Determination of moment maginutde from broadband P and pP phases

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Tsuboi et al[1995] proposed using the P-wave portion of broadband seismograms and derived the "broadband P-wave moment magnitude", Mwp. However, it is expected that in some cases later phases, such as pP and sP, give larger amplitude with opposite polarity than the direct P phase and Mwp underestimates the earthquake size. In this paper, we compute Mwp including a minor modification so that we can include the contribution from at least the pP phase. We compute Mwp for both local and global earthquakes using data from broadband seismometers available to the West Coast & Alaska Tsunami Warning Center (WC&ATWC) to determine if Mwp is accurate.

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Tsuboi et al[1995] proposed using the P-wave portion of broadband seismograms and derived the "broadband P-wave moment magnitude", Mwp. They showed that the magnitude scale, Mwp, agrees quite well with the moment magnitude calculated from the seismic moment listed in the Harvard CMT catalog for shallow earthquakes near the Japanese Islands. However, it is expected that in some cases later phases, such as pP and sP, give larger amplitude with opposite polarity than the direct P phase and Mwp underestimates the earthquake size. In this paper, we compute Mwp including a minor modification so that we can include the contribution from at least the pP phase. We compute Mwp for both local and global earthquakes using data from broadband seismometers available to the West Coast & Alaska Tsunami Warning Center (WC&ATWC) to determine if Mwp is accurate. So far we have computed Mwp for 178 earthquakes. We use the moment magnitude determined by Harvard CMT solutions as a reference and compare the moment magnitude estimated by our method. The agreement of both magnitudes suggests the Mwp can be used as a rapid indicator of earthquake size for regional and teleseismic events at any depth.