Wavelet Analysis of the Seismograms of the 2004 Sumatra-Andaman Earthquake and its Application to Tsunami Early Warning

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ABSTRACT

We applied the wavelet transform in an attempt to detect long-period components early in a seismogram. We analyzed the displacement seismograms of the December 26, 2004, Sumatra-Andaman earthquake (M_w=9.2) and the March 28, 2005, Nias earthquake (M_w=8.7). Wavelet analysis is able to clearly distinguish the amplitudes of the long-period W-phase between the seismograms of the two earthquakes before the S-wave reaches the station. This facility has potential application to rapidly identifying truly great earthquakes with high tsunami potential.

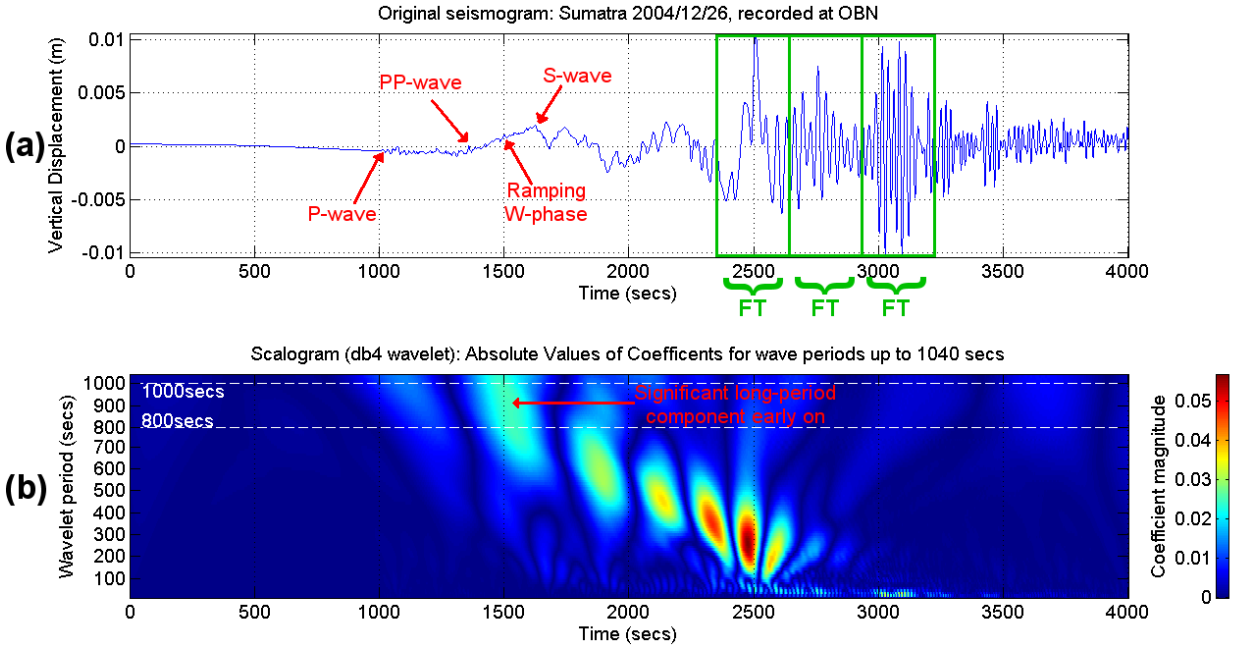

Figure (a). Displacement seismogram of the 2004 Sumatra-Andaman earthquake recorded at OBN. **Figure (b).** Scalogram of (a). A diagram which displays the wavelet scale as a function of time is called a "scalogram". Figure (b) show the scalogram for the 2004 event. Color intensity at any point in the picture corresponds to the coefficient magnitude of a wavelet with a particular period at a particular point of the time series. The y-axis has been translated from wavelet scale into corresponding wavelet time period. The long-period component arrived at about 1500 seconds. The wavelet transform can simultaneously achieve: (1) Accurate frequency representation for low frequencies, and (2) Good time resolution for high frequencies.