Appendix A - Figures

Figure 1.Map showing major faults of the southern California region. Northwest-trending faults are right-slip in character. The "big bend" of the San Andreas fault curves from the Salton Trough to the Great Valley. Major offshore faults include the Newport-Inglewood-Rose Canyon (NIRC), Palos Verdes - Coronado Bank (PVCB), San Diego Trough, and San Clemente. (Shaded relief base map from NOAA State DEM).

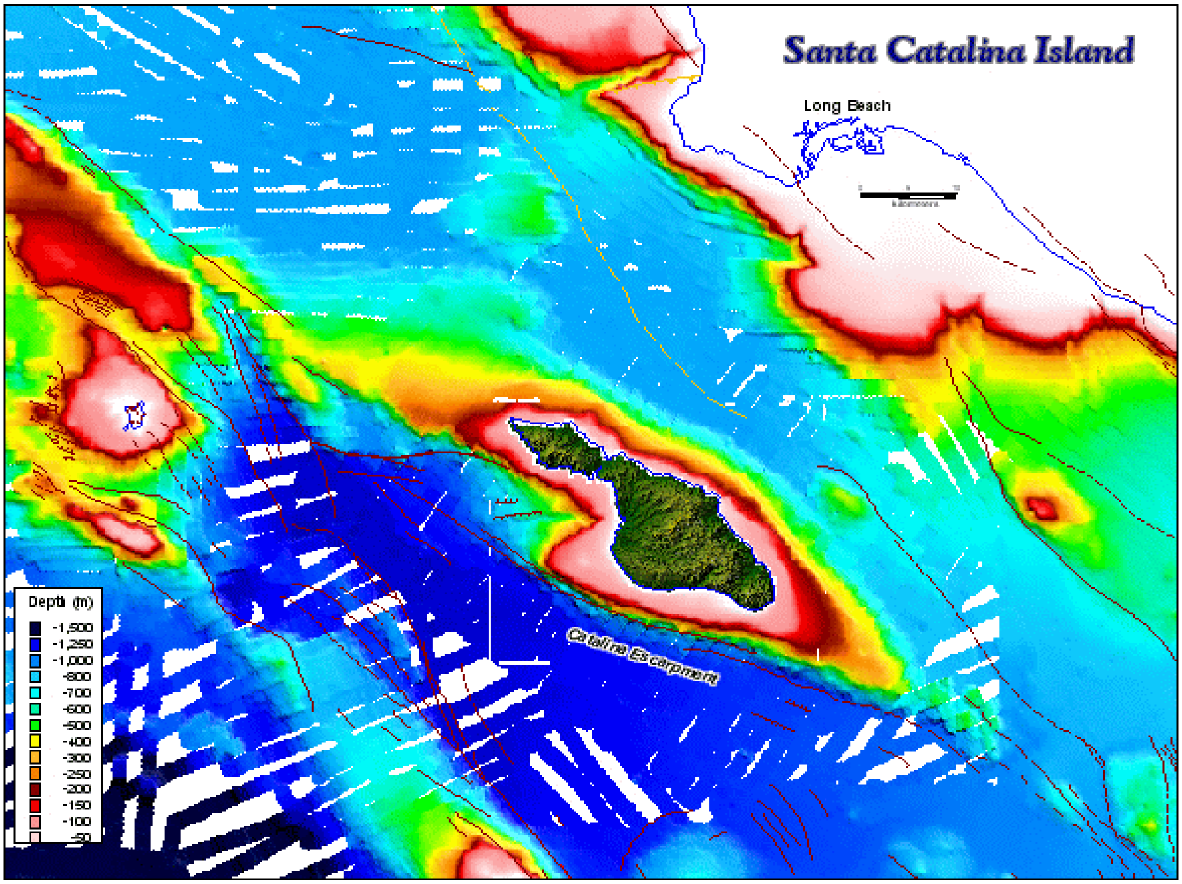


Figure 2. Map showing bathymetry and faulting in the vicinity of Santa Catalina Island. The uplift of the island and surrounding seafloor results from the restraining bend (left bend) along the right-lateral San Diego Trough, Catalina Escarpment, and Santa Cruz - Catalina Ridge fault zone. Shaded relief for island is from USGS DEM; bathymetry from NOAA hydrographic data (1999).

