Deep S-wave velocity profiles of the San Francisco Bay Area obtained by passive surface wave method

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Three-dimensional deep S-wave velocity structure (to a depth of several km) has a large effect on middle to long period (0.5 to 5 s) ground motion in tectonic basins, such as the San Francisco Bay Area. Most studies on basin velocity structure rely on geological information, surface and borehole geophysical data and observed earthquake records. In general, geophysical data and seismic stations are sparsely distributed and much of the well data is too shallow to characterize deep S-wave velocity structure. To establish more accurate basin velocity structure, there is a need for more densely distributed deep S-wave velocity data. The use of active and passive surface wave methods has increased significantly during the past 15 years. The passive surface wave method or microtremor array measurements, in which ambient noise is used as surface waves, is particularly effective for estimation of deep S-wave velocity structure because the method does not require an artificial source and the depth of investigation can easily be extended by increasing the size of the array. Large scale microtremor array measurements have been widely used during the past 15 years in Japan for estimating S-wave velocity structure to a depth of several km. We measured S-wave velocity profiles more than 25 sites in the San Francisco Bay Area using active and passive surface wave methods. The presentation summarizes the results of our measurements and discusses 2D and 3D deep basin velocity structure from an earthquake engineering point of view.