

Report for the Sri Lanka training course on seismology and tsunami warnings



Participants and trainers for the Sri Lanka training course on seismology and tsunami warnings

The 5-day training course in seismology and tsunami warnings was held in the Construction Training and Equipment Centre in Colombo, Sri Lanka, from the 3rd-7th April 2006. The course was designed to provide a background understanding of the science of earthquake seismology and tsunami warning system operations to professional geologists and related scientists in academic and government institutions. The training was provided to professionals who will be involved in the Indian Ocean Tsunami Warning System, Sri Lankan disaster mitigation and preparedness and to the scientific community in general, to ensure that understanding of the science is disseminated and maintained in the long-term. A full list of participants is provided in Appendix 1. The training course was sponsored by the US Agency for International Development, the Geological Survey and Mines Bureau (GSMB) of Sri Lanka, the Intergovernmental Oceanographic Commission of UNESCO, the US Geological Survey.

The training was directly relevant to the daily duties of 7 of the 20 participants. The level of previous knowledge of seismology and tsunami warning was generally very low, with most participants either never studying seismology or covering only the very basics in a small number of university undergraduate lectures. However, there was some considerable variation, with a small number of the participants having previously attended training courses in earthquake seismology.

The course was designed to cover the basic theory of seismology and interpretation of seismic data in the first two days with the third day focused on seismic instrumentation and the damaging effects of earthquakes. Learning was directed primarily through lectures and reinforced with computer-based practical sessions. The fourth day covered seismic hazard assessment, introduced the physics of tsunamis and summarized the main topics covered in the seismology component of the course. The final day dealt with tsunamis, tsunami warning center operations, education and

outreach with special reference to Sri Lanka. The training course agenda is given in Appendix 2.

The lecture and practical material was supported by a course handout which contained information on the training course (such as sponsoring organizations and timetabling) and additional information on the topics covered in the training course. In addition, at the end of the course the participants were all provided with a copy of the lecture PowerPoint slides and the computer codes used in the practical sessions.

At the completion of the course the participants were asked to fill out a questionnaire on the training provided. Feedback was obtained from 19 of the 20 participants. The diverse nature of employment and scientific interest among the participants was supported by the broad base of topics covered in the training course, as indicated by the widespread feedback on the most appealing component of the training: the introductory lessons were most desired aspect for 11% of the participants; theoretical seismology was preferred by 37%; seismogram interpretation was the most favoured component, being the first choice topic for 52% of the participants; and the review of instrumentation was the most desired aspect of the course to 16% of the attendees. There was a general feeling among the participants that the course would have benefited from a greater component of practical training and a small component of lectures. This feedback has been taken onboard and the timetables for the next training courses will contain more hands-on sessions. However, the course was a general success with all except one of the participants stating that they gained knowledge during the course (with 32% stating that they gained much knowledge) and with all participants feeling that the course fulfilled their expectations to some extent.



Dr J R Kayal lecturing on earthquake sources



General discussion at the end of the day

Appendix 1 – Participants

Name	Affiliation
Ms. Nayomi kulasena	University of Peradeniya
Ms. Deepani Weerakoon	Geological Survey & Mines Bureau
Ms. Nilmini Thaldena	Geological Survey & Mines Bureau
Mr. Tharanga Udagedara	University of Peradeniya
Ms. Madurya Adikaram	University of Peradeniya
Ms. Geethika Wijewardana	University of Peradeniya
Mr. T.M.N. Peiris	Dept of Meteorology
Mr. R.M.K.R. Bandara	Central Engineering Consultancy Bureau
Mr. Saman Thilakasiri Kalubandara	Geological Survey & Mines Bureau
Dr. Nishantha Attanayake	Geological Survey & Mines Bureau
Dr. D.M.D.O.K. Dissanayake	University of Moratuwa
Mr. D.M. Sunil Dissanayake	Geological Survey & Mines Bureau
Mr. N.I.C. Peiris	National Building Research Organisation
Mr. C.H.E.R. Siriwardana	Geological Survey & Mines Bureau
Mr. S.W.M. Seneviratne	Geological Survey & Mines Bureau
Mr. Nalin De Silva	Geological Survey & Mines Bureau
Dr. N. P. Ratnayake	University of Moratuwa
Cdr. Eranga Ratnayake	D M C
Mr. A.G.M.M. Wimalasuriya	Department of Meteorology
Mr. Saman Perera	Geological Survey & Mines Bureau

Lecturers

Name	Affiliation
Dr Pete Davis	University of California, San Diego
Dr J R Kayal	Geological Survey of India
Dr Annabel Kelly	US Geological Survey
Dr Laura Kong	International Tsunami Information Center
Dr Jim Mori	Kyoto University
Dr Sarath Weerawarnakula	Geological Survey and Mines Bureau, Sri Lanka

Appendix 2 - Agenda

Day 1 - Introduction and the Tectonic Situation of Sri Lanka, Introduction to Earthquakes