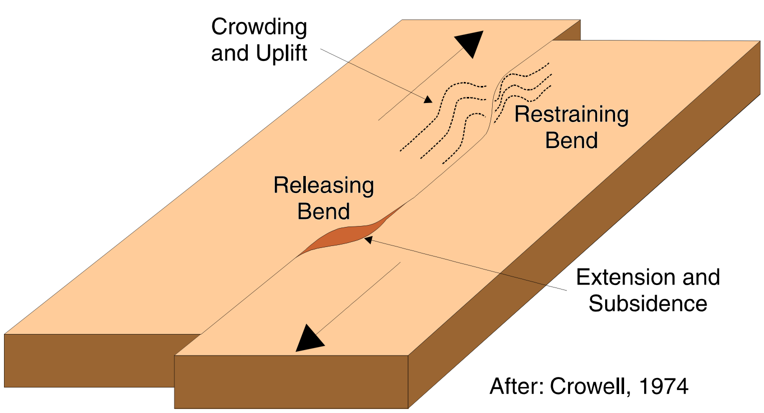
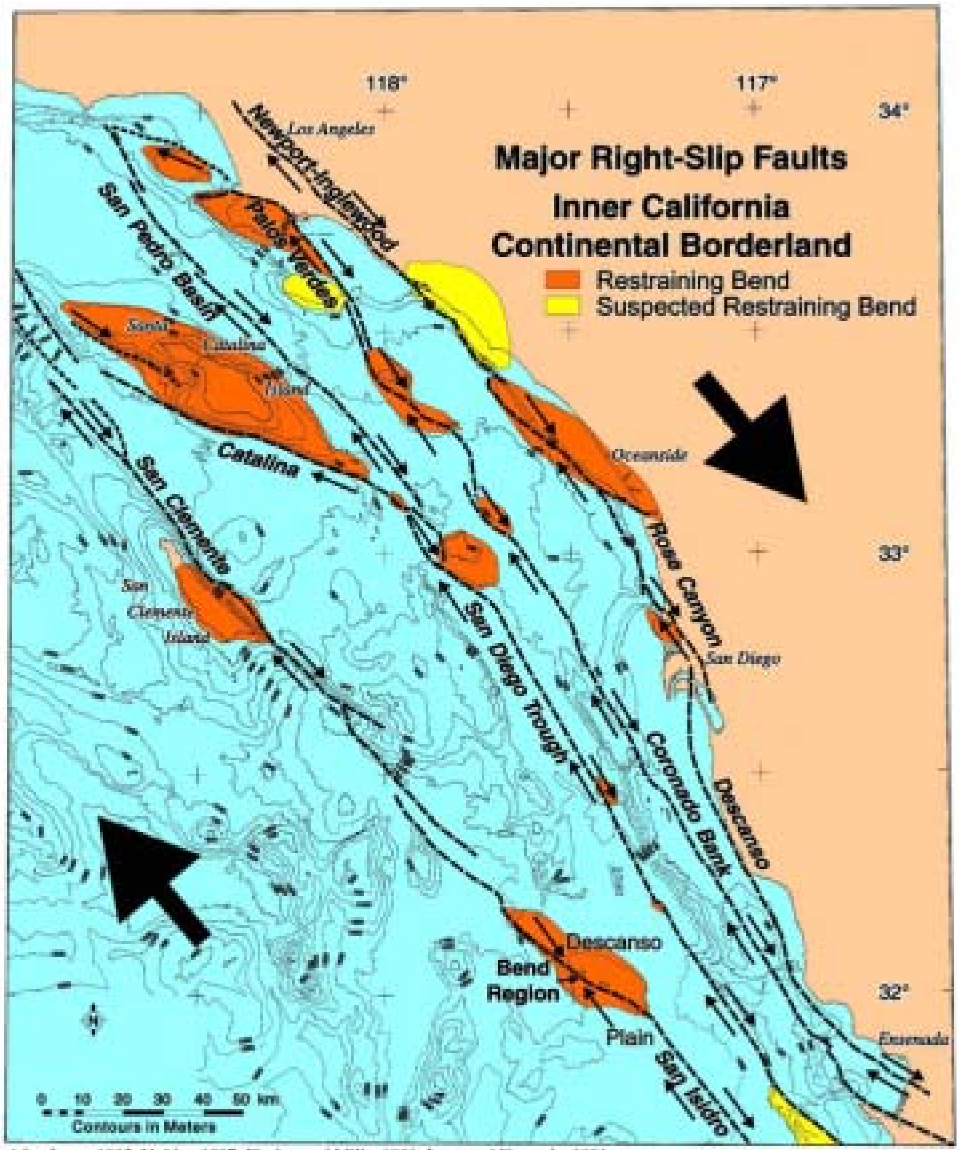


