IRIS DATA ALLOWED RAPID PUBLIC INFORMATION ABOUT SUMATRA EARTHQUAKE AND TSUNAMI

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The devastation caused by the December 26, 2004 Sumatra earthquake and resultant tsunami caused worldwide public interest and hence provided a “teachable moment” to inform the public about a variety of scientific and hazard issues. However, until recently such opportunities after major earthquakes were limited because the time required to acquire and analyze seismic data was longer than the period of intense public interest. As a result, although earthquake locations, magnitudes, and mechanisms are available during this “news window”, the most interesting scientific information about the underlying tectonics and physics of major earthquakes often emerges after public interest waned. As a result, the public often gets little feel for how earthquake studies are addressing exciting and unresolved science questions which have great societal import.

The availability of IRIS GSN data within days of the earthquake made it possible for exciting science to be reported by investigators worldwide. For example, within six weeks (February 7) of the earthquake we reported publicly on analysis of ultra-long period normal mode data showing that the earthquake was even bigger than first appeared. These results were disseminated on the WWW and reported worldwide and drew great interest. Thus we were able to explain through the media a number of surprisingly sophisticated concepts. We explained the often-confusing concepts of different magnitude scales yielding different results at different periods. We further explained that these results indicated that slip occurred along the entire rupture zone suggested by aftershocks, a much larger area than previously inferred. We were then able to explain that these seemingly-arcane seismological issues had important implications. First, the long rupture played a key role in generating the devastating tsunami. In particular, as shown below, the large tsunami amplitudes in Sri Lanka and India result from rupture on the northern, north-trending, segment because tsunami amplitudes are largest perpendicular to the fault. Second, because the entire rupture zone slipped, strain accumulated from subduction of the Indian plate beneath the Burma microplate has been released, leaving no immediate danger of a large tsunami being generated by slip on this segment of the plate boundary. However, we explained that the danger of a large tsunami resulting from a great earthquake on segments to the south remained. When such an earthquake occurred in March, in the week our paper was published, the media again responded with interest. We used this opportunity to explain both the concept that the first earthquake may have loaded the segment to the south, and that the March earthquake, though large enough to generate a major tsunami, did not due so because the rupture did not extend up dip to the sea floor. Throughout this processes we were gratified by the often-sophisticated questions we were able to explore with the media.