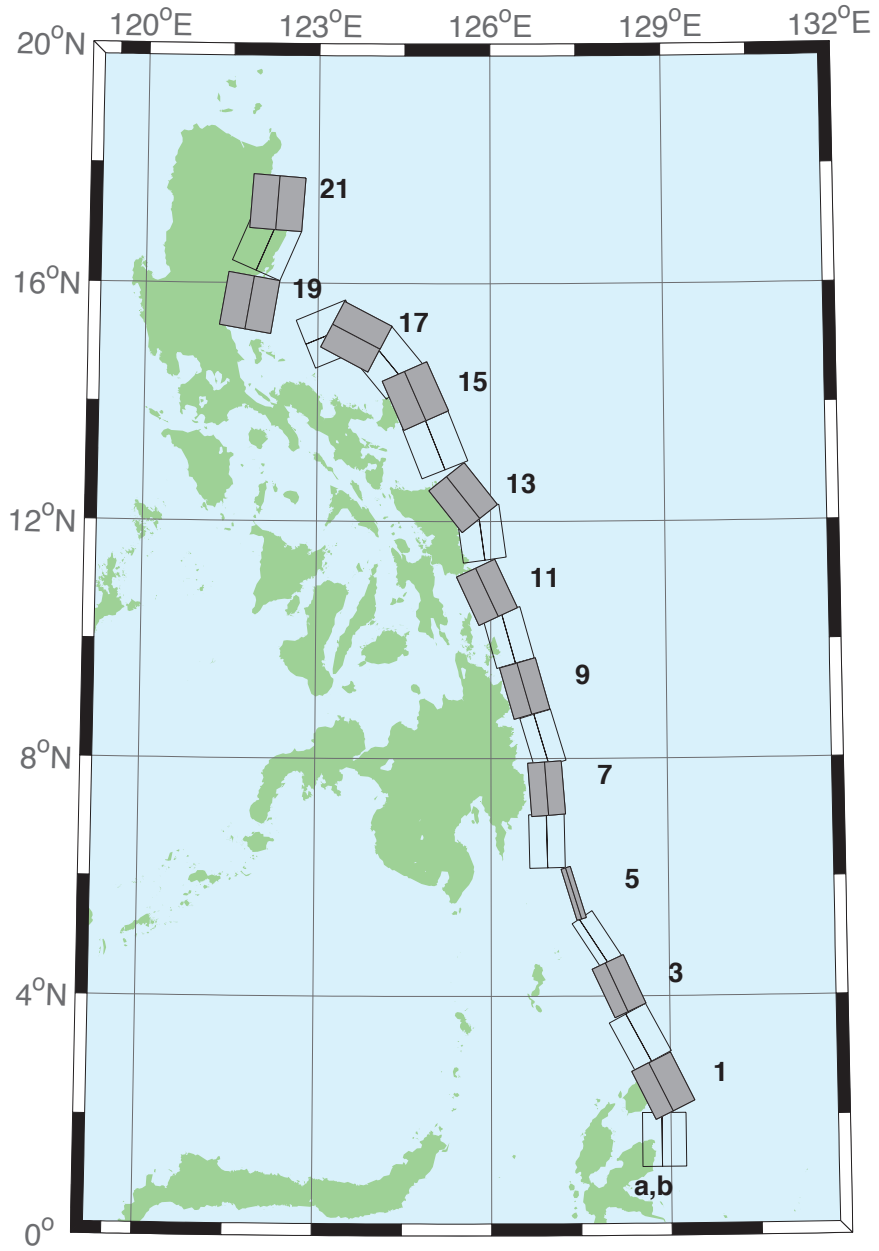


Figure B.3: Eastern Philippines Subduction Zone unit sources.

Table B.3: Earthquake parameters for Eastern Philippines Subduction Zone unit sources.

Segment	Description	Longitude( $^{\circ}$ E)	Latitude( $^{\circ}$ N)	Strike( $^{\circ}$ )	Dip( $^{\circ}$ )	Depth (km)
epsz-0a	Eastern Philippines	128.5264	1.5930	180	44	26.92
epsz-0b	Eastern Philippines	128.8496	1.5930	180	26	5
epsz-1a	Eastern Philippines	128.5521	2.3289	153.6	44.2	27.62
epsz-1b	Eastern Philippines	128.8408	2.4720	153.6	26.9	5
epsz-2a	Eastern Philippines	128.1943	3.1508	151.9	45.9	32.44
epsz-2b	Eastern Philippines	128.4706	3.2979	151.9	32.8	5.35
epsz-3a	Eastern Philippines	127.8899	4.0428	155.2	57.3	40.22
epsz-3b	Eastern Philippines	128.1108	4.1445	155.2	42.7	6.31
epsz-4a	Eastern Philippines	127.6120	4.8371	146.8	71.4	48.25
epsz-4b	Eastern Philippines	127.7324	4.9155	146.8	54.8	7.39
epsz-5a	Eastern Philippines	127.3173	5.7040	162.9	79.9	57.4
epsz-5b	Eastern Philippines	127.3930	5.7272	162.9	79.4	8.25
epsz-6a	Eastern Philippines	126.6488	6.6027	178.9	48.6	45.09
epsz-6b	Eastern Philippines	126.9478	6.6085	178.9	48.6	7.58
epsz-7a	Eastern Philippines	126.6578	7.4711	175.8	50.7	45.52
epsz-7b	Eastern Philippines	126.9439	7.4921	175.8	50.7	6.83
epsz-8a	Eastern Philippines	126.6227	8.2456	163.3	56.7	45.6
epsz-8b	Eastern Philippines	126.8614	8.3164	163.3	48.9	7.92
epsz-9a	Eastern Philippines	126.2751	9.0961	164.1	47	43.59
epsz-9b	Eastern Philippines	126.5735	9.1801	164.1	44.9	8.3
epsz-10a	Eastern Philippines	125.9798	9.9559	164.5	43.1	42.25
epsz-10b	Eastern Philippines	126.3007	10.0438	164.5	43.1	8.09
epsz-11a	Eastern Philippines	125.6079	10.6557	155	37.8	38.29
epsz-11b	Eastern Philippines	125.9353	10.8059	155	37.8	7.64
epsz-12a	Eastern Philippines	125.4697	11.7452	172.1	36	37.01
epsz-12b	Eastern Philippines	125.8374	11.7949	172.1	36	7.62
epsz-13a	Eastern Philippines	125.2238	12.1670	141.5	32.4	33.87
epsz-13b	Eastern Philippines	125.5278	12.4029	141.5	32.4	7.08
epsz-14a	Eastern Philippines	124.6476	13.1365	158.2	23	25.92
epsz-14b	Eastern Philippines	125.0421	13.2898	158.2	23	6.38
epsz-15a	Eastern Philippines	124.3107	13.9453	156.1	24.1	26.51
epsz-15b	Eastern Philippines	124.6973	14.1113	156.1	24.1	6.09
epsz-16a	Eastern Philippines	123.8998	14.4025	140.3	19.5	21.69
epsz-16b	Eastern Philippines	124.2366	14.6728	140.3	19.5	5
epsz-17a	Eastern Philippines	123.4604	14.7222	117.6	15.3	18.19
epsz-17b	Eastern Philippines	123.6682	15.1062	117.6	15.3	5
epsz-18a	Eastern Philippines	123.3946	14.7462	67.4	15	17.94
epsz-18b	Eastern Philippines	123.2219	15.1467	67.4	15	5
epsz-19a	Eastern Philippines	121.3638	15.7400	189.6	15	17.94
epsz-19b	Eastern Philippines	121.8082	15.6674	189.6	15	5
epsz-20a	Eastern Philippines	121.6833	16.7930	203.3	15	17.94
epsz-20b	Eastern Philippines	122.0994	16.6216	203.3	15	5
epsz-21a	Eastern Philippines	121.8279	17.3742	184.2	15	17.94
epsz-21b	Eastern Philippines	122.2814	17.3425	184.2	15	5



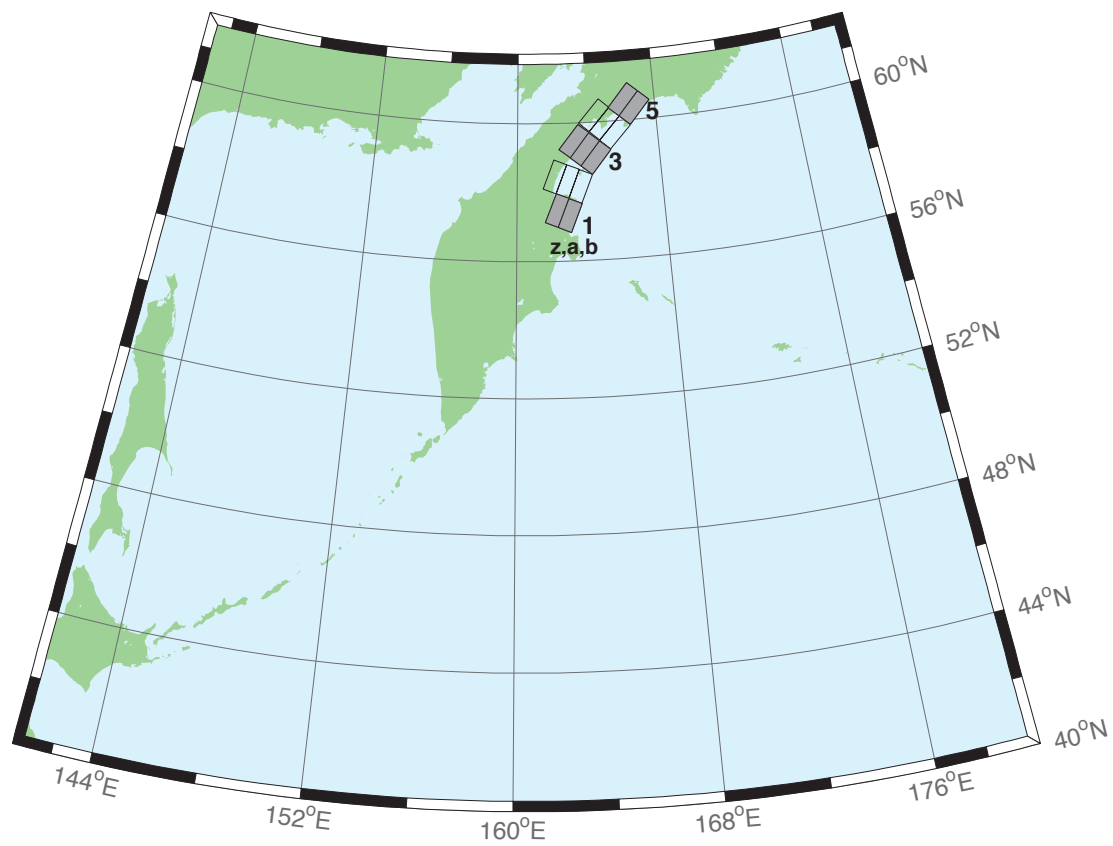


Figure B.4: Kamchatka-Bering Subduction Zone unit sources.

Table B.4: Earthquake parameters for Kamchatka-Bering Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
kbsz-1a	Kamchatka-Bering	161.8374	57.5485	201.5	29	26.13
kbsz-1b	Kamchatka-Bering	162.5162	57.4030	202.1	25	5
kbsz-2a	Kamchatka-Bering	162.4410	58.3816	201.7	29	26.13
kbsz-2b	Kamchatka-Bering	163.1344	58.2343	202.3	25	5
kbsz-2z	Kamchatka-Bering	161.7418	58.5249	201.1	29	50.37
kbsz-3a	Kamchatka-Bering	163.5174	59.3493	218.9	29	26.13
kbsz-3b	Kamchatka-Bering	164.1109	59.1001	219.4	25	5
kbsz-3z	Kamchatka-Bering	162.9150	59.5958	218.4	29	50.37
kbsz-4a	Kamchatka-Bering	164.7070	60.0632	222.2	29	26.13
kbsz-4b	Kamchatka-Bering	165.2833	59.7968	222.7	25	5
kbsz-4z	Kamchatka-Bering	164.1212	60.3270	221.7	29	50.37
kbsz-5a	Kamchatka-Bering	165.8652	60.7261	220.5	29	26.13
kbsz-5b	Kamchatka-Bering	166.4692	60.4683	221	25	5

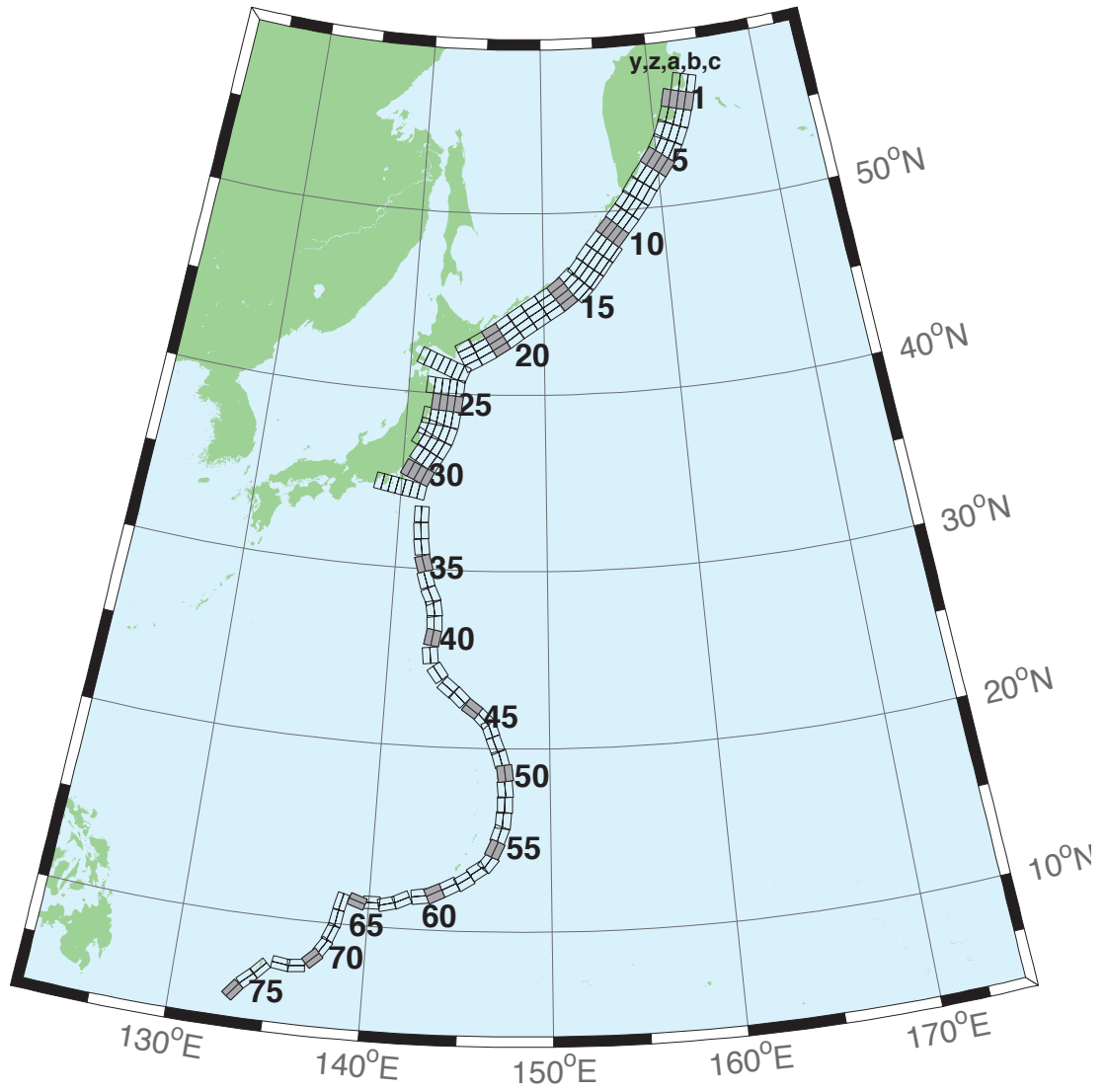


Figure B.5: Kamchatka-Kuril-Japan-Izu-Mariana-Yap Subduction Zone unit sources.

