10. Santa Clara Valley Basin Structure

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10.1 Research

The importance of basins in generation of significant strong ground motion has recently become increasingly apparent. The presence of alluvial velocities and basin structures may soon be considered among the most important factors in prediction of damage in future earthquakes, and with this in mind, Santa Clara Valley has become an area of heightened study, with its deep alluvial basin underlying the most heavily populated area of the San Francisco Bay region. Our 3D velocity model of the San Francisco Bay region includes Santa Clara Valley basin structure with alluvial velocities, and use of this model with a 3D finite-difference code developed by Shawn Larsen (Larsen and Schultz, 1995) allows simulation of local events that can be used to test the validity of the model's structure. For more information about the 3D velocity model, use of the 3D finite-difference code and simulations of the 1989 Loma Prieta earthquake, see Stidham et al., 1999.

The Santa Clara Valley Seismic Experiment (SCVSE; USGS/UCB/PASSCAL, 6/98 - 12/98) recorded several small to moderate earthquakes in the south San Francisco Bay region, including the 8/12/98 San Juan Bautista (SJB) event, M5.3. Station and event distribution is shown in Figure 10.20. The density of short-period deployed in the SCVSE allows close examination of the effects of the structure of the Santa Clara Valley basin and the major faults adjacent to the basin on the relative amplitudes of ground motions across the array and on wave propagation throughout the basin. Comparisons of synthetic ground motion amplitudes and waveforms with those recorded by the SCVSE can help us to constrain several important features of the alluvial basin underlying Santa Clara Valley, such as its depth, geometry and the seismic velocities of the alluvial material. In work so far, we have found that the initial structure used for the Santa Clara Valley basin does quite a good job of reproducing the data in simulations of SJB, especially when compared to results using a 1D velocity model (Figure 11.6). These results will aid in prediction of the areas of greatest damage from future large earthquakes in the San Francisco Bay region.

10.2 References

Larsen, S. and C. A. Schultz, "ELAS3D: 2D/3D elastic finite-difference wave propagation code.", Technical Report No. UCRL-MA-121792, 19 pp., 1995.

Stidham, C., M. Antolik, D. Dreger, S. Larsen and B. Romanowicz, "Three-Dimensional Structure Influences on the Strong Motion Wavefield of the 1989 Loma Prieta Earthquake.", *Bull. Seism. Soc. Am., 89,* 1184, 1999.

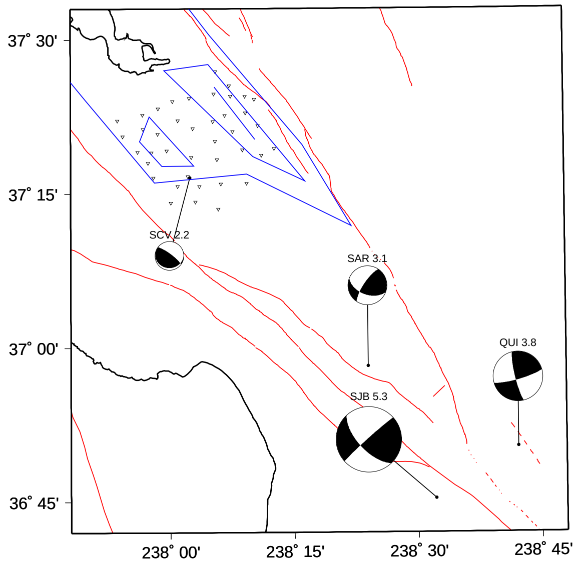

Figure 10.20: Locations of SCVSE seismometers and location and mechanisms for some of the recorded events. The lines show 0 km, 1 km and 2 km depth contours of alluvium under SCV basin.