9am- Session I.1: Introductions

Welcome by Sri Lanka: Sarath Weerawarnakula, Director of GSMB

Welcome by IOC/USGS: Laura Kong

Outline of Training Course: Annabel Kelly

10:15am- Session I.2

Topic: Introduction to Earthquake Science: A Historical Perspective

Lecturer: Peter Davis

11:15am- Coffee Break

11:30am- Session I.3

Topic: The Earth's Structure and Seismicity

Lecturer: Annabel Kelly

12:30pm- Lunch Break

1:45pm- Session I.4

Topic: Seismotectonics of Southeast Asia with special reference to Sri Lanka

Lecturer: J. R. Kayal

2:45pm- Coffee Break

3pm- Session I.5

Topic: Theoretical Seismology 1: Sources

Lecturer: James Mori

4:15pm- Discussions

6pm- Dinner

8pm- MOVIE (NatureTech documentary – earthquakes)

Day 2 - Seismic Theory & Applications

9am- Session II.1

Topic: Theoretical Seismology 2: Wave Propagation

Lecturer: James Mori

10am- Session II.2

Topic: Structure & Interpretation of Seismograms 1: Waveforms and Hypocentral Locations

Lecturer: J. R. Kayal

11:00am- Coffee Break

11:15am- Session II.3

Topic: Structure & Interpretation of Seismograms 2: Magnitude and Source Mechanisms

Lecturer: J. R. Kayal

12:15pm- Lunch Break

1:30pm- Hands on Computer Exercises (Annabel Kelly)

3:15pm- Coffee Break

3:30pm- Session II.4

Topic: Review of December, 2004 Sumatra Earthquake

Lecturer: Annabel Kelly

4:45pm- Discussions

6pm- Dinner

8pm- MOVIE (Documentary – the 1906 San Francisco earthquake)

Day 3 - Global and Local Seismic Networks, Instrumentation & Seismic Data Analysis

9am- Session III.1

Topic: Earthquake Forecasting

Lecturer: James Mori

10am - Session III.2

Topic: Instrumentation, Recording systems, Data Transmission & Archiving

Lecturer: Peter Davis

11:15am - Coffee Break

11:30pm- Session III.3

Topic: Global and Local Arrays

Lecturer: Peter Davis

12:45pm - Lunch Break

2pm - Hands on Computer Exercises (Annabel Kelly)

3:30pm- Coffee Break

3:45pm –Session III.4

Topic: Damaging effects of earthquakes

Lecturer: James Mori

4:45pm- Discussions

6pm- Dinner

8pm- MOVIE (NatureTech documentary – tsunamis)

Day 4 - Earthquake Hazard Assessment & Conclusion of Seismology Training, Introduction to Tsunamis

9am- Session IV.1

Topic: Earthquake Hazard Assessment (Hazard maps, Seismic Building Code for Sri Lanka)

Lecturer: J. R. Kayal

10am- Coffee Break

10:15am- Session IV.2

Topic: Challenges in Observational Seismology in the Indian Ocean with special reference to the 2004 Sumatra-Andaman earthquake

Lecturer: J. R. Kayal

11:30am – Session IV.3

Topic: Summary of seismology component of training course

Lecturer: Annabel Kelly

12:15pm- Lunch Break

1:45pm- Session IV.3

Topic: Web Resources for Earthquake Information (Hands-On Computer Lab Exercise)

Lecturer: Annabel Kelly

3pm- Coffee Break

3:15pm- Session IV.4

Topic: Tsunami Generation and Propagation

Lecturer: Peter Davis

4:15pm- Discussions

6pm- Dinner

8pm- Presentation: *Paleotsunamis*, by Starin Fernando (GSMB)

Day 5 - Seismology, Tsunamis and Tsunami Warnings in Sri Lanka, summary, discussion, recommendations, and conclusions

9am - Session V.1

Topic: Earthquake Monitoring Center Operations – HYDRA, Antelope
The Use of Seismology and Sea Level Data for Tsunami Warning

Lecturer: Annabel Kelly, Peter Davis, Laura Kong

9:45am - Session V.2

Topic: Tsunami Warning Center Operations

- a. Objectives and Activities of Warning Centers
- b. Guidance on developing new National Warning Centers
- c. Regional Indian Ocean Interim Tsunami Advisory Information System
- d. Sri Lanka Seismic and Tsunami Monitoring – Present and Future

Lecturer: Laura Kong, GSMB (Sarath Weerawarnakula or representative) and/or National Tsunami Warning Centre (Department of Meteorology G.H.P. Dharmaratna or representative)

11:15am - Coffee Break

11:30am – Session V.3.

Topic: Tsunami Emergency Response after Tsunami Warnings Issued (included hazards, shelters, etc)

- a. Objectives and Activities involved in Emergency Response
- b. Guidance on developing tsunami response
- c. Sri Lanka Tsunami Emergency Response – Present and Future

Lecturer: Laura Kong, Sri Lanka Disaster Management Centre (Major General Gamini Hettiarachchi or representative)

12:45am - Lunch Break

2pm- Session V.4.

Topic: Tsunami Hazard Mitigation - Preparedness, Education, and Outreach (Earthquake Hazard Mitigation building codes and design guidance here)

- a. Preparedness - risk assessment, exercises and drills, structural mitigation
- b. Education and Outreach - reasons for, examples, and how carried out
- c. Sri Lanka Model Village Preparedness Program and other initiatives

Lecturer: Laura Kong, GSMB and/or Department of Meteorology

3:15pm- Coffee Break

3:30pm- Session V.5

Topic: Conclusions, Recommendations, & Discussion

Lecturer: P. Davis, J. R. Kayal, A. Kelly, L. Kong