Table B.5: Earthquake parameters for Kamchatka-Kuril-Japan-Izu-Mariana-Yap Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
kisz-0a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	162.8200		56.3667	194.4	29
kisz-0b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	163.5057		56.2677	195	25
kisz-0z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	162.1309		56.4618	193.8	29
kisz-1a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	162.4318		55.5017	195	29
kisz-1b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	163.1000		55.4000	195	25
kisz-1y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	161.0884		55.7050	195	29
kisz-1z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	161.7610		55.6033	195	29
kisz-2a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	161.9883		54.6784	200	29
kisz-2b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	162.6247		54.5440	200	25
kisz-2y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.7072		54.9471	200	29
kisz-2z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	161.3488		54.8127	200	29
kisz-3a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	161.4385		53.8714	204	29
kisz-3b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	162.0449		53.7116	204	25
kisz-3y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.2164		54.1910	204	29
kisz-3z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.8286		54.0312	204	29
kisz-4a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.7926		53.1087	210	29
kisz-4b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	161.3568		52.9123	210	25
kisz-4y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	159.6539		53.5015	210	29
kisz-4z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.2246		53.3051	210	29
kisz-5a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.0211		52.4113	218	29
kisz-5b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	160.5258		52.1694	218	25
kisz-5y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	159.0005		52.8950	218	29
kisz-5z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	159.5122		52.6531	218	29
kisz-6a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	159.1272		51.7034	218	29
kisz-6b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	159.6241		51.4615	218	25
kisz-6y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	158.1228		52.1871	218	29
kisz-6z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	158.6263		51.9452	218	29
kisz-7a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	158.2625		50.9549	214	29
kisz-7b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	158.7771		50.7352	214	25
kisz-7y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	157.2236		51.3942	214	29
kisz-7z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	157.7443		51.1745	214	29
kisz-8a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	157.4712		50.2459	218	31
kisz-8b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	157.9433		50.0089	218	27
kisz-8y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	156.5176		50.7199	218	31
kisz-8z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	156.9956		50.4829	218	31
kisz-9a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	156.6114		49.5583	220	31
kisz-9b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	157.0638		49.3109	220	27
kisz-9y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	155.6974		50.0533	220	31
kisz-9z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	156.1556		49.8058	220	31
kisz-10a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	155.7294		48.8804	221	31
kisz-10b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	156.1690		48.6278	221	27
kisz-10y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	154.8413		49.3856	221	31
kisz-10z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	155.2865		49.1330	221	31
kisz-11a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	154.8489		48.1821	219	31
kisz-11b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	155.2955		47.9398	219	27
kisz-11y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.9472		48.6667	219	31
kisz-11z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	154.3991		48.4244	219	31
kisz-11c	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	156.0358		47.5374	39	57.89
kisz-12a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.9994		47.4729	217	31
kisz-12b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	154.4701		47.2320	217	27
kisz-12y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.0856		47.9363	217	31
kisz-12z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.5435		47.7046	217	31
kisz-12c	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	155.2208		46.8473	37	57.89
kisz-13a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.2239		46.7564	218	31
kisz-13b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.6648		46.5194	218	27
kisz-13y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	152.3343		47.2304	218	31
kisz-13z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	152.7801		46.9934	218	31
kisz-13c	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	154.3957		46.1257	38	57.89
kisz-14a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	152.3657		46.1514	225	23
kisz-14b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	152.7855		45.8591	225	23

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Table B.5 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
kisz-14y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	151.5172		46.7362	225	23
kisz-14z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	151.9426		46.4438	225	23
kisz-14c	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	153.4468		45.3976	45	57.89
kisz-15a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	151.4663		45.5963	233	25
kisz-15b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	151.8144		45.2712	233	22
kisz-15y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	150.7619		46.2465	233	25
kisz-15z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	151.1151		45.9214	233	25
kisz-16a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	150.4572		45.0977	237	25
kisz-16b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	150.7694		44.7563	237	22
kisz-16y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	149.8253		45.7804	237	25
kisz-16z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	150.1422		45.4390	237	25
kisz-17a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	149.3989		44.6084	237	25
kisz-17b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	149.7085		44.2670	237	22
kisz-17y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	148.7723		45.2912	237	25
kisz-17z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	149.0865		44.9498	237	25
kisz-18a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	148.3454		44.0982	235	25
kisz-18b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	148.6687		43.7647	235	22
kisz-18y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.6915		44.7651	235	25
kisz-18z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	148.0194		44.4316	235	25
kisz-19a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.3262		43.5619	233	25
kisz-19b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.6625		43.2368	233	22
kisz-19y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.6463		44.2121	233	25
kisz-19z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.9872		43.8870	233	25
kisz-20a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.3513		43.0633	237	25
kisz-20b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.6531		42.7219	237	22
kisz-20y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.7410		43.7461	237	25
kisz-20z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.0470		43.4047	237	25
kisz-21a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.3331		42.5948	239	25
kisz-21b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.6163		42.2459	239	22
kisz-21y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.7603		43.2927	239	25
kisz-21z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.0475		42.9438	239	25
kisz-22a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.3041		42.1631	242	25
kisz-22b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.5605		41.8037	242	22
kisz-22y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.7854		42.8819	242	25
kisz-22z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.0455		42.5225	242	25
kisz-23a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.2863		41.3335	202	21
kisz-23b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.8028		41.1764	202	19
kisz-23v	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.6816		42.1189	202	21
kisz-23w	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.2050		41.9618	202	21
kisz-23x	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.7273		41.8047	202	21
kisz-23y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.2482		41.6476	202	21
kisz-23z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7679		41.4905	202	21
kisz-24a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.9795		40.3490	185	21
kisz-24b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.5273		40.3125	185	19
kisz-24x	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.3339		40.4587	185	21
kisz-24y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.8827		40.4221	185	21
kisz-24z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.4312		40.3856	185	21
kisz-25a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.8839		39.4541	185	21
kisz-25b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.4246		39.4176	185	19
kisz-25y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.8012		39.5272	185	21
kisz-25z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.3426		39.4907	185	21
kisz-26a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7622		38.5837	188	21
kisz-26b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.2930		38.5254	188	19
kisz-26x	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.1667		38.7588	188	21
kisz-26y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.6990		38.7004	188	21
kisz-26z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.2308		38.6421	188	21
kisz-27a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.5320		37.7830	198	21
kisz-27b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.0357		37.6534	198	19
kisz-27x	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.0142		38.1717	198	21
kisz-27y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.5210		38.0421	198	21
kisz-27z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.0269		37.9126	198	21
kisz-28a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.1315		37.0265	208	21

Continued on next page

Table B.5 – continued

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)	
kisz-28b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.5941		36.8297	208	19	5
kisz-28x	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.7348		37.6171	208	21	75.04
kisz-28y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.2016		37.4202	208	21	57.12
kisz-28z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.6671		37.2234	208	21	39.2
kisz-29a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.5970		36.2640	211	21	21.28
kisz-29b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.0416		36.0481	211	19	5
kisz-29y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.7029		36.6960	211	21	57.12
kisz-29z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.1506		36.4800	211	21	39.2
kisz-30a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.0553		35.4332	205	21	21.28
kisz-30b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.5207		35.2560	205	19	5
kisz-30y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.1204		35.7876	205	21	57.12
kisz-30z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.5883		35.6104	205	21	39.2
kisz-31a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.6956		34.4789	190	22	22.1
kisz-31b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.1927		34.4066	190	20	5
kisz-31v	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	138.2025		34.8405	190	22	115.8
kisz-31w	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	138.7021		34.7682	190	22	97.02
kisz-31x	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	139.2012		34.6958	190	22	78.29
kisz-31y	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	139.6997		34.6235	190	22	59.56
kisz-31z	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.1979		34.5512	190	22	40.83
kisz-32a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.0551		33.0921	180	32	23.48
kisz-32b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.5098		33.0921	180	21.69	5
kisz-33a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.0924		32.1047	173.8	27.65	20.67
kisz-33b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.5596		32.1473	173.8	18.27	5
kisz-34a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.1869		31.1851	172.1	25	18.26
kisz-34b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.6585		31.2408	172.1	15.38	5
kisz-35a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.4154		30.1707	163	25	17.12
kisz-35b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.8662		30.2899	163	14.03	5
kisz-36a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.6261		29.2740	161.7	25.73	18.71
kisz-36b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.0670		29.4012	161.7	15.91	5
kisz-37a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.0120		28.3322	154.7	20	14.54
kisz-37b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.4463		28.5124	154.7	11	5
kisz-38a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.2254		27.6946	170.3	20	14.54
kisz-38b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.6955		27.7659	170.3	11	5
kisz-39a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.3085		26.9127	177.2	24.23	17.42
kisz-39b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7674		26.9325	177.2	14.38	5
kisz-40a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.2673		26.1923	189.4	26.49	22.26
kisz-40b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7090		26.1264	189.4	20.2	5
kisz-41a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.1595		25.0729	173.7	22.07	19.08
kisz-41b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.6165		25.1184	173.7	16.36	5
kisz-42a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7641		23.8947	143.5	21.54	18.4
kisz-42b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.1321		24.1432	143.5	15.54	5
kisz-43a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.5281		23.0423	129.2	23.02	18.77
kisz-43b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.8128		23.3626	129.2	15.99	5
kisz-44a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.2230		22.5240	134.6	28.24	18.56
kisz-44b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.5246		22.8056	134.6	15.74	5
kisz-45a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.0895		21.8866	125.8	36.73	22.79
kisz-45b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.3171		22.1785	125.8	20.84	5
kisz-46a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.6972		21.3783	135.9	30.75	20.63
kisz-46b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.9954		21.6469	135.9	18.22	5
kisz-47a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.0406		20.9341	160.1	29.87	19.62
kisz-47b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.4330		21.0669	160.1	17	5
kisz-48a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.3836		20.0690	158	32.75	19.68
kisz-48b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.7567		20.2108	158	17.07	5
kisz-49a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.6689		19.3123	164.5	25.07	21.41
kisz-49b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.0846		19.4212	164.5	19.16	5
kisz-50a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.9297		18.5663	172.1	22	22.1
kisz-50b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.3650		18.6238	172.1	20	5
kisz-51a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.9495		17.7148	175.1	22.06	22.04
kisz-51b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.3850		17.7503	175.1	19.93	5
kisz-52a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.9447		16.8869	180	25.51	18.61
kisz-52b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.3683		16.8869	180	15.79	5
kisz-53a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.8626		16.0669	185.2	27.39	18.41

Continued on next page

Table B.5 – continued

Segment	Description	Longitude( <sup>o</sup> E)	Latitude( <sup>o</sup> N)	Strike( <sup>o</sup> )	Dip( <sup>o</sup> )	Depth (km)
kisz-53b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.2758		16.0309	185.2	15.56
kisz-54a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.7068		15.3883	199.1	28.12
kisz-54b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	147.0949		15.2590	199.1	18.56
kisz-55a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.4717		14.6025	204.3	29.6
kisz-55b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.8391		14.4415	204.3	25.18
kisz-56a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.1678		13.9485	217.4	32.04
kisz-56b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	146.4789		13.7170	217.4	25.84
kisz-57a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.6515		13.5576	235.8	37
kisz-57b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.8586		13.2609	235.8	23
kisz-58a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.9648		12.9990	237.8	37.72
kisz-58b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	145.1589		12.6984	237.8	23
kisz-59a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.1799		12.6914	242.9	34.33
kisz-59b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	144.3531		12.3613	242.9	20.25
kisz-60a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.3687		12.3280	244.9	30.9
kisz-60b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	143.5355		11.9788	244.9	18.2
kisz-61a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7051		12.1507	261.8	35.41
kisz-61b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	142.7582		11.7883	261.8	24.22
kisz-62a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.6301		11.8447	245.7	39.86
kisz-62b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	141.7750		11.5305	245.7	35.94
kisz-63a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.8923		11.5740	256.2	42
kisz-63b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.9735		11.2498	256.2	42
kisz-64a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.1387		11.6028	269.6	42.48
kisz-64b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	140.1410		11.2716	269.6	42.48
kisz-65a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	139.4595		11.5883	288.7	44.16
kisz-65b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	139.3541		11.2831	288.7	44.16
kisz-66a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	138.1823		11.2648	193.1	45
kisz-66b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	138.4977		11.1929	193.1	45
kisz-67a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	137.9923		10.3398	189.8	45
kisz-67b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	138.3104		10.2856	189.8	45
kisz-68a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	137.7607		9.6136	201.7	45
kisz-68b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	138.0599		9.4963	201.7	45
kisz-69a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	137.4537		8.8996	213.5	45
kisz-69b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	137.7215		8.7241	213.5	45
kisz-70a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	137.0191		8.2872	226.5	45
kisz-70b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	137.2400		8.0569	226.5	45
kisz-71a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	136.3863		7.9078	263.9	45
kisz-71b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	136.4202		7.5920	263.9	45
kisz-72a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	135.6310		7.9130	276.9	45
kisz-72b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	135.5926		7.5977	276.9	45
kisz-73a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	134.3296		7.4541	224	45
kisz-73b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	134.5600		7.2335	224	45
kisz-74a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	133.7125		6.8621	228.1	45
kisz-74b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	133.9263		6.6258	228.1	45
kisz-75a	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	133.0224		6.1221	217.7	45
kisz-75b	Kamchatka-Kuril-Japan-Izu-Mariana-Yap	133.2751		5.9280	217.7	45

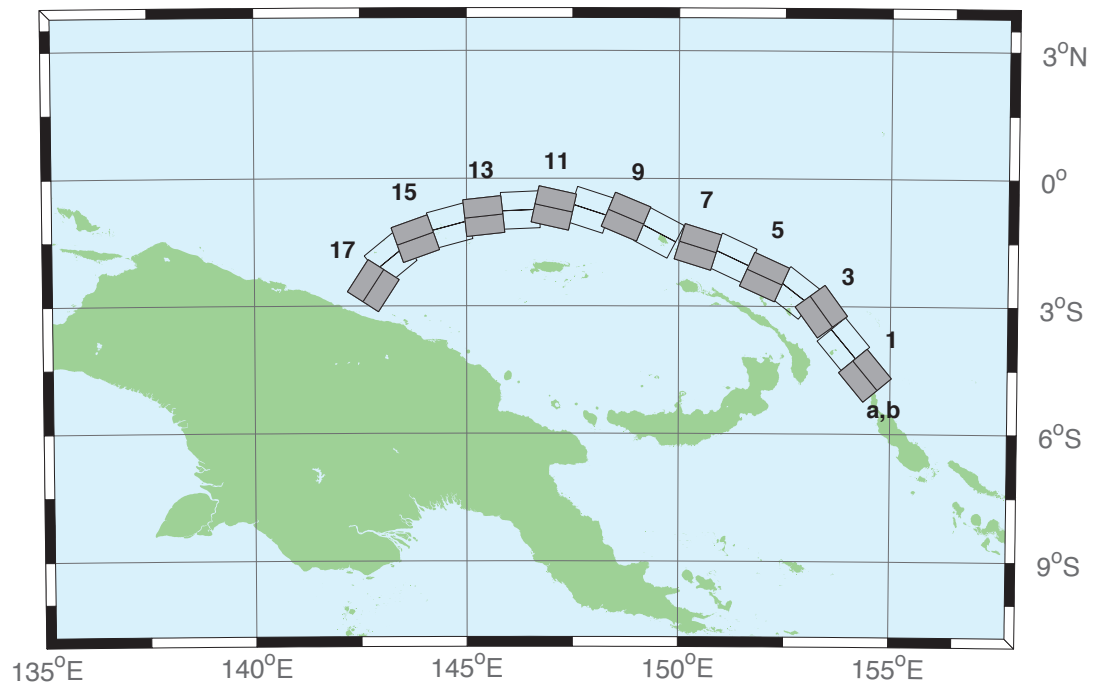


Figure B.6: Manus–Oceanic Convergent Boundary unit sources.



Table B.6: Earthquake parameters for Manus–Oceanic Convergent Boundary unit sources.