10.3 Acknowledgments

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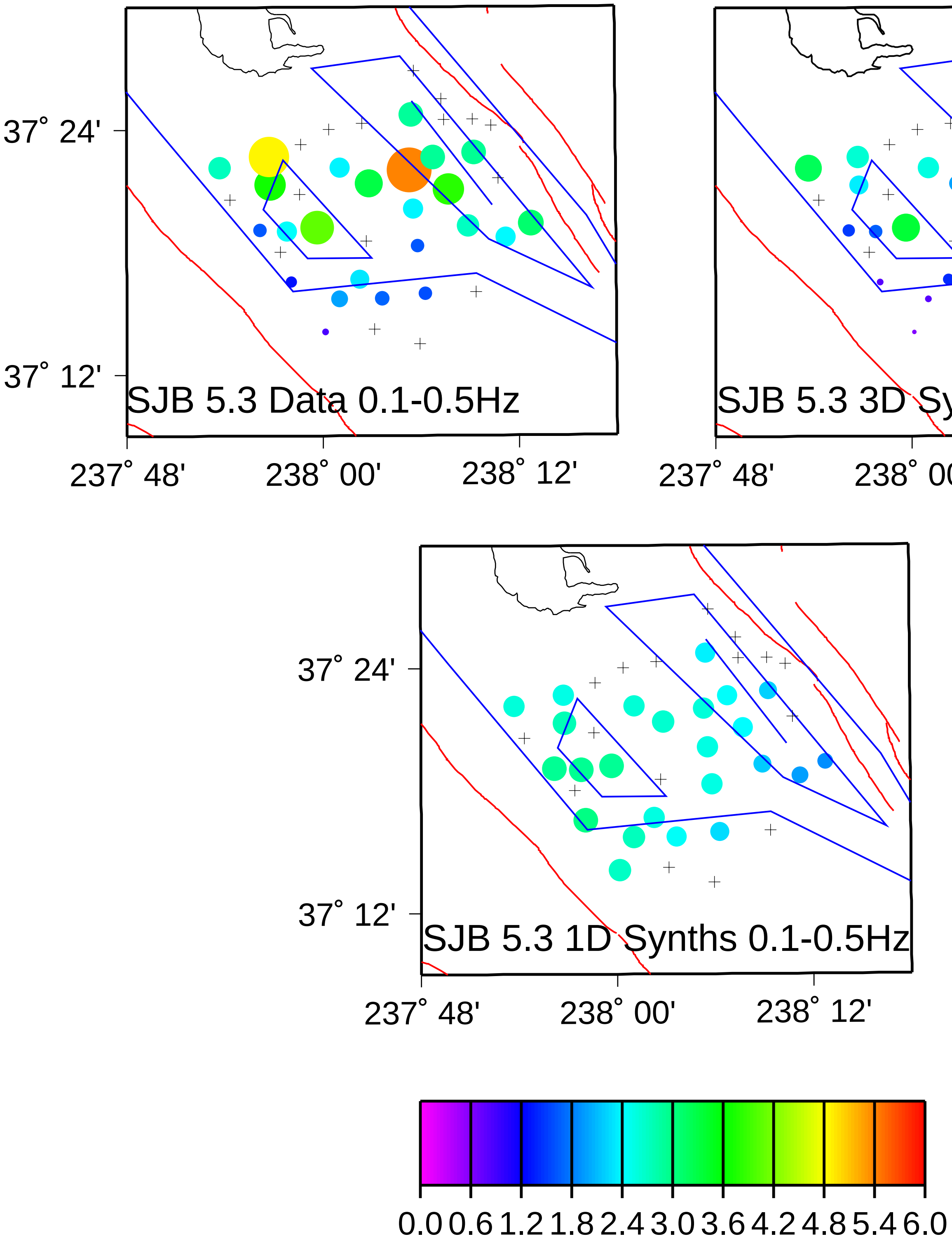

Figure 10.21: Recorded and synthetic maximum horizontal ground velocities at the locations of the SCVSE seismometers for the 8/12/98 San Juan Bautista earthquake, in mm/s.