

IASPEI Commission on Seismological Observation and Interpretation (CoSOI)

Reports from working groups for the period March 2004 to March 2005

Work group on reference events

Members: Eric R. Engdahl, Paul G. Richards
Chairman: Paul G. Richards

Further progress in this WG is through launching the project with an oral presentation at the EGU meeting in Vienna this April (see abstract below) and through invitations to be sent to key people worldwide within the next week to become members of our WG.

Acquisition of reference events to improve earthquake locations and to test 3-D Earth models
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A project to improve the accuracy of earthquake locations in many regions and eventually worldwide has been organized under an IASPEI Working Group on Reference Events. The immediate goal of the Working Group is to develop a set of earthquakes or other seismic sources for which hypocenter information (origin time, depth, latitude, longitude) is accurately known, and whose seismic signals are large enough to be detected at distances out to 1000 km and perhaps teleseismically. We are calling such earthquakes (or other seismic sources) "reference events". Our larger goal is to enable the seismological community to do a better job of locating earthquakes. By building up a large enough set of reference events, we anticipate that empirical information on travel times as a function of distance, phase, and azimuth (and eventually as a function of depth) can be obtained for individual stations detecting the events. From stations calibrated in this way, we anticipate that it will be possible to improve the accuracy of earthquake locations over broad regions for which reference events are available. Moreover, the data derived from these reference events can be used to test 3-D Earth models such as the proposed European Reference Model. Reference events can be found in a number of different ways. We use the notation GT_n for an event whose epicenter is confidently known to within n kilometers. In part this recognizes that depth is often more difficult to estimate, although it can be traded off with the origin time. When we are being careful in our designation of an event as, say GT₅, we mean that this uncertainty describes an area of $\pi * 5 * 5 = 78.5$ sq. km, which has a 95% chance of including the actual hypocenter. A number of successful ways in which reference events have been identified, as well as the types of data and information that we seek to acquire, will be discussed. Because there may not be general agreement on what evidence is needed to attain, say, GT₅ or GT₂ or better quality, we anticipate the need to evaluate contributed GT events, at least in the early process of building up this archive. Possibly, once a number of different guidelines are agreed

upon, it will be enough simply to certify that one or another set of guidelines has been followed or, to demonstrate that other evidence has been used. We anticipate that during an initial period of about two years, we shall be able to build a significant dataset of reference events using previous lists of such events that have been developed as a result of research projects already accomplished. At the same time, and continuing for a longer period, we shall want to build sets of reference events that fill in gaps in our knowledge.

Work group on Magnitudes

Members:

Peter Bormann, Jim Dewey, Peter Firbas, Soren Gregersen, Alexander Gusev, Jens Havskov (ex officio member), Won-Young Kim, Klaus Klinge, Howard Patton, Bruce Presgrave, Liu Ruifeng, Bob Uhrhammer, Karl Veith.

Chairman: Jim Dewey

A. Overall purposes of magnitude WG

The purpose of our WG is to identify standards for making measurements from digital data to be used in calculating earthquake magnitudes. We are proposing standards for M_L , M_S , m_b , m_B , M_W and $m_b(L_g)$. For M_S , we identify standards for measuring $M_S(20)$, from surface-waves having periods within a few seconds of $20s$, and for measuring $M_S(BB)$, from surface-waves having periods in the range $3s < T < 60s$. We have sought to identify standard procedures that will: (1) maximize the extent to which existing magnitude data can be judged equivalent to data produced by the standard procedures, (2) produce magnitudes that are unbiased with respect to magnitudes of the same type that are measured from traditional analog seismograms, and (3) allow seismologists to take advantage of digital data to more efficiently or precisely measure magnitudes. Objectives 1 – 3 are to some extent mutually exclusive; they are listed above in our order of priority.

Adoption of standard procedures will reduce a serious source of noise in magnitude measurements and add greatly to the value of bulletin-reported amplitude measurements for studies of earthquake source parameters and the attenuation structure of the earth. Inevitably, some individual centers will continue to use non-standard procedures that are better suited to the centers' primary missions. The existence of standard procedures will nonetheless provide a basis for understanding biases in magnitudes that must be computed by non-standard procedures and provide an impetus for better documentation of magnitude procedures in general.

B. Goals completed or partially completed

1. We have reached WG consensus on broad characteristics of standard procedures for each magnitude, and we have presented the WG consensus to the seismological community at the Sapporo IUGG.
2. We have tested m_B and $M_S(BB)$ $(A/T)_{max}$ values measured directly from velocity-proportional broadband seismograms against $(A/T)_{max}$ measured from classical KIRNOS(SKD) displacement-proportional seismograms. The agreement is satisfactory. In view of the greater ease with which $(A/T)_{max}$ can be measured from velocity proportional seismograms, we will recommend that procedure as standard.
3. We are nearing completion of a paper that provides an overview of specific formulas, instrument responses, measurement time- and period- windows, etc., for the standard procedures.

C. Goal for October 2005

Submit final written report to the CoSOI in September 2005 and deliver an oral report at the Santiago IASPEI meeting in October 2005. Submit recommendations to CoSOI for procedures to be adopted as IASPEI standards.

Work group on seismological archives

Membership: RMW Musson, Johannes Schweitzer, Josep Batllo

Chairman: RMW Musson

The Working Group has continued to update the project files with information on the survival and whereabouts of seismograms and bulletins prior to 1920. A presentation was given of some of the results so far at the XXIX General Assembly of the European Seismological Commission in September 2004. This was also the occasion for a meeting of the members of the Working Group to discuss the way ahead. As regards European archives, it was agreed in Potsdam that the Working Group would collaborate with INGV, Rome, who have already amassed a great deal of information on this subject.

Subsequent to the Potsdam meeting, a campaign was initiated to attempt to make contact with relevant institutes in all countries outside Europe that had active seismological stations before 1920. To date the results have been rather disappointing. In some cases it seems clear that there is no responsible person for managing seismological records, and that no-one knows anything about the records, and it must be presumed that they have long since been lost, although there is no specific knowledge of their destruction. In other cases there has simply been no reply to enquiries.

The Working Group is now affiliated to the Seismological Society of America's Committee on Archives, which has now established an email forum for discussing matters relating to seismological archives. It is clear from discussion in this forum that the problems of maintaining archives are certainly not confined to what are clearly, from today's perspective, old historical archives: paper records from the 1960s and 1970s are also under threat. At some date in the future material from this period will be viewed as just as historical as material from the earliest period of seismology.

A new WG has been proposed and has started working. It will have to be formally accepted at the meeting in Chile.

Work group for Seismic Stations Code Names

The working group is composed of the following people:

Avi Shapira - ISC (Chairman)
Bruce Presgrave - USGS/NEIC
Ghassem Heiderinejad - BHRC, Iran
Jim Lyons - GSC, Canada
Remy Bossu - EMSC
Tim Ahern - IRIS
Bernard Dost - ORFEUS
Vladimir Mishatkin - Russian Academy of Science
Hidemi Ito - JMA, Japan
Sergio Barrientos - CTBTO/IMS

The WG has a web page at www.isc.ac.uk/stationcode/