Segment	Description	Longitude( $^{\circ}$ E)	Latitude( $^{\circ}$ N)	Strike( $^{\circ}$ )	Dip( $^{\circ}$ )	Depth (km)	
mosz-1a	Manus–Oceanic Convergent Boundary	154.0737		-4.8960	140.2	15	15.88
mosz-1b	Manus–Oceanic Convergent Boundary	154.4082		-4.6185	140.2	15	2.94
mosz-2a	Manus–Oceanic Convergent Boundary	153.5589		-4.1575	140.2	15	15.91
mosz-2b	Manus–Oceanic Convergent Boundary	153.8931		-3.8800	140.2	15	2.97
mosz-3a	Manus–Oceanic Convergent Boundary	153.0151		-3.3716	143.9	15	16.64
mosz-3b	Manus–Oceanic Convergent Boundary	153.3662		-3.1160	143.9	15	3.7
mosz-4a	Manus–Oceanic Convergent Boundary	152.4667		-3.0241	127.7	15	17.32
mosz-4b	Manus–Oceanic Convergent Boundary	152.7321		-2.6806	127.7	15	4.38
mosz-5a	Manus–Oceanic Convergent Boundary	151.8447		-2.7066	114.3	15	17.57
mosz-5b	Manus–Oceanic Convergent Boundary	152.0235		-2.3112	114.3	15	4.63
mosz-6a	Manus–Oceanic Convergent Boundary	151.0679		-2.2550	115	15	17.66
mosz-6b	Manus–Oceanic Convergent Boundary	151.2513		-1.8618	115	15	4.72
mosz-7a	Manus–Oceanic Convergent Boundary	150.3210		-2.0236	107.2	15	17.73
mosz-7b	Manus–Oceanic Convergent Boundary	150.4493		-1.6092	107.2	15	4.79
mosz-8a	Manus–Oceanic Convergent Boundary	149.3226		-1.6666	117.8	15	17.83
mosz-8b	Manus–Oceanic Convergent Boundary	149.5251		-1.2829	117.8	15	4.89
mosz-9a	Manus–Oceanic Convergent Boundary	148.5865		-1.3017	112.7	15	17.84
mosz-9b	Manus–Oceanic Convergent Boundary	148.7540		-0.9015	112.7	15	4.9
mosz-10a	Manus–Oceanic Convergent Boundary	147.7760		-1.1560	108	15	17.78
mosz-10b	Manus–Oceanic Convergent Boundary	147.9102		-0.7434	108	15	4.84
mosz-11a	Manus–Oceanic Convergent Boundary	146.9596		-1.1226	102.5	15	17.54
mosz-11b	Manus–Oceanic Convergent Boundary	147.0531		-0.6990	102.5	15	4.6
mosz-12a	Manus–Oceanic Convergent Boundary	146.2858		-1.1820	87.48	15	17.29
mosz-12b	Manus–Oceanic Convergent Boundary	146.2667		-0.7486	87.48	15	4.35
mosz-13a	Manus–Oceanic Convergent Boundary	145.4540		-1.3214	83.75	15	17.34
mosz-13b	Manus–Oceanic Convergent Boundary	145.4068		-0.8901	83.75	15	4.4
mosz-14a	Manus–Oceanic Convergent Boundary	144.7151		-1.5346	75.09	15	17.21
mosz-14b	Manus–Oceanic Convergent Boundary	144.6035		-1.1154	75.09	15	4.27
mosz-15a	Manus–Oceanic Convergent Boundary	143.9394		-1.8278	70.43	15	16.52
mosz-15b	Manus–Oceanic Convergent Boundary	143.7940		-1.4190	70.43	15	3.58
mosz-16a	Manus–Oceanic Convergent Boundary	143.4850		-2.2118	50.79	15	15.86
mosz-16b	Manus–Oceanic Convergent Boundary	143.2106		-1.8756	50.79	15	2.92
mosz-17a	Manus–Oceanic Convergent Boundary	143.1655		-2.7580	33	15	16.64
mosz-17b	Manus–Oceanic Convergent Boundary	142.8013		-2.5217	33	15	3.7

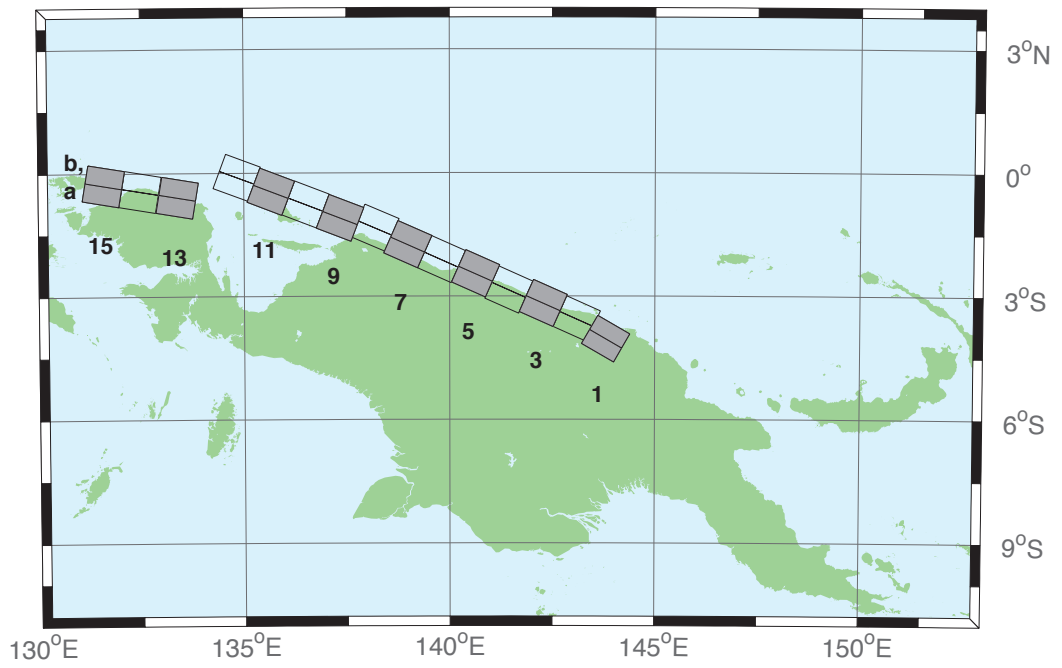


Figure B.7: New Guinea Subduction Zone unit sources.

Table B.7: Earthquake parameters for New Guinea Subduction Zone unit sources.

Segment	Description	Longitude( $^{\circ}$ E)	Latitude( $^{\circ}$ N)	Strike( $^{\circ}$ )	Dip( $^{\circ}$ )	Depth (km)
ngsz-1a	New Guinea	143.6063	-4.3804	120	29	25.64
ngsz-1b	New Guinea	143.8032	-4.0402	120	29	1.4
ngsz-2a	New Guinea	142.9310	-3.9263	114	27.63	20.1
ngsz-2b	New Guinea	143.0932	-3.5628	114	21.72	1.6
ngsz-3a	New Guinea	142.1076	-3.5632	114	20.06	18.73
ngsz-3b	New Guinea	142.2795	-3.1778	114	15.94	5
ngsz-4a	New Guinea	141.2681	-3.2376	114	21	17.76
ngsz-4b	New Guinea	141.4389	-2.8545	114	14.79	5
ngsz-5a	New Guinea	140.4592	-2.8429	114	21.26	16.14
ngsz-5b	New Guinea	140.6296	-2.4605	114	12.87	5
ngsz-6a	New Guinea	139.6288	-2.4960	114	22.72	15.4
ngsz-6b	New Guinea	139.7974	-2.1175	114	12	5
ngsz-7a	New Guinea	138.8074	-2.1312	114	21.39	15.4
ngsz-7b	New Guinea	138.9776	-1.7491	114	12	5
ngsz-8a	New Guinea	138.0185	-1.7353	113.1	18.79	15.14
ngsz-8b	New Guinea	138.1853	-1.3441	113.1	11.7	5
ngsz-9a	New Guinea	137.1805	-1.5037	111	15.24	13.23
ngsz-9b	New Guinea	137.3358	-1.0991	111	9.47	5
ngsz-10a	New Guinea	136.3418	-1.1774	111	13.51	11.09
ngsz-10b	New Guinea	136.4983	-0.7697	111	7	5
ngsz-11a	New Guinea	135.4984	-0.8641	111	11.38	12.49
ngsz-11b	New Guinea	135.6562	-0.4530	111	8.62	5
ngsz-12a	New Guinea	134.6759	-0.5216	110.5	10	13.68
ngsz-12b	New Guinea	134.8307	-0.1072	110.5	10	5
ngsz-13a	New Guinea	133.3065	-1.0298	99.5	10	13.68
ngsz-13b	New Guinea	133.3795	-0.5935	99.5	10	5
ngsz-14a	New Guinea	132.4048	-0.8816	99.5	10	13.68
ngsz-14b	New Guinea	132.4778	-0.4453	99.5	10	5
ngsz-15a	New Guinea	131.5141	-0.7353	99.5	10	13.68
ngsz-15b	New Guinea	131.5871	-0.2990	99.5	10	5

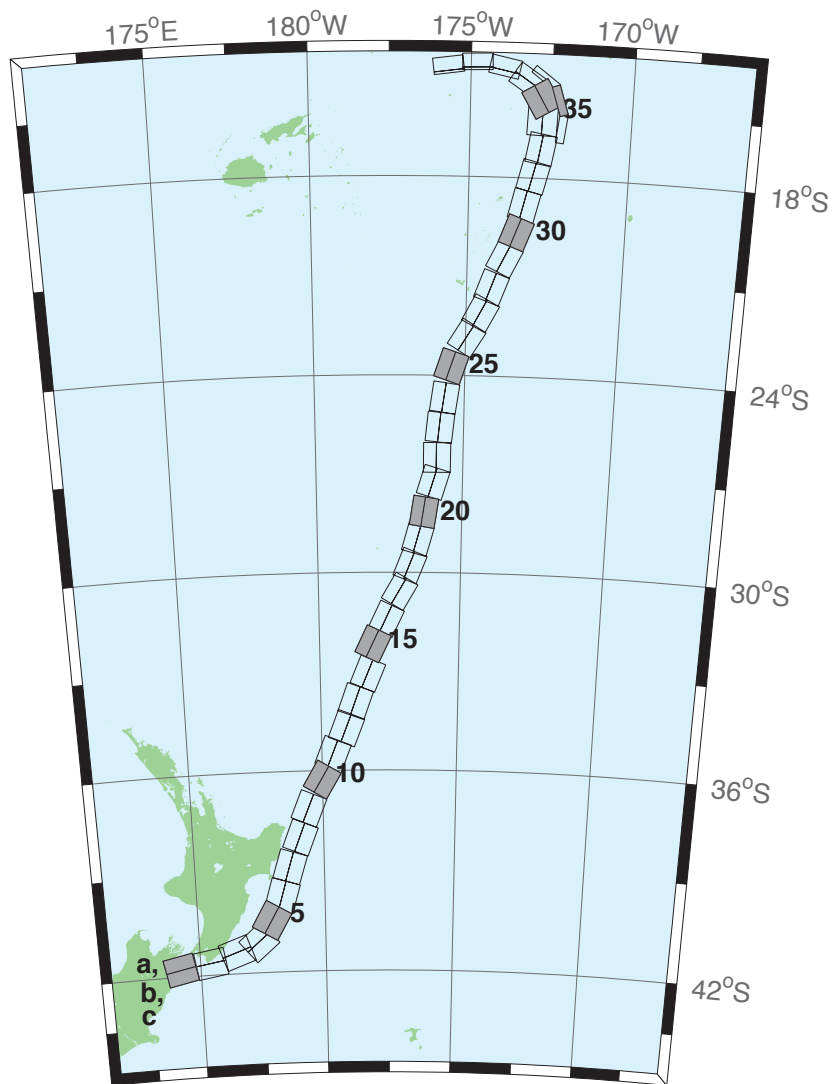


Figure B.8: New Zealand–Kermadec–Tonga Subduction Zone unit sources.

Table B.8: Earthquake parameters for New Zealand–Kermadec–Tonga Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
ntsz-1a	New Zealand–Kermadec–Tonga	174.0985	-41.3951	258.6	24	25.34
ntsz-1b	New Zealand–Kermadec–Tonga	174.2076	-41.7973	258.6	24	5
ntsz-2a	New Zealand–Kermadec–Tonga	175.3289	-41.2592	260.6	29.38	23.17
ntsz-2b	New Zealand–Kermadec–Tonga	175.4142	-41.6454	260.6	21.31	5
ntsz-3a	New Zealand–Kermadec–Tonga	176.2855	-40.9950	250.7	29.54	21.74
ntsz-3b	New Zealand–Kermadec–Tonga	176.4580	-41.3637	250.7	19.56	5
ntsz-4a	New Zealand–Kermadec–Tonga	177.0023	-40.7679	229.4	24.43	18.87
ntsz-4b	New Zealand–Kermadec–Tonga	177.3552	-41.0785	229.4	16.1	5
ntsz-5a	New Zealand–Kermadec–Tonga	177.4114	-40.2396	210	18.8	19.29
ntsz-5b	New Zealand–Kermadec–Tonga	177.8951	-40.4525	210	16.61	5
ntsz-6a	New Zealand–Kermadec–Tonga	177.8036	-39.6085	196.7	18.17	15.8
ntsz-6b	New Zealand–Kermadec–Tonga	178.3352	-39.7310	196.7	12.48	5
ntsz-7a	New Zealand–Kermadec–Tonga	178.1676	-38.7480	197	28.1	17.85
ntsz-7b	New Zealand–Kermadec–Tonga	178.6541	-38.8640	197	14.89	5
ntsz-8a	New Zealand–Kermadec–Tonga	178.6263	-37.8501	201.4	31.47	18.78
ntsz-8b	New Zealand–Kermadec–Tonga	179.0788	-37.9899	201.4	16	5
ntsz-9a	New Zealand–Kermadec–Tonga	178.9833	-36.9770	202.2	29.58	20.02
ntsz-9b	New Zealand–Kermadec–Tonga	179.4369	-37.1245	202.2	17.48	5
ntsz-10a	New Zealand–Kermadec–Tonga	179.5534	-36.0655	210.6	32.1	20.72
ntsz-10b	New Zealand–Kermadec–Tonga	179.9595	-36.2593	210.6	18.32	5
ntsz-11a	New Zealand–Kermadec–Tonga	179.9267	-35.3538	201.7	25	16.09
ntsz-11b	New Zealand–Kermadec–Tonga	180.3915	-35.5040	201.7	12.81	5
ntsz-12a	New Zealand–Kermadec–Tonga	180.4433	-34.5759	201.2	25	15.46
ntsz-12b	New Zealand–Kermadec–Tonga	180.9051	-34.7230	201.2	12.08	5
ntsz-13a	New Zealand–Kermadec–Tonga	180.7990	-33.7707	199.8	25.87	19.06
ntsz-13b	New Zealand–Kermadec–Tonga	181.2573	-33.9073	199.8	16.33	5
ntsz-14a	New Zealand–Kermadec–Tonga	181.2828	-32.9288	202.4	31.28	22.73
ntsz-14b	New Zealand–Kermadec–Tonga	181.7063	-33.0751	202.4	20.77	5
ntsz-15a	New Zealand–Kermadec–Tonga	181.4918	-32.0035	205.4	32.33	22.64
ntsz-15b	New Zealand–Kermadec–Tonga	181.8967	-32.1665	205.4	20.66	5
ntsz-16a	New Zealand–Kermadec–Tonga	181.9781	-31.2535	205.5	34.29	23.59
ntsz-16b	New Zealand–Kermadec–Tonga	182.3706	-31.4131	205.5	21.83	5
ntsz-17a	New Zealand–Kermadec–Tonga	182.4819	-30.3859	210.3	37.6	25.58
ntsz-17b	New Zealand–Kermadec–Tonga	182.8387	-30.5655	210.3	24.3	5
ntsz-18a	New Zealand–Kermadec–Tonga	182.8176	-29.6545	201.6	37.65	26.13
ntsz-18b	New Zealand–Kermadec–Tonga	183.1985	-29.7856	201.6	25	5
ntsz-19a	New Zealand–Kermadec–Tonga	183.0622	-28.8739	195.7	34.41	26.13
ntsz-19b	New Zealand–Kermadec–Tonga	183.4700	-28.9742	195.7	25	5
ntsz-20a	New Zealand–Kermadec–Tonga	183.2724	-28.0967	188.8	38	26.13
ntsz-20b	New Zealand–Kermadec–Tonga	183.6691	-28.1508	188.8	25	5
ntsz-21a	New Zealand–Kermadec–Tonga	183.5747	-27.1402	197.1	32.29	24.83
ntsz-21b	New Zealand–Kermadec–Tonga	183.9829	-27.2518	197.1	23.37	5
ntsz-22a	New Zealand–Kermadec–Tonga	183.6608	-26.4975	180	29.56	18.63
ntsz-22b	New Zealand–Kermadec–Tonga	184.0974	-26.4975	180	15.82	5
ntsz-23a	New Zealand–Kermadec–Tonga	183.7599	-25.5371	185.8	32.42	20.56
ntsz-23b	New Zealand–Kermadec–Tonga	184.1781	-25.5752	185.8	18.13	5
ntsz-24a	New Zealand–Kermadec–Tonga	183.9139	-24.6201	188.2	33.31	23.73
ntsz-24b	New Zealand–Kermadec–Tonga	184.3228	-24.6734	188.2	22	5
ntsz-25a	New Zealand–Kermadec–Tonga	184.1266	-23.5922	198.5	29.34	19.64
ntsz-25b	New Zealand–Kermadec–Tonga	184.5322	-23.7163	198.5	17.03	5
ntsz-26a	New Zealand–Kermadec–Tonga	184.6613	-22.6460	211.7	30.26	19.43
ntsz-26b	New Zealand–Kermadec–Tonga	185.0196	-22.8497	211.7	16.78	5
ntsz-27a	New Zealand–Kermadec–Tonga	185.0879	-21.9139	207.9	31.73	20.67
ntsz-27b	New Zealand–Kermadec–Tonga	185.4522	-22.0928	207.9	18.27	5
ntsz-28a	New Zealand–Kermadec–Tonga	185.4037	-21.1758	200.5	32.44	21.76
ntsz-28b	New Zealand–Kermadec–Tonga	185.7849	-21.3084	200.5	19.58	5
ntsz-29a	New Zealand–Kermadec–Tonga	185.8087	-20.2629	206.4	32.47	20.4
ntsz-29b	New Zealand–Kermadec–Tonga	186.1710	-20.4312	206.4	17.94	5
ntsz-30a	New Zealand–Kermadec–Tonga	186.1499	-19.5087	200.9	32.98	22.46
ntsz-30b	New Zealand–Kermadec–Tonga	186.5236	-19.6432	200.9	20.44	5

