

International Training Course in Seismology and Tsunami Warnings



Figure 1 Training course participants, lecturers and hosts. Front row are Principal Organizers and Trainers (see Appendix 1): Masahiro Yamamoto, Leong Chow Peng, RK Chadha, Annabel Kelly, Yap Kok Seng, Jim Mori, Laura Kong, Mohd Rosaidi Bin Che Abas.

A five-day international training course in Seismology and Tsunami Warnings was held at the Malaysia Meteorology Department in Kuala Lumpur (Petaling Jaya district), Malaysia from August 21-25, 2006. The course involved participants from Indonesia, Thailand, Sri Lanka, Vietnam and Malaysia. The Malaysian Meteorology Department (MMD), the UNESCO Intergovernmental Oceanographic Commission (IOC), the US Geological Survey (USGS) and the US Agency for International Development (USAID) sponsored the training course.



Figure 2. Dr Laura Kong lecturing on tsunami generation.

A total of 49 participants attended: 10 from the Indonesian Meteorology and Geophysics Agency (BMG) offices in Jakarta and Bali; 3 from the Thai National Disaster Warning Center (NDWC); 2 Sri Lankans, 1 from the National Disaster Management Center and 1 from the Department of Meteorology; 2 Vietnamese scientists, from the Institute of Oceanography and the Institute of Geophysics; and 32 Malaysian scientists, 3 from Astronautic Technology (M) Sdn. Bhd., 2 from the Crisis & Disaster Management Directorate, and the remainder from the Meteorology Department. A full list of participants and lecturers is provided in Appendix 1.



Figure 3. Participants from Indonesia during a hands-on exercise



Figure 4. Dr Annabel Kelly lecturing on focal mechanisms



Figure 5. Malaysian participants during a practical exercise analyzing seismic data.

The training was directly relevant to the daily duties for the majority of the participants. The level of previous knowledge of earthquake seismology and tsunami warning was varied, with experience ranging from new employees of the MMD to experienced seismologists from the Indonesian BMG.

The training course was structured to give an introduction to earthquake seismology and tsunami warning center procedures and operations. The first day gave an overview of the basic theory of earthquake seismology, covering plate tectonics, earthquake source and seismic waves. The second day reviewed the technical seismology used in tsunami warnings, including earthquake location and focal mechanism solutions. For the morning of the third day more general topics in earthquake seismology were discussed, including seismic instrumentation and networks. This day also introduced tsunami science, reviewing the generation and propagation of tsunami waves. In the afternoon of day 3 the Malaysian Meteorology Department arranged a visit to a local seismic station.

The final two days of the training were focused on tsunami warnings. On day 4, this section of the training began with a review of tsunami warning systems and warning center practices. This review was followed by detailed discussion of scenarios for tsunami events in the Indian Ocean and the South China Sea, and a hands-on session using the Integrated Tsunami Data Base computer program (winITDB). On the final day of the training reviewed the communication of warnings and the work of warning centers in education and mitigation. The full agenda for the course is provided in Appendix 2.



Figure 4. Dr RK Chadha lecturing on earthquake location.

At the end of the training course questionnaires were given to the participants. 45 of the participants provided feedback. In general the reports were very positive, with the all but one of participants reporting that they gained knowledge in the training and a little over a third stating that the gained a great deal of knowledge. General comments provided by the participants included: "Very good course. Very useful to me since I am directly involved in earthquake instrumentation, monitoring and warning. A great job was done by all lecturers. The

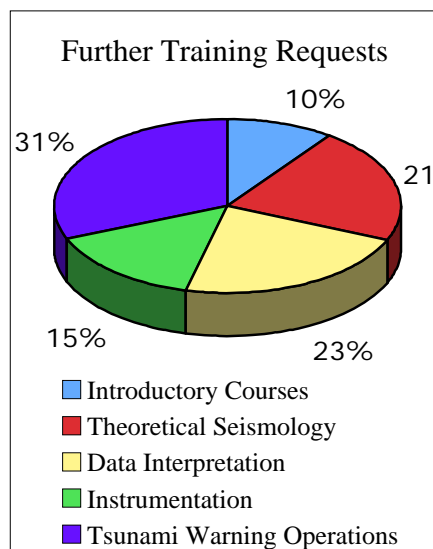


Figure 5. Requests for further training from the participants.

handout, slides, presentations were very good and informative", "I'm new to seismology, the course has really improved my knowledge", "I've read about earthquakes and tsunamis before, but this course really opened my eyes to the dangers of tsunami to Malaysia", "Learnt the importance of sharing information, every second counts". Several of the participants had attended the previous training courses in Thailand and Indonesia, these participants gained less new information than those attending the training for the first time. However, the development of training materials and the more advanced level of this course ensured that the returning participants reinforced existing knowledge and gained some knowledge. This was indicated in the feedback forms, for example, "Some of the material I previously got when the course was in my country, Indonesia, so here I just

take some new information from this course". A combination of improved PowerPoint slides and participants with more experience of teaching in English reduced the communication problems that were experienced in previously training programs. In the feedback forms 89% of the participants indicated that the lectures were at the correct speed, with 1 participant indicating that the lectures were a little too slow and 3 that they were too fast. Additionally the participants were almost unanimous with their support for the starting level of the lectures, with just 2 reporting that they believed the level was a little too basic. As with previous courses the hands-on sessions were very popular with the participants, and despite more than 7 hours of practical sessions, 3 of the responses requested more hands-on time.

