

MEETINGS

Advancing the Frontiers of Earthquake Science

***Fifth International Workshop on Statistical Seismology,
Erice, Sicily, Italy, 31 May to 6 June 2007***

PAGE 302

Statistical seismology has been emerging as a new discipline at the interface between earthquake physics, earthquake statistics, hazard assessment, and society. A workshop in Italy was sponsored by the Italian Istituto Nazionale di Geofisica e Vulcanologia (INGV), the Swiss Federal Institute of Technology Zurich (ETH), and the Japanese Institute of Statistical Mathematics (ISM), to discuss the state of the art and future directions.

Conference participants discussed how to use available tools and techniques of statistical seismology to advance earthquake science. Building increasingly accurate time-dependent earthquake forecast models at various spatial and temporal scales is widely recognized as an important challenge, and various such models were presented and discussed at the workshop. Exploiting time dependence for hazard assessment requires us to develop a detailed understanding of the behavior of regional fault systems and corresponding earthquake catalogs spanning decades. We can no longer analyze

individual faults or earthquake sequences in isolation.

However, because our understanding of the fundamental physical processes that take place within fault systems and drive the earthquake processes is poor (e.g., what is the appropriate frictional behavior of faults? are the tectonic stresses high or low? how are earthquakes triggered? what is the role of fluids? how do earthquakes start or stop?), physics-based earthquake forecast models are currently generally outperformed by purely data driven, statistical models, and even those models remain rather limited in their predictive power.

Adding time-dependent components to societally useful hazards estimates requires broad acceptance by the wider scientific community. Meeting participants agreed that this acceptance must result from rigorous statistical testing in both an off-line mode and in real-time laboratories, using a controlled testing environment and authorized data streams. To facilitate such testing, the meeting participants discussed how the global community could reach agreements on standards. For instance, there is an urgent need for standardization

of data products such as earthquake catalogs, including in particular microearthquakes, because seismic data collection and processing practices vary within and between countries, leading to inhomogeneous data sets.

Several projects are under way in the United States, New Zealand, Europe, and Japan to facilitate standardization of data products and progress toward implementation of time-dependent hazards estimates. These efforts will enable Earth scientists to provide improved long-term (decades) hazards assessments and more reliable short-term (hours to days) seismicity rate evaluations. Further, new capabilities in real-time seismology, such as early warning within seconds to a few tens of seconds before strong ground shaking arrives, are being tested. Such assessments and warnings are not earthquake prediction but nonetheless a significant step toward protecting today's societies.

A total of 110 seismologists, geologists, and statisticians attended the workshop, held at the Ettore Majorana Foundation and Centre for Scientific Culture, in Erice, Sicily, Italy, from 31 May to 6 June 2007. The meeting was the 28th workshop of the International School of Geophysics. Meeting presentations are at <http://www.ingv.it/primopiano/erice2007/statseiV/indice.html>. The Southern California Earthquake Center will host the sixth workshop, in early 2009.

—EGILL HAUSSON, California Institute of Technology, Pasadena; E-mail: hauksson@gps.caltech.edu; MASSIMO COCCO and RODOLFO CONSOLE, Istituto Nazionale di Geofisica e Vulcanologia, Rome; and STEFAN WIEMER, Swiss Federal Institute of Technology, Zurich, Switzerland.