Continued on next page

**Table B.8 – continued**

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
ntsz-31a	New Zealand–Kermadec–Tonga	186.3538	-18.7332	193.9	34.41	21.19
ntsz-31b	New Zealand–Kermadec–Tonga	186.7339	-18.8221	193.9	18.89	5
ntsz-32a	New Zealand–Kermadec–Tonga	186.5949	-17.8587	194.1	30	19.12
ntsz-32b	New Zealand–Kermadec–Tonga	186.9914	-17.9536	194.1	16.4	5
ntsz-33a	New Zealand–Kermadec–Tonga	186.8172	-17.0581	190	33.15	23.34
ntsz-33b	New Zealand–Kermadec–Tonga	187.2047	-17.1237	190	21.52	5
ntsz-34a	New Zealand–Kermadec–Tonga	186.7814	-16.2598	182.1	15	13.41
ntsz-34b	New Zealand–Kermadec–Tonga	187.2330	-16.2759	182.1	9.68	5
ntsz-34c	New Zealand–Kermadec–Tonga	187.9697	-16.4956	7.62	57.06	6.571
ntsz-35a	New Zealand–Kermadec–Tonga	186.8000	-15.8563	149.8	15	12.17
ntsz-35b	New Zealand–Kermadec–Tonga	187.1896	-15.6384	149.8	8.24	5
ntsz-35c	New Zealand–Kermadec–Tonga	187.8776	-15.6325	342.4	57.06	6.571
ntsz-36a	New Zealand–Kermadec–Tonga	186.5406	-15.3862	123.9	40.44	36.72
ntsz-36b	New Zealand–Kermadec–Tonga	186.7381	-15.1025	123.9	39.38	5
ntsz-36c	New Zealand–Kermadec–Tonga	187.3791	-14.9234	307	57.06	6.571
ntsz-37a	New Zealand–Kermadec–Tonga	185.9883	-14.9861	102	68.94	30.99
ntsz-37b	New Zealand–Kermadec–Tonga	186.0229	-14.8282	102	31.32	5
ntsz-38a	New Zealand–Kermadec–Tonga	185.2067	-14.8259	88.4	80	26.13
ntsz-38b	New Zealand–Kermadec–Tonga	185.2044	-14.7479	88.4	25	5
ntsz-39a	New Zealand–Kermadec–Tonga	184.3412	-14.9409	82.55	80	26.13
ntsz-39b	New Zealand–Kermadec–Tonga	184.3307	-14.8636	82.55	25	5



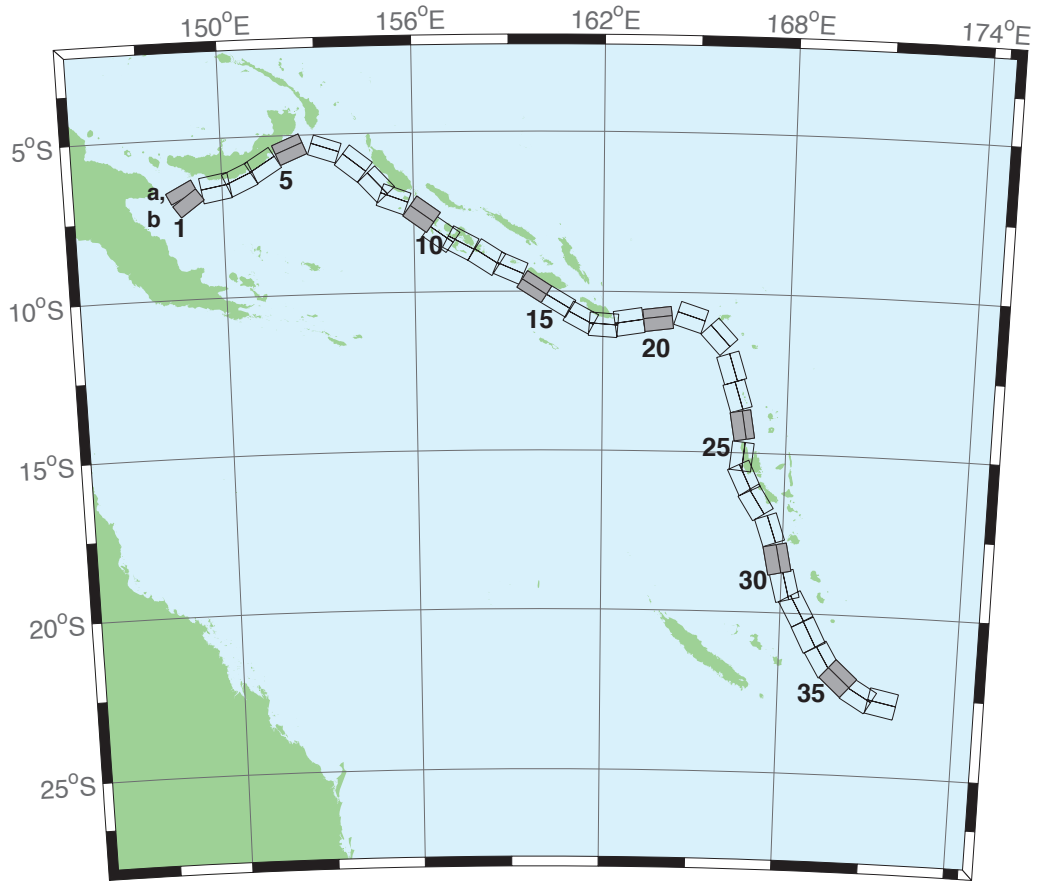


Figure B.9: New Britain–Solomons–Vanuatu Zone unit sources.



Table B.9: Earthquake parameters for New Britain–Solomons–Vanuatu Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)	
nvsv-1a	New Britain–Solomons–Vanuatu	148.6217		-6.4616	243.2	32.34	15.69
nvsv-1b	New Britain–Solomons–Vanuatu	148.7943		-6.8002	234.2	12.34	5
nvsv-2a	New Britain–Solomons–Vanuatu	149.7218		-6.1459	260.1	35.1	16.36
nvsv-2b	New Britain–Solomons–Vanuatu	149.7856		-6.5079	260.1	13.13	5
nvsv-3a	New Britain–Solomons–Vanuatu	150.4075		-5.9659	245.7	42.35	18.59
nvsv-3b	New Britain–Solomons–Vanuatu	150.5450		-6.2684	245.7	15.77	5
nvsv-4a	New Britain–Solomons–Vanuatu	151.1095		-5.5820	238.2	42.41	23.63
nvsv-4b	New Britain–Solomons–Vanuatu	151.2851		-5.8639	238.2	21.88	5
nvsv-5a	New Britain–Solomons–Vanuatu	152.0205		-5.1305	247.7	49.22	32.39
nvsv-5b	New Britain–Solomons–Vanuatu	152.1322		-5.4020	247.7	33.22	5
nvsv-6a	New Britain–Solomons–Vanuatu	153.3450		-5.1558	288.6	53.53	33.59
nvsv-6b	New Britain–Solomons–Vanuatu	153.2595		-5.4089	288.6	34.87	5
nvsv-7a	New Britain–Solomons–Vanuatu	154.3814		-5.6308	308.3	39.72	19.18
nvsv-7b	New Britain–Solomons–Vanuatu	154.1658		-5.9017	308.3	16.48	5
nvsv-8a	New Britain–Solomons–Vanuatu	155.1097		-6.3511	317.2	45.33	22.92
nvsv-8b	New Britain–Solomons–Vanuatu	154.8764		-6.5656	317.2	21	5
nvsv-9a	New Britain–Solomons–Vanuatu	155.5027		-6.7430	290.5	48.75	22.92
nvsv-9b	New Britain–Solomons–Vanuatu	155.3981		-7.0204	290.5	21	5
nvsv-10a	New Britain–Solomons–Vanuatu	156.4742		-7.2515	305.9	36.88	27.62
nvsv-10b	New Britain–Solomons–Vanuatu	156.2619		-7.5427	305.9	26.9	5
nvsv-11a	New Britain–Solomons–Vanuatu	157.0830		-7.8830	305.4	32.97	29.72
nvsv-11b	New Britain–Solomons–Vanuatu	156.8627		-8.1903	305.4	29.63	5
nvsv-12a	New Britain–Solomons–Vanuatu	157.6537		-8.1483	297.9	37.53	28.57
nvsv-12b	New Britain–Solomons–Vanuatu	157.4850		-8.4630	297.9	28.13	5
nvsv-13a	New Britain–Solomons–Vanuatu	158.5089		-8.5953	302.7	33.62	23.02
nvsv-13b	New Britain–Solomons–Vanuatu	158.3042		-8.9099	302.7	21.12	5
nvsv-14a	New Britain–Solomons–Vanuatu	159.1872		-8.9516	293.3	38.44	34.06
nvsv-14b	New Britain–Solomons–Vanuatu	159.0461		-9.2747	293.3	35.54	5
nvsv-15a	New Britain–Solomons–Vanuatu	159.9736		-9.5993	302.8	46.69	41.38
nvsv-15b	New Britain–Solomons–Vanuatu	159.8044		-9.8584	302.8	46.69	5
nvsv-16a	New Britain–Solomons–Vanuatu	160.7343		-10.0574	301	46.05	41
nvsv-16b	New Britain–Solomons–Vanuatu	160.5712		-10.3246	301	46.05	5
nvsv-17a	New Britain–Solomons–Vanuatu	161.4562		-10.5241	298.4	40.12	37.22
nvsv-17b	New Britain–Solomons–Vanuatu	161.2900		-10.8263	298.4	40.12	5
nvsv-18a	New Britain–Solomons–Vanuatu	162.0467		-10.6823	274.1	40.33	29.03
nvsv-18b	New Britain–Solomons–Vanuatu	162.0219		-11.0238	274.1	28.72	5
nvsv-19a	New Britain–Solomons–Vanuatu	162.7818		-10.5645	261.3	34.25	24.14
nvsv-19b	New Britain–Solomons–Vanuatu	162.8392		-10.9315	261.3	22.51	5
nvsv-20a	New Britain–Solomons–Vanuatu	163.7222		-10.5014	262.9	50.35	26.3
nvsv-20b	New Britain–Solomons–Vanuatu	163.7581		-10.7858	262.9	25.22	5
nvsv-21a	New Britain–Solomons–Vanuatu	164.9445		-10.4183	287.9	40.31	23.3
nvsv-21b	New Britain–Solomons–Vanuatu	164.8374		-10.7442	287.9	21.47	5
nvsv-22a	New Britain–Solomons–Vanuatu	166.0261		-11.1069	317.1	42.39	20.78
nvsv-22b	New Britain–Solomons–Vanuatu	165.7783		-11.3328	317.1	18.4	5
nvsv-23a	New Britain–Solomons–Vanuatu	166.5179		-12.2260	342.4	47.95	22.43
nvsv-23b	New Britain–Solomons–Vanuatu	166.2244		-12.3171	342.4	20.4	5
nvsv-24a	New Britain–Solomons–Vanuatu	166.7236		-13.1065	342.6	47.13	28.52
nvsv-24b	New Britain–Solomons–Vanuatu	166.4241		-13.1979	342.6	28.06	5
nvsv-25a	New Britain–Solomons–Vanuatu	166.8914		-14.0785	350.3	54.1	31.16
nvsv-25b	New Britain–Solomons–Vanuatu	166.6237		-14.1230	350.3	31.55	5
nvsv-26a	New Britain–Solomons–Vanuatu	166.9200		-15.1450	365.6	50.46	29.05
nvsv-26b	New Britain–Solomons–Vanuatu	166.6252		-15.1170	365.6	28.75	5
nvsv-27a	New Britain–Solomons–Vanuatu	167.0053		-15.6308	334.2	44.74	25.46
nvsv-27b	New Britain–Solomons–Vanuatu	166.7068		-15.7695	334.2	24.15	5
nvsv-28a	New Britain–Solomons–Vanuatu	167.4074		-16.3455	327.5	41.53	22.44
nvsv-28b	New Britain–Solomons–Vanuatu	167.1117		-16.5264	327.5	20.42	5
nvsv-29a	New Britain–Solomons–Vanuatu	167.9145		-17.2807	341.2	49.1	24.12
nvsv-29b	New Britain–Solomons–Vanuatu	167.6229		-17.3757	341.2	22.48	5
nvsv-30a	New Britain–Solomons–Vanuatu	168.2220		-18.2353	348.6	44.19	23.99
nvsv-30b	New Britain–Solomons–Vanuatu	167.8895		-18.2991	348.6	22.32	5

Continued on next page

**Table B.9 – continued**

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
nvsz-31a	New Britain–Solomons–Vanuatu	168.5022	-19.0510	345.6	42.2	22.26
nvsz-31b	New Britain–Solomons–Vanuatu	168.1611	-19.1338	345.6	20.2	5
nvsz-32a	New Britain–Solomons–Vanuatu	168.8775	-19.6724	331.1	42.03	21.68
nvsz-32b	New Britain–Solomons–Vanuatu	168.5671	-19.8338	331.1	19.49	5
nvsz-33a	New Britain–Solomons–Vanuatu	169.3422	-20.4892	332.9	40.25	22.4
nvsz-33b	New Britain–Solomons–Vanuatu	169.0161	-20.6453	332.9	20.37	5
nvsz-34a	New Britain–Solomons–Vanuatu	169.8304	-21.2121	329.1	39	22.73
nvsz-34b	New Britain–Solomons–Vanuatu	169.5086	-21.3911	329.1	20.77	5
nvsz-35a	New Britain–Solomons–Vanuatu	170.3119	-21.6945	311.9	39	22.13
nvsz-35b	New Britain–Solomons–Vanuatu	170.0606	-21.9543	311.9	20.03	5
nvsz-36a	New Britain–Solomons–Vanuatu	170.9487	-22.1585	300.4	39.42	23.5
nvsz-36b	New Britain–Solomons–Vanuatu	170.7585	-22.4577	300.4	21.71	5
nvsz-37a	New Britain–Solomons–Vanuatu	171.6335	-22.3087	281.3	30	22.1
nvsz-37b	New Britain–Solomons–Vanuatu	171.5512	-22.6902	281.3	20	5



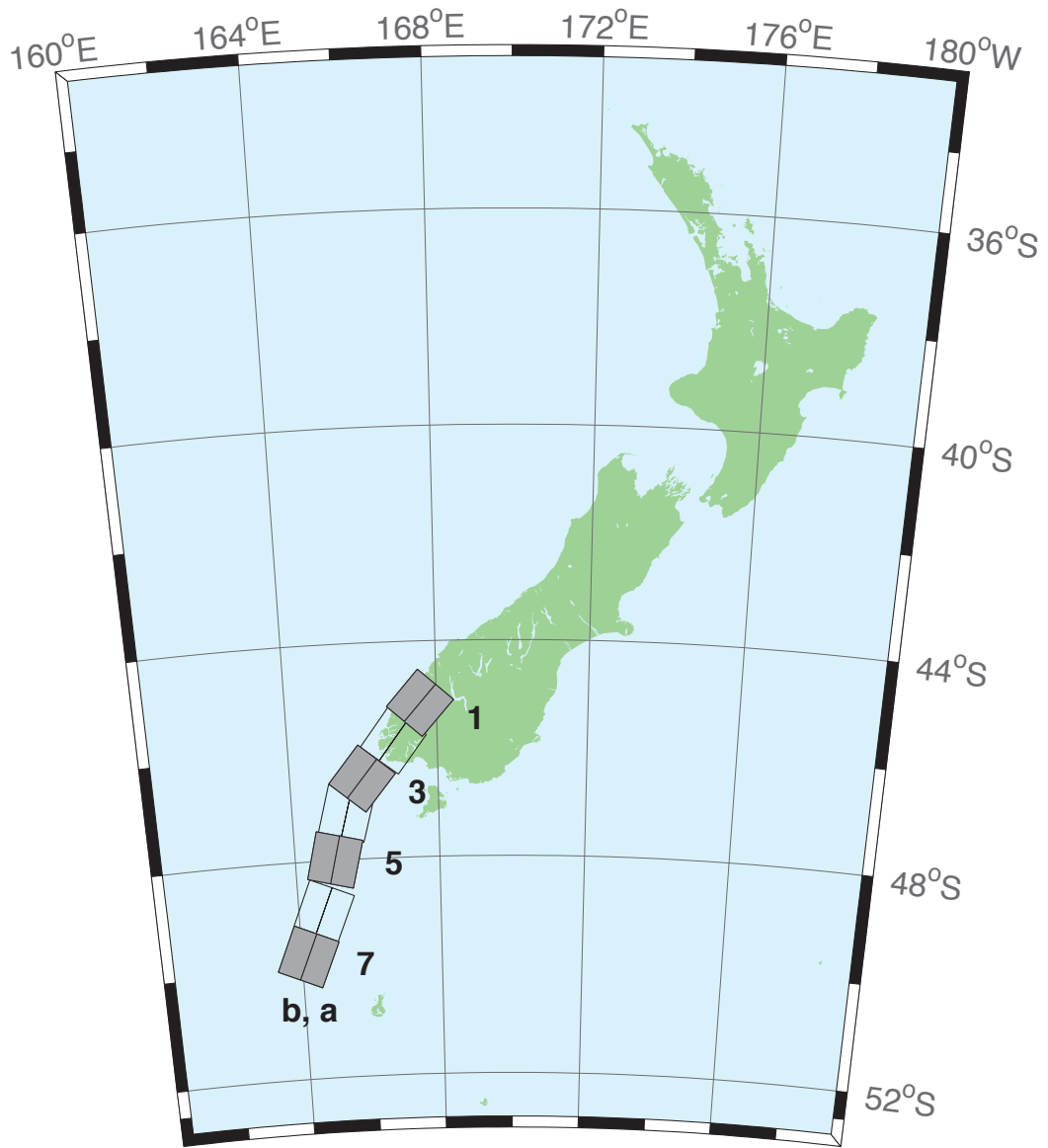


Figure B.10: New Zealand–Puysegur Zone unit sources.