The feedback forms also asked the participants to provide information on what further training they would like. The responses indicated that a further training would be appreciated in a wide range of topics, as indicated by Figure 7.

Appendix 1 Participants and Lecturers

INDONESIA

1. Mr. Setyoajie Prayoedhie
Analyst
Meteorologi and Geophysical Agency
2. Mr. Bayu Pranata
Analyst
Meteorologi and Geophysical Agency
3. Mr. Nurpujiono
Analyst
Meteorologi and Geophysical Agency
4. Mr. Oktifar Tri Bandono
Analyst
Meteorologi and Geophysical Agency
5. Mr. Fauzi
Analyst
Meteorologi and Geophysical Agency
6. Mr. Handi Sulistyو Widodo
Analyst
Meteorologi and Geophysical Agency
7. Mr. Iwan Hermawan
Meteorologi and Geophysical Agency
8. Mr. Sujabar
Meteorologi and Geophysical Agency
9. Mr. Sutiyono
Analyst
Meteorologi and Geophysical Agency
10. Mr. Agus Riyanto
Analyst
Meteorologi and Geophysical Agency
Regional Seismological Center III Denpasar-Bali

SRI LANKA

11. Ms. D.G. Fernando

Meteorologist
Department of Meteorology

12. Mr. N.W.A.M.M.K.N. Bandara
Assistant Director/Geologist
Disaster Management Centre

VIETNAM

13. Mr. Nguyen Le Minh
Researcher
Institute of Geophysics
14. Mr. Tran Van Chung
Researcher
Department of Marine Physics
Institute of Oceanography

THAILAND

15. Mr. Supamit Jantakham
Geologist
National Disaster Warning Center (NDWC)
16. Ms. Apinya Chaila
Meteorologist
National Disaster Warning Center (NDWC)
17. Ms. Tipsakorn Aiadmusik
Meteorologist
National Disaster Warning Center (NDWC)

MALAYSIA

18. Ms Irene Eu Swee Neo
Assistant Director
Seismology Division
Malaysian Meteorological Department
19. Mr. Asmadi bin Abdul Wahab
Assistant Director
Seismology Division
Malaysian Meteorological Department
20. Ms. Sandra Richard a Scholastica
Assistant Meteorological Officer

- Seismology Division
Malaysian Meteorological Department
21. Mr. Devadas a/l Ramachandran
Assistant Meteorological Officer
Seismology Division
Malaysian Meteorological Department
 22. Mr. Lim Chin Tiong
Assistant Meteorological Officer
Seismology Division
Malaysian Meteorological Department
 23. Ms. Lizafadzleena Zaimah binti Ahmad Zabidi
Assistant Meteorological Officer
Seismology Division
Malaysian Meteorological Department
 24. Mr. Muhammad Helmi bin Abdullah
Principal Assistant Director
Central Forecast Office
Malaysian Meteorological Department
 25. Mr. A. Kamiluddin bin Hj. Ibrahim
Principal Assistant Director
Central Forecast Office
Malaysian Meteorological Department
 26. Mr.. Ambun Dindang
Principal Assistant Director
Central Forecast Office
Malaysian Meteorological Department
 27. Ms. Zaridah binti Md. Jalal
Meteorological Officer
Central Forecast Office
Malaysian Meteorological Department
 28. Mr. Azlai bin Taat
Meteorological Officer
Central Forecast Office
Malaysian Meteorological Department
 29. Mr. Wellson David
Assistant Meteorological Officer
Information Communication & Technology (ICT) Division

- Malaysian Meteorological Department
30. Mr. Afiq Zhofri bin Abdul Razak
Meteorological Officer
Malaysian Meteorological Department
 31. Mr. Mohd Ridzuan bin Adam
Meteorological Officer
Malaysian Meteorological Department
 32. Ms. Surina binti Othman
Meteorological Officer
Malaysian Meteorological Department
 33. Ms. Heernani binti Abu Bakar
Meteorological Officer
Malaysian Meteorological Department
 34. Ms. Amzura binti Amran
Meteorological Officer
Malaysian Meteorological Department
 35. Ms. Siti Fauziah binti Mat Adam
Meteorological Officer
Malaysian Meteorological Department
 36. Ms. Mimi Adilla binti Sarmani
Meteorological Officer
Malaysian Meteorological Department
 37. Mr. Prince Assad bin A. Kahar
Meteorological Officer
Malaysian Meteorological Department
 38. Ms. Nur Syarafina binti Shafie
Meteorological Officer
Malaysian Meteorological Department
 39. Mr.. Shamshumar bin Shuhani
Meteorological Officer
Malaysian Meteorological Department
 40. Ms. Junainah binti Ali
Meteorological Officer
Forecast Office Subang