Table B.10: Earthquake parameters for New Zealand–Puysegur Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
nzs-1a	New Zealand–Puysegur	168.0294	-45.4368	41.5	15	17.94
nzs-1b	New Zealand–Puysegur	167.5675	-45.1493	41.5	15	5
nzs-2a	New Zealand–Puysegur	167.3256	-46.0984	37.14	15	17.94
nzs-2b	New Zealand–Puysegur	166.8280	-45.8365	37.14	15	5
nzs-3a	New Zealand–Puysegur	166.4351	-46.7897	39.53	15	17.94
nzs-3b	New Zealand–Puysegur	165.9476	-46.5136	39.53	15	5
nzs-4a	New Zealand–Puysegur	166.0968	-47.2583	15.38	15	17.94
nzs-4b	New Zealand–Puysegur	165.4810	-47.1432	15.38	15	5
nzs-5a	New Zealand–Puysegur	165.7270	-48.0951	13.94	15	17.94
nzs-5b	New Zealand–Puysegur	165.0971	-47.9906	13.94	15	5
nzs-6a	New Zealand–Puysegur	165.3168	-49.0829	22.71	15	17.94
nzs-6b	New Zealand–Puysegur	164.7067	-48.9154	22.71	15	5
nzs-7a	New Zealand–Puysegur	164.8017	-49.9193	23.25	15	17.94
nzs-7b	New Zealand–Puysegur	164.1836	-49.7480	23.25	15	5

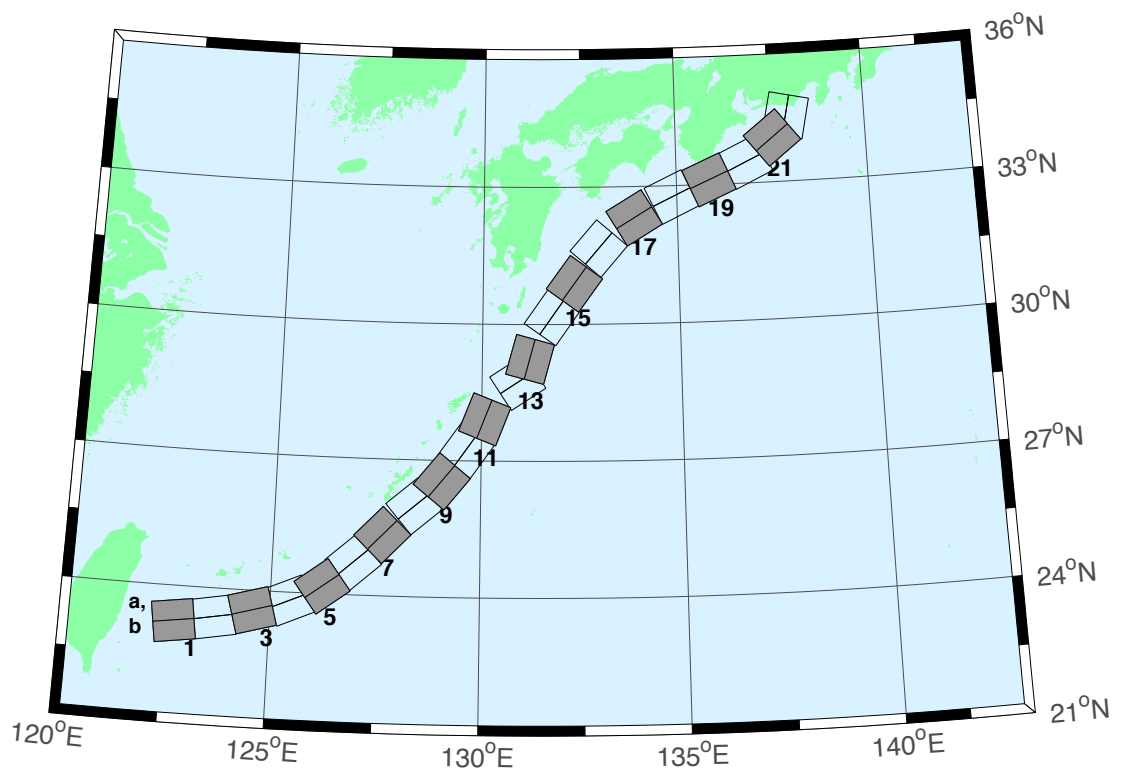


Figure B.11: Ryukyu–Kyushu–Nankai Zone unit sources.

Table B.11: Earthquake parameters for Ryukyu–Kyushu–Nankai Subduction Zone unit sources.

Segment	Description	Longitude(°E)	Latitude(°N)	Strike(°)	Dip(°)	Depth (km)
rnsz-1a	Ryukyu–Kyushu–Nankai	122.6672	23.6696	262	14	11.88
rnsz-1b	Ryukyu–Kyushu–Nankai	122.7332	23.2380	262	10	3.2
rnsz-2a	Ryukyu–Kyushu–Nankai	123.5939	23.7929	259.9	18.11	12.28
rnsz-2b	Ryukyu–Kyushu–Nankai	123.6751	23.3725	259.9	10	3.6
rnsz-3a	Ryukyu–Kyushu–Nankai	124.4604	23.9777	254.6	19.27	14.65
rnsz-3b	Ryukyu–Kyushu–Nankai	124.5830	23.5689	254.6	12.18	4.1
rnsz-4a	Ryukyu–Kyushu–Nankai	125.2720	24.2102	246.8	18	20.38
rnsz-4b	Ryukyu–Kyushu–Nankai	125.4563	23.8177	246.8	16	6.6
rnsz-5a	Ryukyu–Kyushu–Nankai	125.9465	24.5085	233.6	18	20.21
rnsz-5b	Ryukyu–Kyushu–Nankai	126.2241	24.1645	233.6	16	6.43
rnsz-6a	Ryukyu–Kyushu–Nankai	126.6349	25.0402	228.7	17.16	19.55
rnsz-6b	Ryukyu–Kyushu–Nankai	126.9465	24.7176	228.7	15.16	6.47
rnsz-7a	Ryukyu–Kyushu–Nankai	127.2867	25.6343	224	15.85	17.98
rnsz-7b	Ryukyu–Kyushu–Nankai	127.6303	25.3339	224	13.56	6.26
rnsz-8a	Ryukyu–Kyushu–Nankai	128.0725	26.3146	229.7	14.55	14.31
rnsz-8b	Ryukyu–Kyushu–Nankai	128.3854	25.9831	229.7	9.64	5.94
rnsz-9a	Ryukyu–Kyushu–Nankai	128.6642	26.8177	219.2	15.4	12.62
rnsz-9b	Ryukyu–Kyushu–Nankai	129.0391	26.5438	219.2	8	5.66
rnsz-10a	Ryukyu–Kyushu–Nankai	129.2286	27.4879	215.2	17	12.55
rnsz-10b	Ryukyu–Kyushu–Nankai	129.6233	27.2402	215.2	8.16	5.45
rnsz-11a	Ryukyu–Kyushu–Nankai	129.6169	28.0741	201.3	17	12.91
rnsz-11b	Ryukyu–Kyushu–Nankai	130.0698	27.9181	201.3	8.8	5.26
rnsz-12a	Ryukyu–Kyushu–Nankai	130.6175	29.0900	236.7	16.42	13.05
rnsz-12b	Ryukyu–Kyushu–Nankai	130.8873	28.7299	236.7	9.57	4.74
rnsz-13a	Ryukyu–Kyushu–Nankai	130.7223	29.3465	195.2	20.25	15.89
rnsz-13b	Ryukyu–Kyushu–Nankai	131.1884	29.2362	195.2	12.98	4.66
rnsz-14a	Ryukyu–Kyushu–Nankai	131.3467	30.3899	215.1	22.16	19.73
rnsz-14b	Ryukyu–Kyushu–Nankai	131.7402	30.1507	215.1	17.48	4.71
rnsz-15a	Ryukyu–Kyushu–Nankai	131.9149	31.1450	216	15.11	16.12
rnsz-15b	Ryukyu–Kyushu–Nankai	132.3235	30.8899	216	13.46	4.48
rnsz-16a	Ryukyu–Kyushu–Nankai	132.5628	31.9468	220.9	10.81	10.88
rnsz-16b	Ryukyu–Kyushu–Nankai	132.9546	31.6579	220.9	7.19	4.62
rnsz-17a	Ryukyu–Kyushu–Nankai	133.6125	32.6956	239	10.14	12.01
rnsz-17b	Ryukyu–Kyushu–Nankai	133.8823	32.3168	239	8.41	4.7
rnsz-18a	Ryukyu–Kyushu–Nankai	134.6416	33.1488	244.7	10.99	14.21
rnsz-18b	Ryukyu–Kyushu–Nankai	134.8656	32.7502	244.5	10.97	4.7
rnsz-19a	Ryukyu–Kyushu–Nankai	135.6450	33.5008	246.5	14.49	14.72
rnsz-19b	Ryukyu–Kyushu–Nankai	135.8523	33.1021	246.5	11.87	4.44
rnsz-20a	Ryukyu–Kyushu–Nankai	136.5962	33.8506	244.8	15	14.38
rnsz-20b	Ryukyu–Kyushu–Nankai	136.8179	33.4581	244.8	12	3.98
rnsz-21a	Ryukyu–Kyushu–Nankai	137.2252	34.3094	231.9	15	15.4
rnsz-21b	Ryukyu–Kyushu–Nankai	137.5480	33.9680	231.9	12	5
rnsz-22a	Ryukyu–Kyushu–Nankai	137.4161	34.5249	192.3	15	15.4
rnsz-22b	Ryukyu–Kyushu–Nankai	137.9301	34.4327	192.3	12	5

# Appendix C

## SIFT Testing

### C.1 Purpose

Forecast models are tested with synthetic tsunami events covering a range of tsunami source locations. Testing is also done with selected historical tsunami events when available.

The purpose of forecast model testing is three-fold. The first objective is to assure that the results obtained with NOAA's tsunami forecast system, which has been released to the Tsunami Warning Centers for operational use, are identical to those obtained by the researcher during the development of the forecast model. The second objective is to test the forecast model for consistency, accuracy, time efficiency, and quality of results over a range of possible tsunami locations and magnitudes. The third objective is to identify bugs and issues in need of resolution by the researcher who developed the forecast model or by the forecast software development team before the next version release to NOAA's two Tsunami Warning Centers.

Local hardware and software applications, and tools familiar to the researcher(s), are used to run the Method of Splitting Tsunami (MOST) model during the forecast model development. The test results presented in this report lend confidence that the model performs as developed and produces the same results when initiated within the forecast application in an operational setting as those produced by the researcher during the forecast model development. The test results assure those who rely on the Wake Island tsunami forecast model that consistent results are produced irrespective of system.

### C.2 Testing Procedure

The general procedure for forecast model testing is to run a set of synthetic tsunami scenarios and a selected set of historical tsunami events through the forecast system application and compare the results with those obtained by the researcher during the forecast model development and presented in the Tsunami Forecast Model Report. Specific steps taken to test the model include:

1. Identification of testing scenarios, including the standard set of synthetic events, appropriate historical events, and customized synthetic scenarios that may have been used by the researcher(s) in developing the forecast model.



2. Creation of new events to represent customized synthetic scenarios used by the researcher(s) in developing the forecast model, if any.
3. Submission of test model runs with the forecast system, and export of the results from A, B, and C grids, along with time series.
4. Recording applicable metadata, including the specific version of the forecast system used for testing.
5. Examination of forecast model results from the forecast system for instabilities in both time series and plot results.
6. Comparison of forecast model results obtained through the forecast system with those obtained during the forecast model development.
7. Summarization of results with specific mention of quality, consistency, and time efficiency.
8. Reporting of issues identified to modeler and forecast software development team.
9. Retesting the forecast models in the forecast system when reported issues have been addressed or explained.

Synthetic model runs were tested on a DELL PowerEdge R510 computer equipped with two Xeon E5670 processors at 2.93 Ghz, each with 12 MBytes of cache and 32 GB memory. The processors are hex core and support hyperthreading, resulting in the computer performing as a 24 processor core machine. Additionally, the testing computer supports 10 Gigabit Ethernet for fast network connections. This computer configuration is similar or the same as the configurations of the computers installed at the Tsunami Warning Centers so the compute times should only vary slightly.

### **C.3 Results**

A forecast model for the U.S. territory of Wake Island was tested with NOAA's tsunami forecast system version 3.2. Testing was conducted with five synthetic scenarios and one historical tsunami event. Test results from the forecast system and comparisons with the results obtained during the forecast model development are shown numerically in Table C.1 and graphically in Figures C.1 to C.6. The results show that the forecast model is stable and robust, with consistent and high-quality results across geographically distributed tsunami sources and megaevent tsunami magnitudes. The model run time (wall-clock time) was under 19 min for 8 hr of simulation time, and under 10 min for 4 hr. This run time is within the 10 min run time for 4 hr of simulation time and satisfies time efficiency requirements.

Five synthetic events (there were no time series plots in the report for the CSSZ 89-98 case) were run on the Wake Island forecast model. The modeled scenarios were stable for all cases tested, with no instabilities or ringing. Results show that the largest modeled amplitude originating in the Kamchatka-Yap-Mariana-Izu-Bonin (KISZ 22-31) source, was 149.67 cm (Figure C1). Amplitudes greater than 100 cm were recorded for 1 out of 5 test sources. The smallest signal of 22.67 cm was recorded at a far-field Central and South American (CSSZ 102-111) source

(Figure C5). Direct comparisons, of output from the forecast tool with results of both the historical event (Kuril 2006) and available development synthetic events, demonstrated that the wave patterns were similar in shape, pattern, and amplitude.

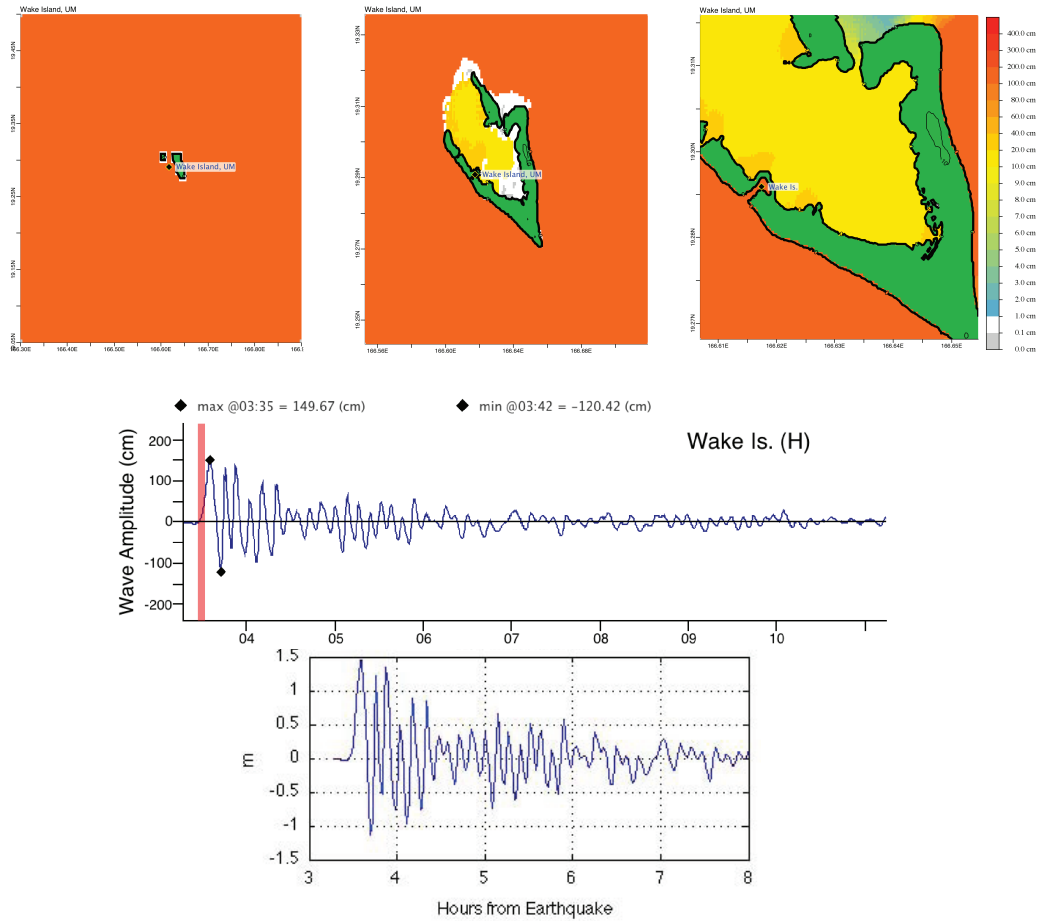


Figure C.1: Response of the Wake Island forecast model to synthetic scenario KISZ 22–31 ( $\alpha = 29$ ). Maximum sea surface elevation for (a) A grid, (b) B grid, (c) C grid. Sea surface elevation time series at the C grid warning point (d). The lower time series plot is the result obtained during model development and is shown for comparison with test results.

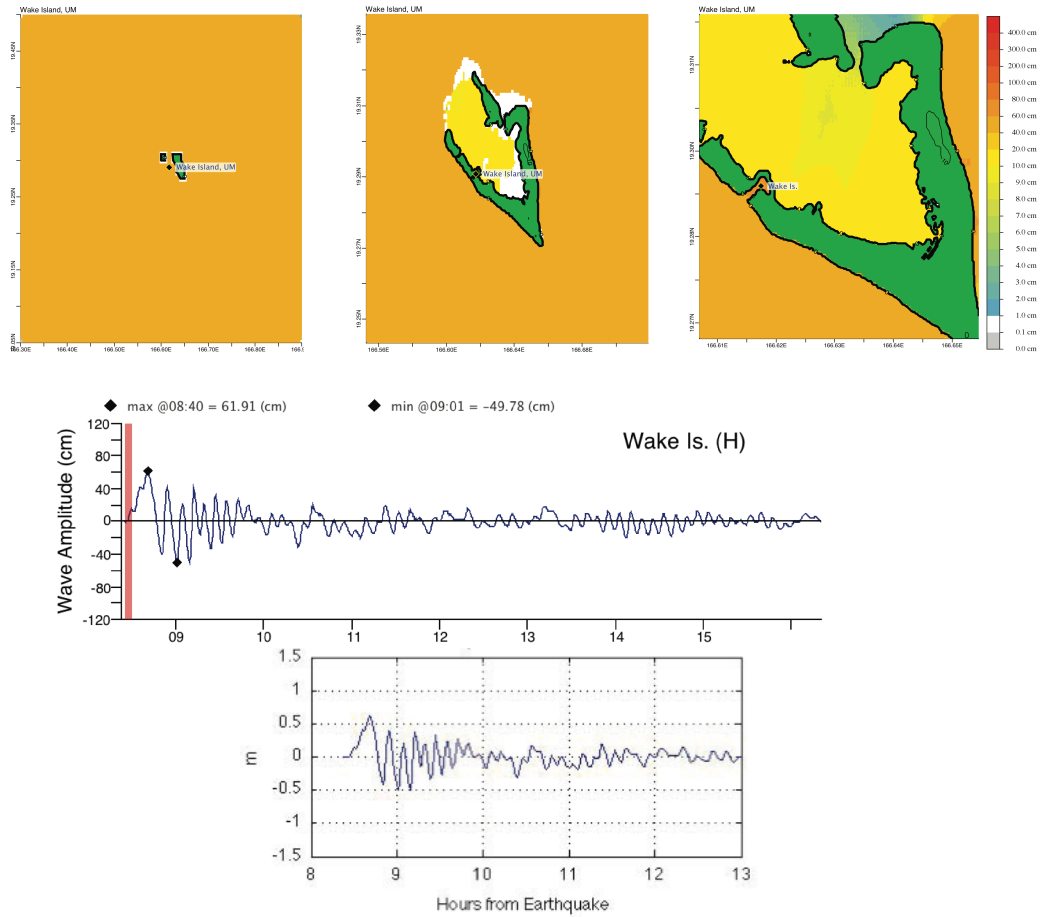


Figure C.2: Response of the Wake Island forecast model to synthetic scenario ACSZ 56–65 ( $\alpha = 29$ ). Maximum sea surface elevation for (a) A grid, (b) B grid, (c) C grid. Sea surface elevation time series at the C grid warning point (d). The lower time series plot is the result obtained during model development and is shown for comparison with test results.

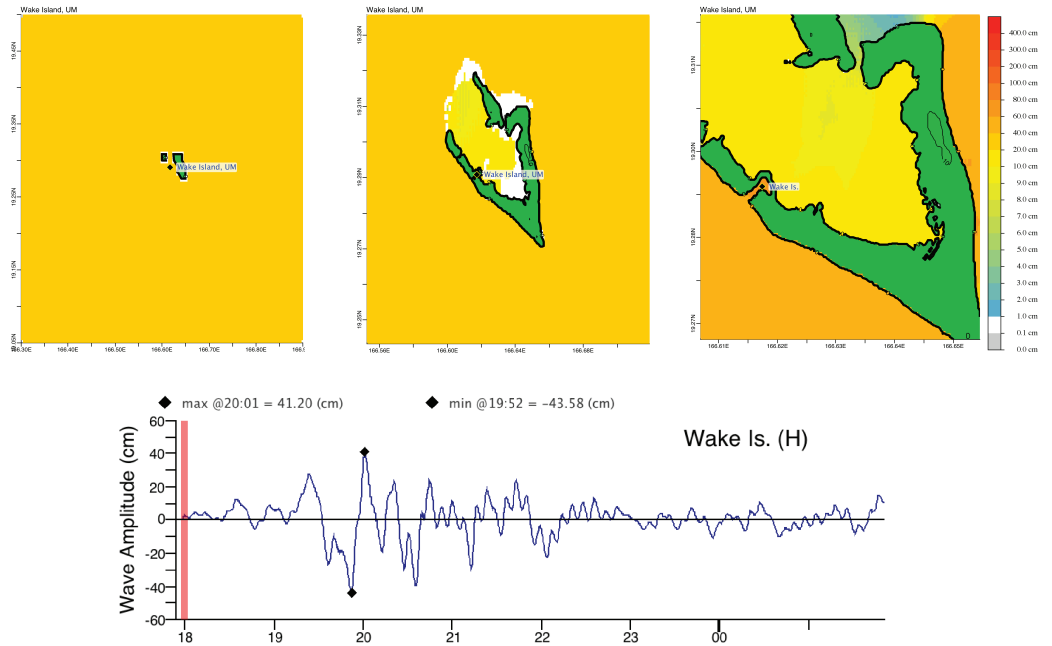


Figure C.3: Response of the Wake Island forecast model to synthetic scenario CSSZ 89–98 ( $\alpha = 29$ ). Maximum sea surface elevation for (a) A grid, (b) B grid, (c) C grid. Sea surface elevation time series at the C grid warning point (d). The lower time series plot is the result obtained during model development and is shown for comparison with test results.

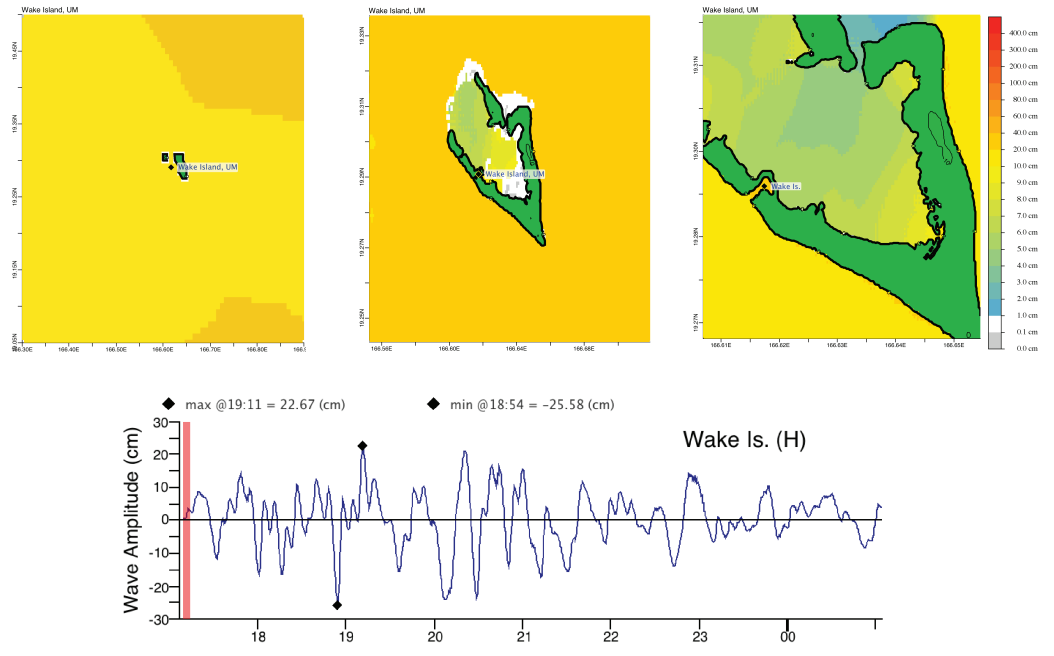


Figure C.4: Response of the Wake Island forecast model to synthetic scenario CSSZ 102–111 ( $\alpha = 29$ ). Maximum sea surface elevation for (a) A grid, (b) B grid, (c) C grid. Sea surface elevation time series at the C grid warning point (d). The lower time series plot is the result obtained during model development and is shown for comparison with test results.

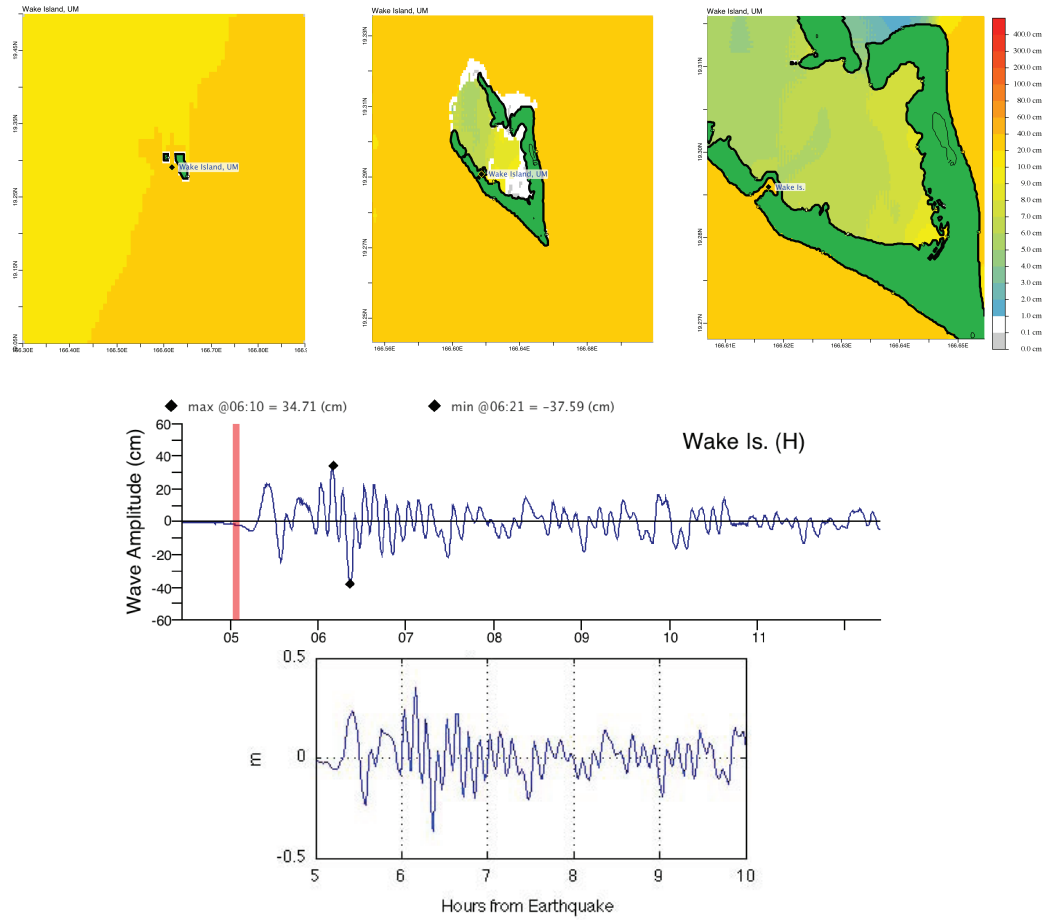


Figure C.5: Response of the Wake Island forecast model to synthetic scenario NTSZ 30–39 ( $\alpha = 29$ ). Maximum sea surface elevation for (a) A grid, (b) B grid, (c) C grid. Sea surface elevation time series at the C grid warning point (d). The lower time series plot is the result obtained during model development and is shown for comparison with test results.

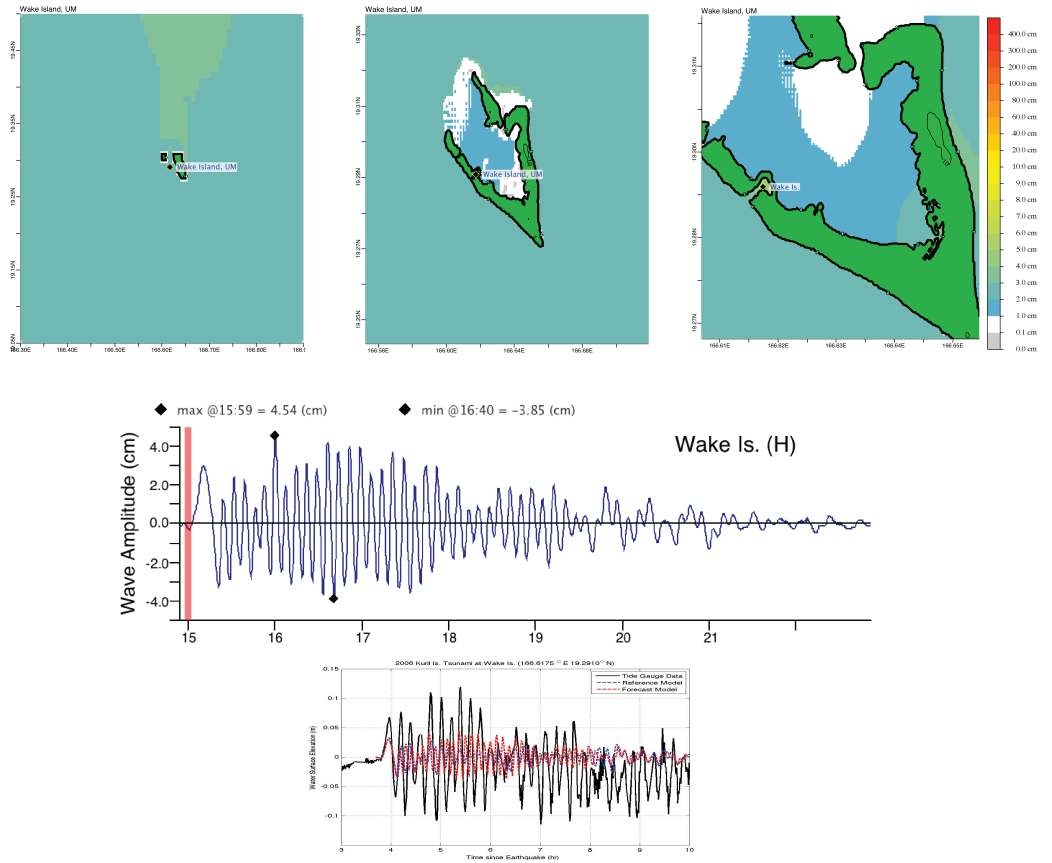


Figure C.6: Response of the Wake Island forecast model to the Kuril 2006 event. Maximum sea surface elevation for (a) A grid, (b) B grid, (c) C grid. Sea surface elevation time series at the C grid warning point (d). The lower time series plot is the result obtained during model development and is shown for comparison with test results.



Table C.1: Table of maximum and minimum amplitudes (cm) at the Wake Island, United States Minor Outlying Islands warning point for synthetic and historical events tested using SIFT 3.2 and obtained during development.

Scenario Name	Source Zone	Tsunami Source	$\alpha$ [m]	SIFT Max (cm)	Development Max (cm)	SIFT Min (cm)	Development Min (cm)
<b>Mega-tsunami Scenarios</b>							
KISZ 22-31	Kamchatka-Yap-Mariana-Izu-Bonin	A22-A31, B22-B31	29	149,667	144	-120,419	-113
ASCZ 56-65	Aleutian-Alaska-Cascadia	A56-A65, B56-B65	29	61,909	62	-49,781	-50
CSSZ 89-98	Central and South America	A89-A98, B89-B98	29	41,196	n/a	-43,579	n/a
CSSZ 102-111	Central and South America	A102-A111, B102-B111	29	22,668	n/a	-25,58	n/a
NTSZ 30-39	New Zealand-Kermadec-Tonga	A30-A39, B30-B39	29	34,711	35	-37,593	-36
<b>Historical Events</b>							
Kuril 2006	Kamchatka-Yap-Mariana-Izu-Bonin	A12-13, B12-13	varies	4,536	4.5	-3,853	-3.8

## **Appendix D**

# **Supplementary Material**

### **D.1 1960 and 1964 Events at Wake Island**

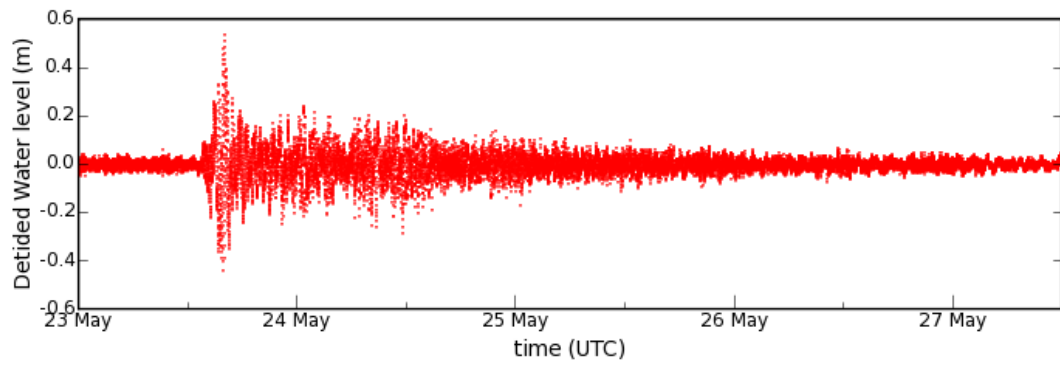


Figure D.1: Recorded tide gauge record at Wake Island during the 1960 Chile tsunami.