41. Ms. Norhadizah binti Mohd Khalid
Meteorological Officer
KLIA Meteorological Office
42. Ms. Toh Ying Ying
Meteorological Officer
KLIA Meteorological Office
43. Ms. Zaty Aktar binti Hj. Mokhtar
Meteorological Officer
Forecast Office Bayan Lepas
44. Mr. Rosli bin Zakaria
Meteorological Officer
Kuching Meteorological Office
45. Mr. Mohd Razif bin Samsudin
System Engineer
Astronautic Technology (M) Sdn. Bhd. (ATSB)
46. Ms. Aumuhaimi binti Md. Yusof
System Engineer
Astronautic Technology (M) Sdn. Bhd. (ATSB)
47. Ms. Yulia binti Jaswar
Assistant System Engineer
Astronautic Technology (M) Sdn. Bhd. (ATSB)
48. Mr. Mohamad Syazwan Bin Saleh
Assistant Director
Crisis & Disaster Management Directorate
National Security Council (BKN)
49. Mr. Norhisham bin Kamarudin
Assistant Director
Crisis & Disaster Management Directorate
National Security Council (BKN)

LECTURERS

- Prof. Jim Mori
Disaster Prevention Research Institute
Kyoto University,
Japan
- Dr. R.K. Chadha
Deputy Director

National Geophysical Research Institute
India

Dr. Annabel Kelly
Research Seismologist
US Geological Survey

Dr. Laura S Kong
Director
UNESCO-IOC, International Tsunami, Information Centre

Mr. Masahiro Yamamoto
Senior Tsunami Advisor
UNESCO-IOC

Appendix 2 Training Course Agenda

Time	Topic	
Day 1	<i>Seismology</i>	
9:00-10:30	Introductions	
10:30-11:00	Coffee	
11:00-11:30	Seismicity and Plate Tectonics	RK Chadha
11:30-12:30	Earthquake theory - sources	Jim Mori
12:30-1:30	Lunch	
1:30-3:30	Computer exercises (seismic data interpretation)	Annabel Kelly
3:30-4:00	Coffee	
4:00-5:00	Earthquake theory - waves	Jim Mori
5:00-6:00	Optional: DVD documentary on earthquakes	
Day 2	<i>Seismology</i>	
9:00-10:00	Seismic data interpretation - Location	RK Chadha
10:00-11:00	Seismic data interpretation - Focal mechanisms	Annabel Kelly
11:00-11:30	Coffee	
11:30-12:30	Earthquake forecasting	Jim Mori
12:30-1:30	Lunch	
1:30-3:30	Computer exercises (earthquake location and focal mechanisms)	Annabel Kelly
3:30-4:00	Coffee	
4:00-5:00	Damaging effects of earthquakes	Jim Mori
5:00-5:30	The July 17, 2006 Indonesia Tsunami	Jim Mori
Day 3	<i>Seismology and Tsunamis</i>	
9:00-10:00	Seismic instrumentation	RK Chadha
10:00-10:45	Seismic arrays and networks	RK Chadha
10:45-11:00	Coffee	
11:00-11:45	Tsunami generation and physics	Masahiro Yamamoto
11:45-1:00	Computer learning - TsunamiTeacher	Kong + Kelly
1:00-2:00	Lunch	
2:00-5:00	Visit to seismic station	
Day 4	<i>Tsunami Warning and Mitigation Systems - Tsunami Warnings</i>	
9:00-10:00	Tsunami Warning and Mitigation Systems	Laura Kong
10:00-11:00	Tsunami Warning Center Operations	Masahiro Yamamoto
11:00-11:30	Coffee	
11:30-12:30	Tsunami Warning Center Operations (PTWC and JMA) - IO Scenario	
	Procedures for the IOTWS Interim Advisory Information Service	Masahiro Yamamoto
	Case Study: Indonesia Source Region	Laura Kong
12:30-1:30	Lunch	
1:30-2:30	Tsunami Warning Center Operations (PTWC and JMA) - South China Sea Scenario	
	Procedures for the Northwest Pacific Tsunami Advisory Center - SCS events	Masahiro Yamamoto
	Case Study: Exercise Pacific Wave 06 source, north of Philippines	Laura Kong
2:30-3:30	Computer tsunami exercises (winITDB)	Kong, Kelly, Yamamoto
3:30-4:00	Coffee	

4:00-5:00	Computer learning: TsunamiTeacher, winITDB	Kong, Kelly, Yamamoto
5:00-6:00	Optional: DVD documentary on tsunamis	
Day 5	<i>Tsunami Hazard Assessment, Emergency Response, Mitigation</i>	
9:00-10:00	Tsunami Hazard Risk Assessment and Preparedness	Laura Kong
10:00-11:00	Warning Dissemination and Public Alerts - Communications Technologies	Yamamoto, Kong
11:00-11:30	Coffee	
11:30-12:30	Tsunami Emergency Response after warning issuance	Laura Kong
12:30-2:30	Lunch	
2:30-3:30	NHK 2004 Indian Ocean Tsunami Summary Video	Masahiro Yamamoto
3:30-4:00	Discussion, and Question and Answer	Kong, Yamamoto
4:00-4:30	Summary and Closing	All
3:30-4:00	Coffee	