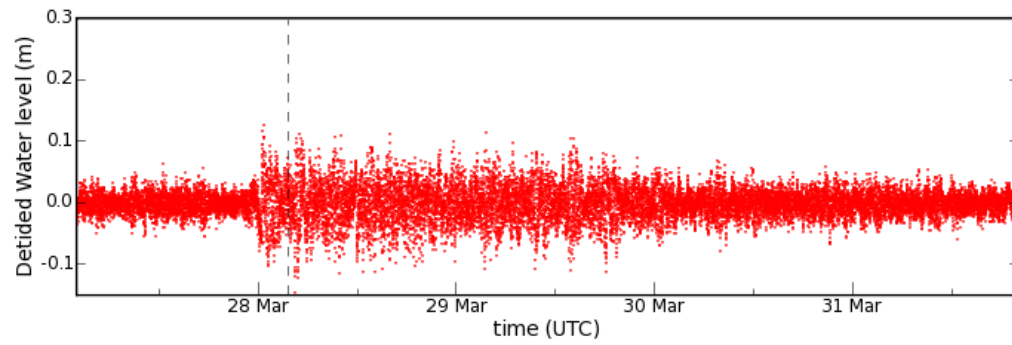


Figure D.2: Recorded tide gauge record at Wake Island during the 1964 Alaska tsunami.

## **D.2 Time Series Records at Sample Point 2 (166.6140° E, 19.2995° N).**

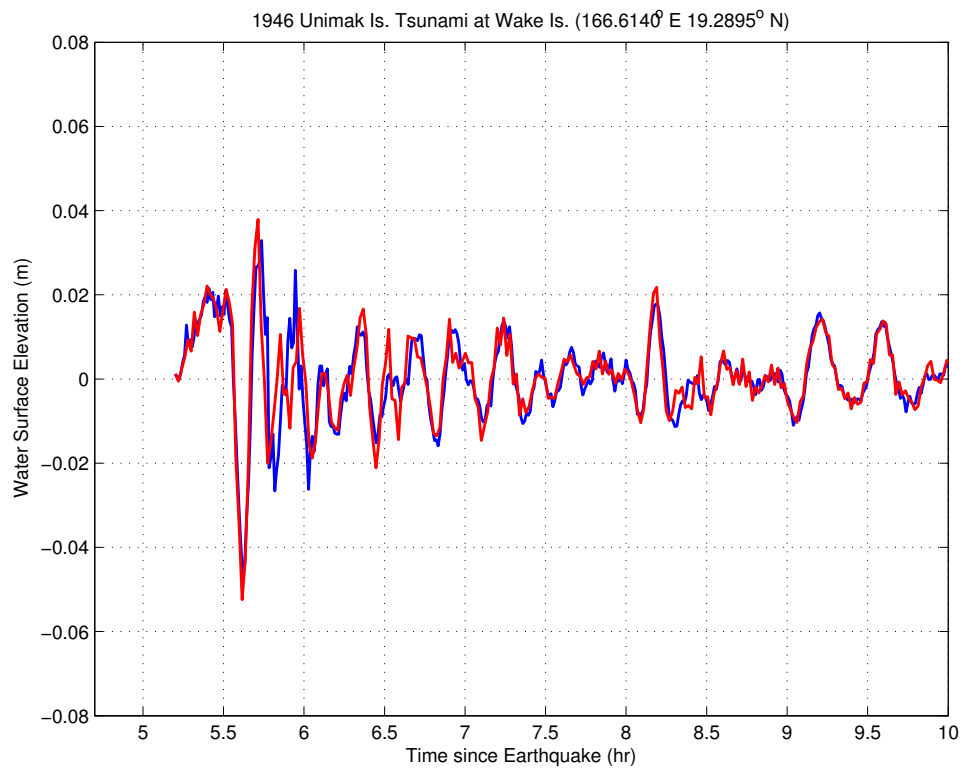


Figure D.3: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2995° N) for the 1946 Unimak Island event.

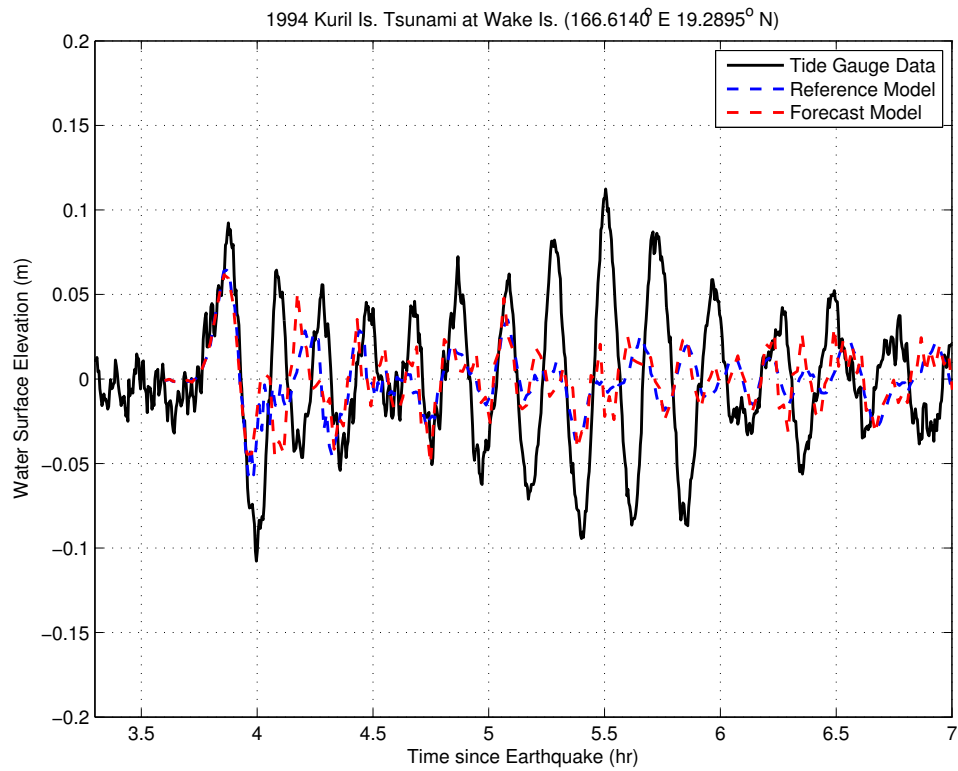


Figure D.4: Comparison of the forecast, reference model and observed signals at sample point 2 (166.6140° E, 19.2995° N) for the 1994 Kuril Island event.

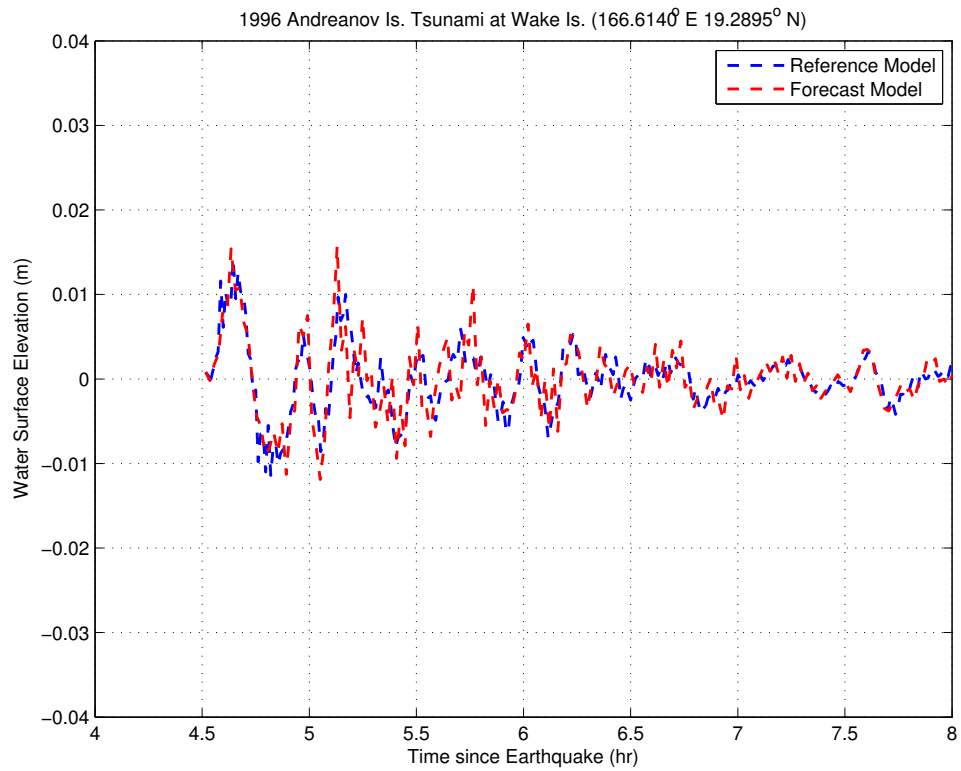


Figure D.5: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2995° N) for the 1996 Andeanov Island event.

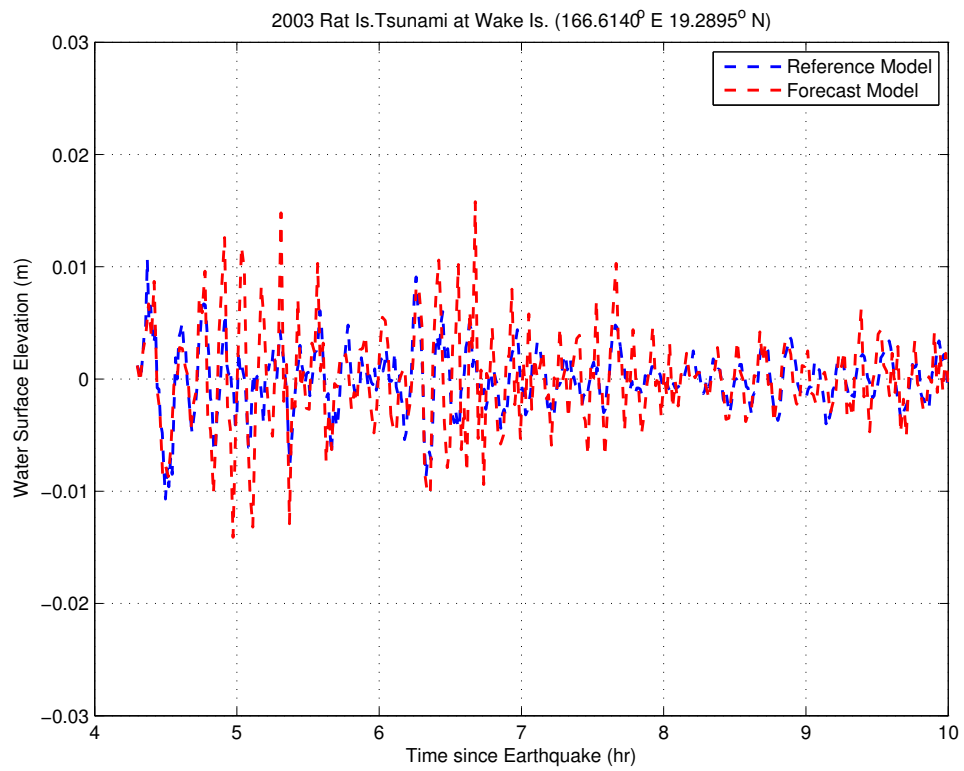


Figure D.6: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2995° N) for the 2003 Rat Island event.



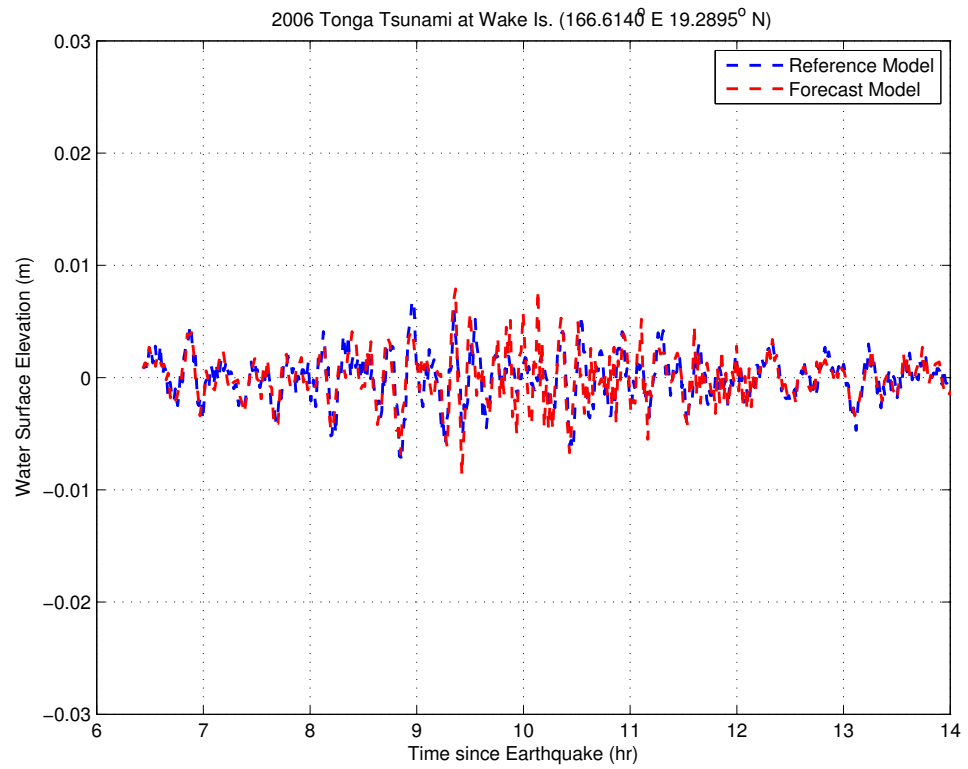


Figure D.7: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2895° N) for the 2006 Tonga Island event.

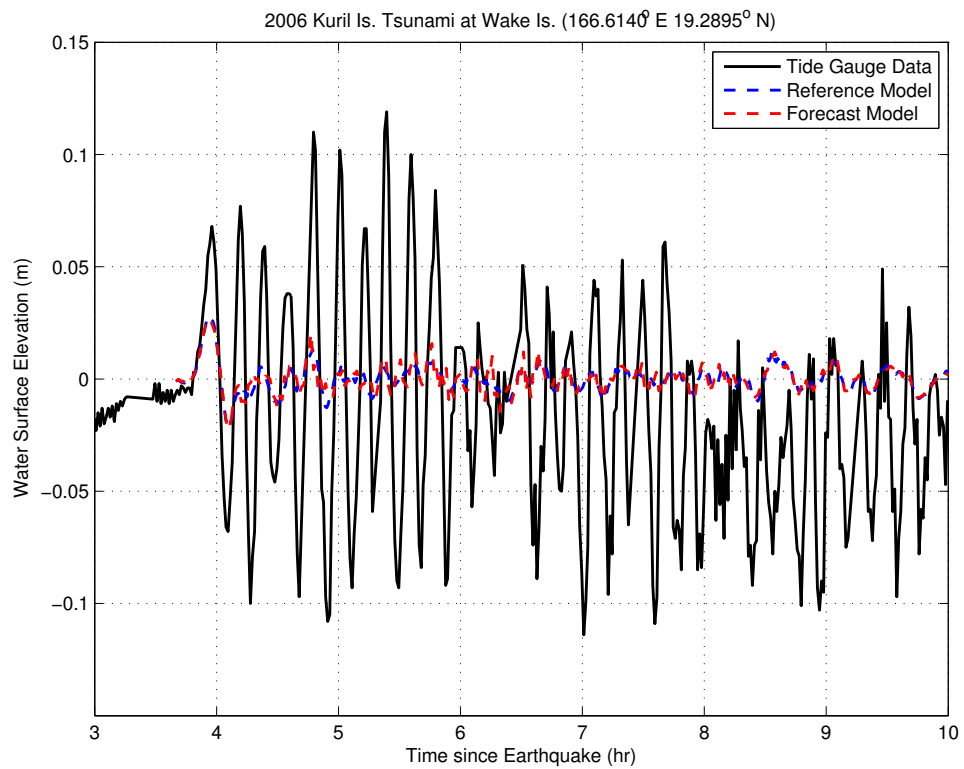


Figure D.8: Comparison of the forecast, reference model and observed signals at sample point 2 (166.6140° E, 19.2995° N) for the 2006 Kuril Island event.

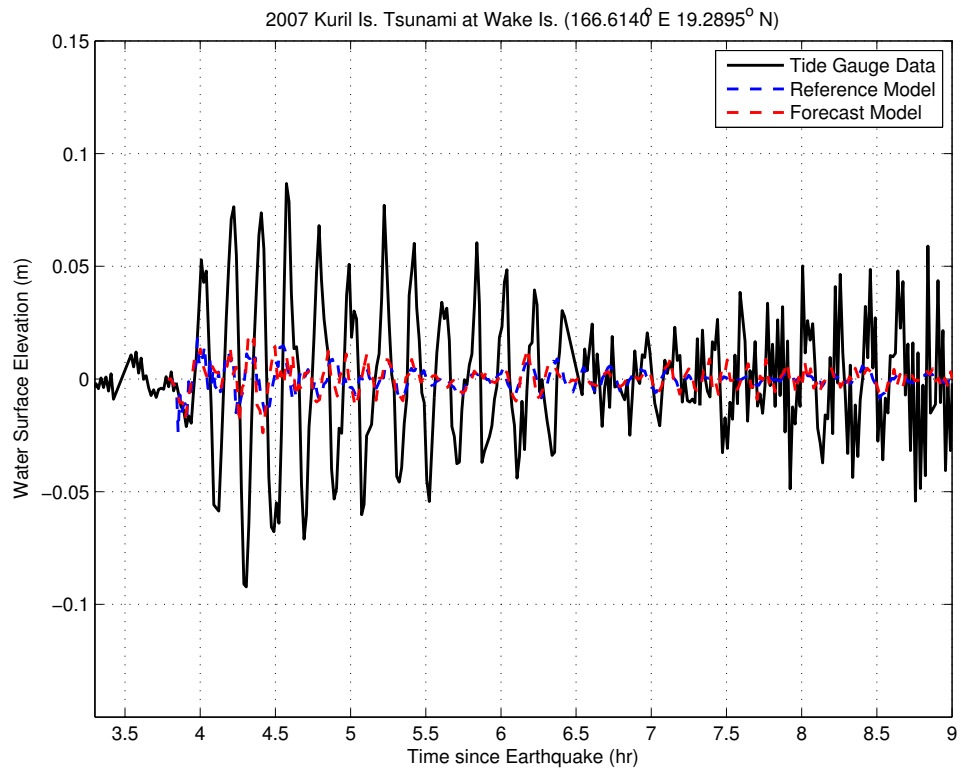


Figure D.9: Comparison of the forecast, reference model and observed signals at sample point 2 (166.6140° E, 19.2995° N) for the 2007 Kuril Island event.

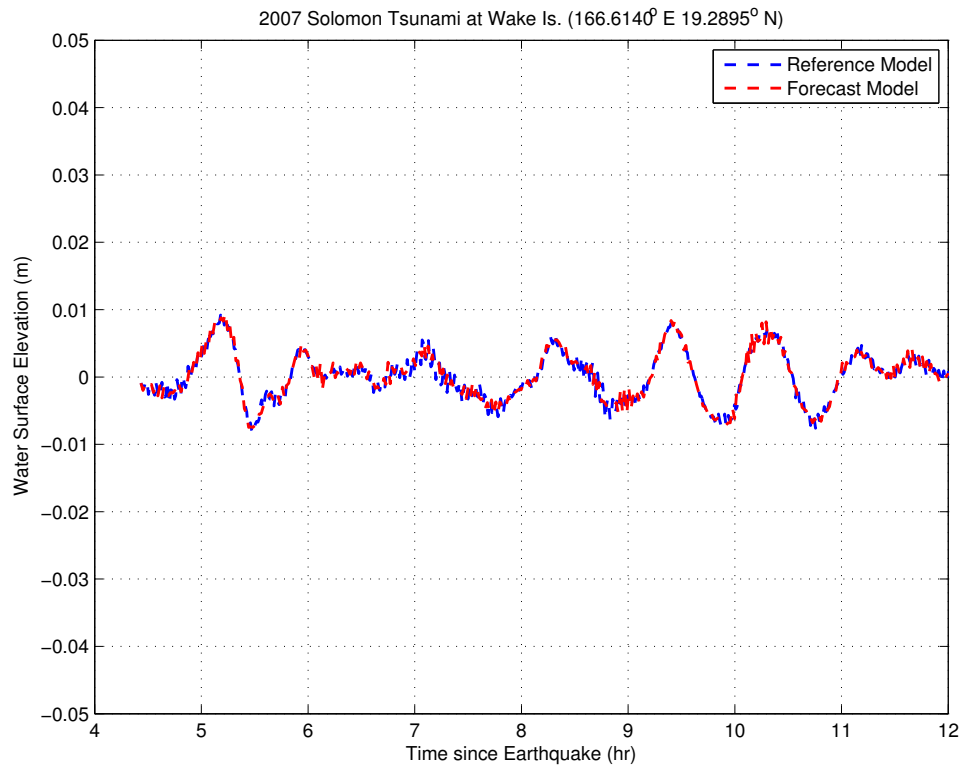


Figure D.10: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2995° N) for the 2007 Solomon Island event.

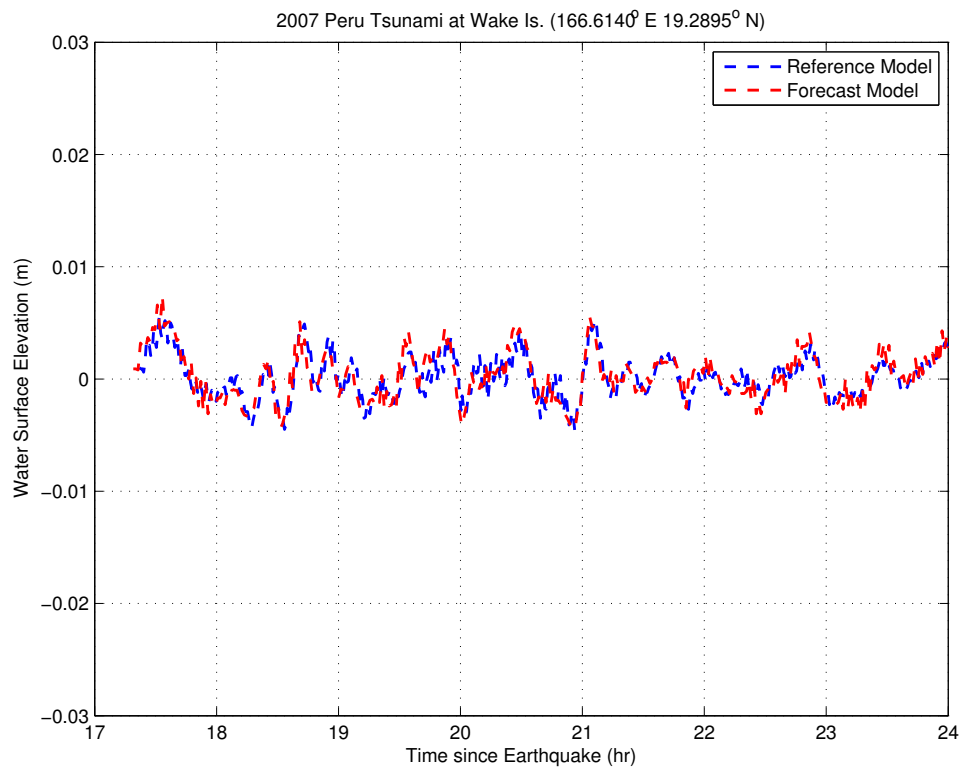


Figure D.11: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2995° N) for the 2007 Peru event.

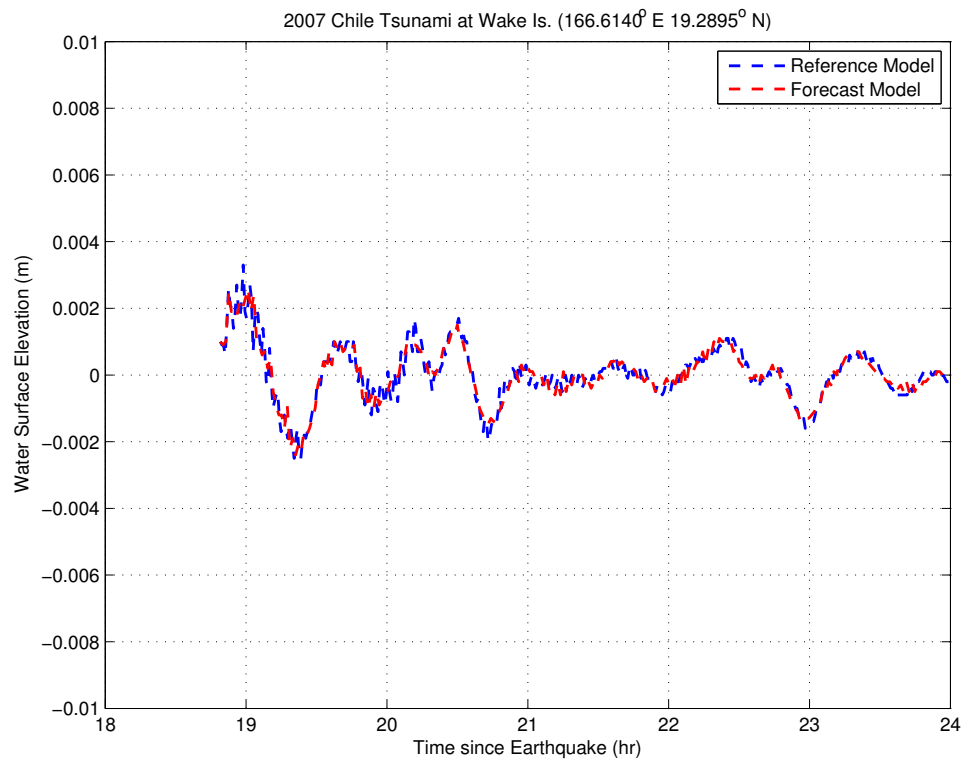


Figure D.12: Comparison of the forecast and reference model signals at sample point 2 (166.6140° E, 19.2995° N) for the 2007 Chile event.

### **D.3 Time Series Records at Wake Island for Synthetic Scenarios.**

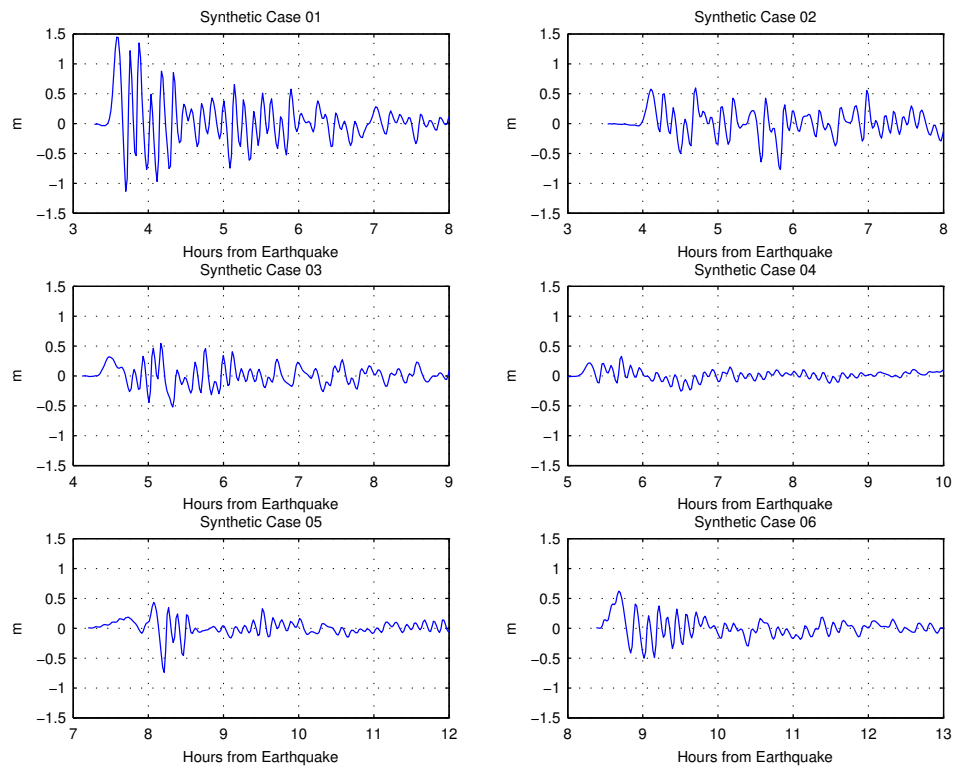


Figure D.13: Computed tide gauge record at Wake Island for synthetic scenarios 1 through 6. Case 1: KISZ 22-31, Case 2: KISZ 1-10, Case 3: ACSZ 12-21, Case 4: ACSZ 22-31, Case 5: ACSZ 38-47, Case 6: ACSZ 56-65, see Table 3 for further details.



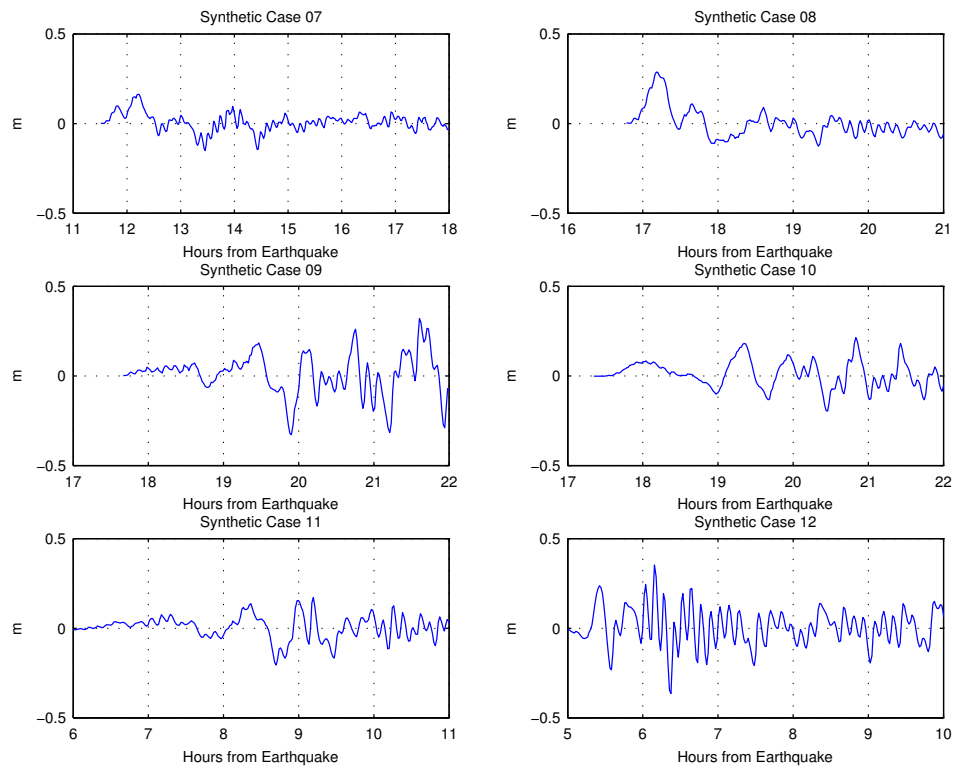


Figure D.14: Computed tide gauge record at Wake Island for synthetic scenarios 7 through 12. Case 7: CSSZ 1-10, Case 8: CSSZ 37-46, Case 9: CSSZ 92-101, Case 10: CSSZ 64-73, Case 11: NTSZ 20-29, Case 12: NTSZ 30-39, see Table 3 for further details.

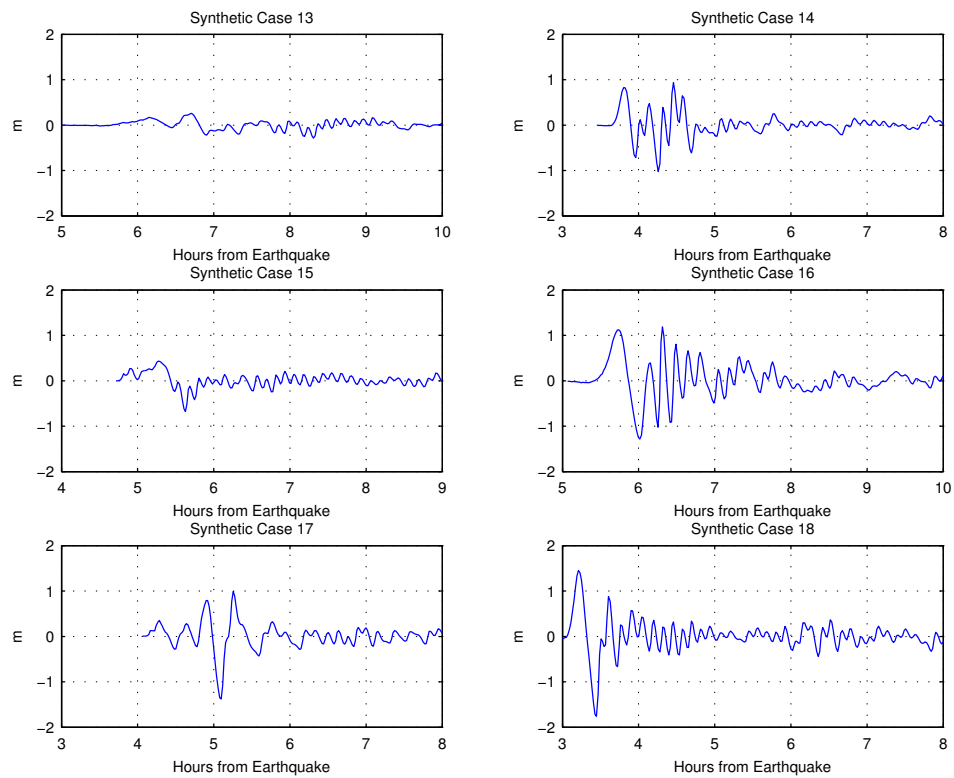


Figure D.15: Computed tide gauge record at Wake Island for synthetic scenarios 13 through 18. Case 13: NVSZ 22-31, Case 14: MOSZ 1-10, Case 15: NGSZ 3-12, Case 16: EPSZ 6-15, Case 17: RNSZ 12-21, Case 18: KISZ 32-41, see Table 3 for further details.