Figure 3. Material crowded into a restraining bend along a strike-slip fault results in convergence, folding and reverse faulting that creates a local uplift. In contrast, extension and subsidence occurs at a releasing bend.



After Legg, 1985; Vedder, 1987; Fischer and Mills, 1991; Legg and Kennedy, 1991

Figure 4. Active strike-slip faults of the Inner California Continental Borderland have sinuous traces with many restraining and releasing bends. The major restraining bend along the San Diego Trough fault system represented by the Santa Catalina Island uplift is the focus of this study.

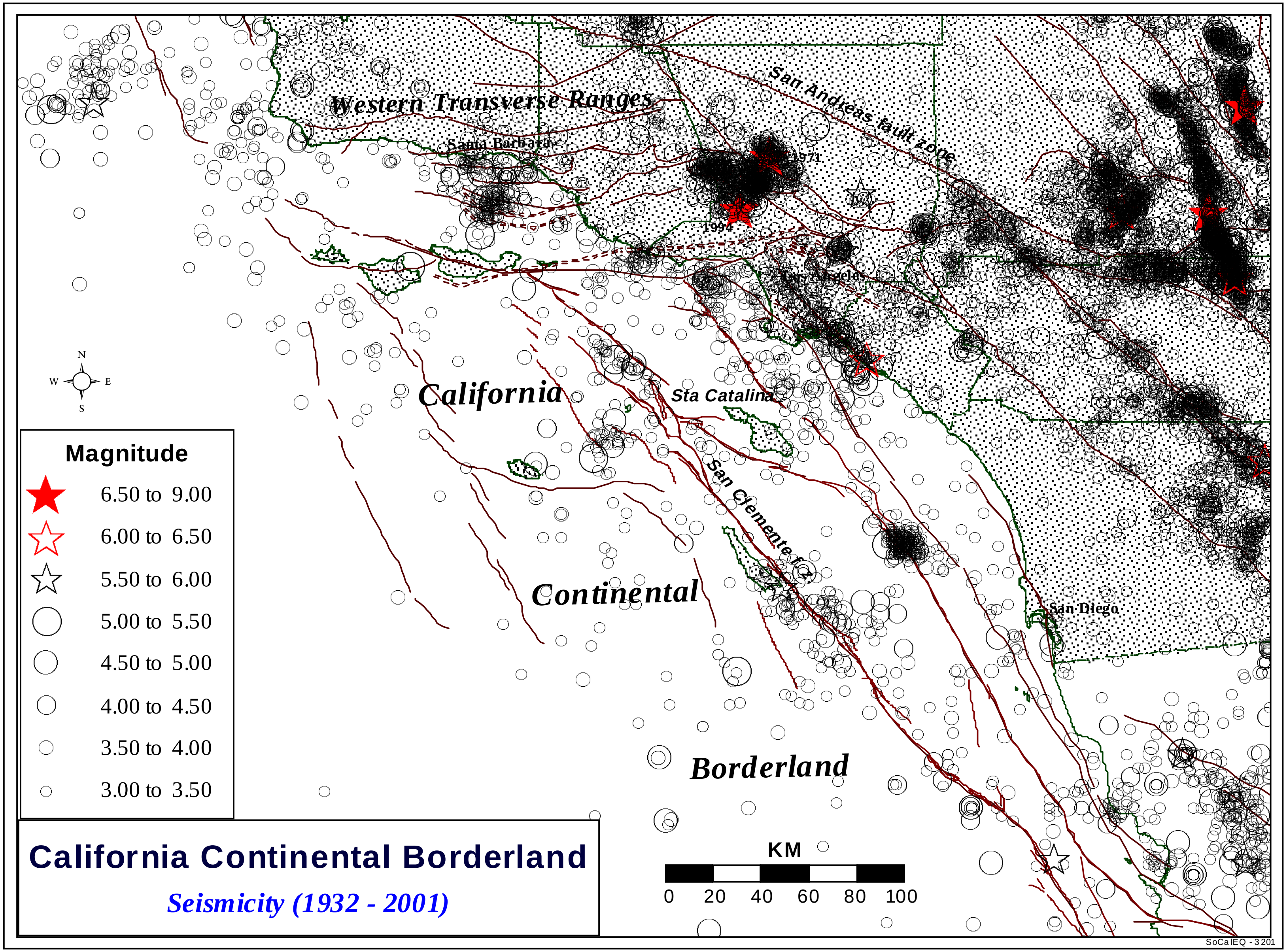


Figure 5. Map showing seismicity of coastal and offshore southern California (data from the Southern California Seismograph Network).

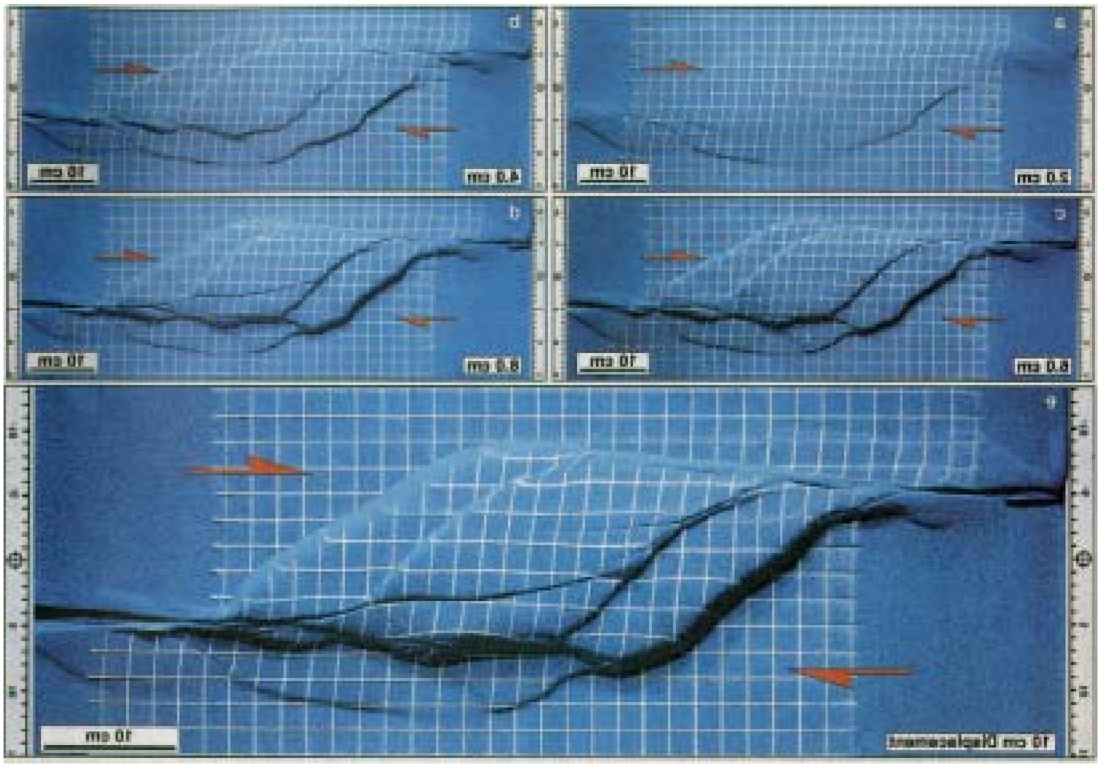


Figure 6a. Analog Model of Restraining Bend Pop-Up Structure
Flipped for right slip (after McClay and Bonora,2001)

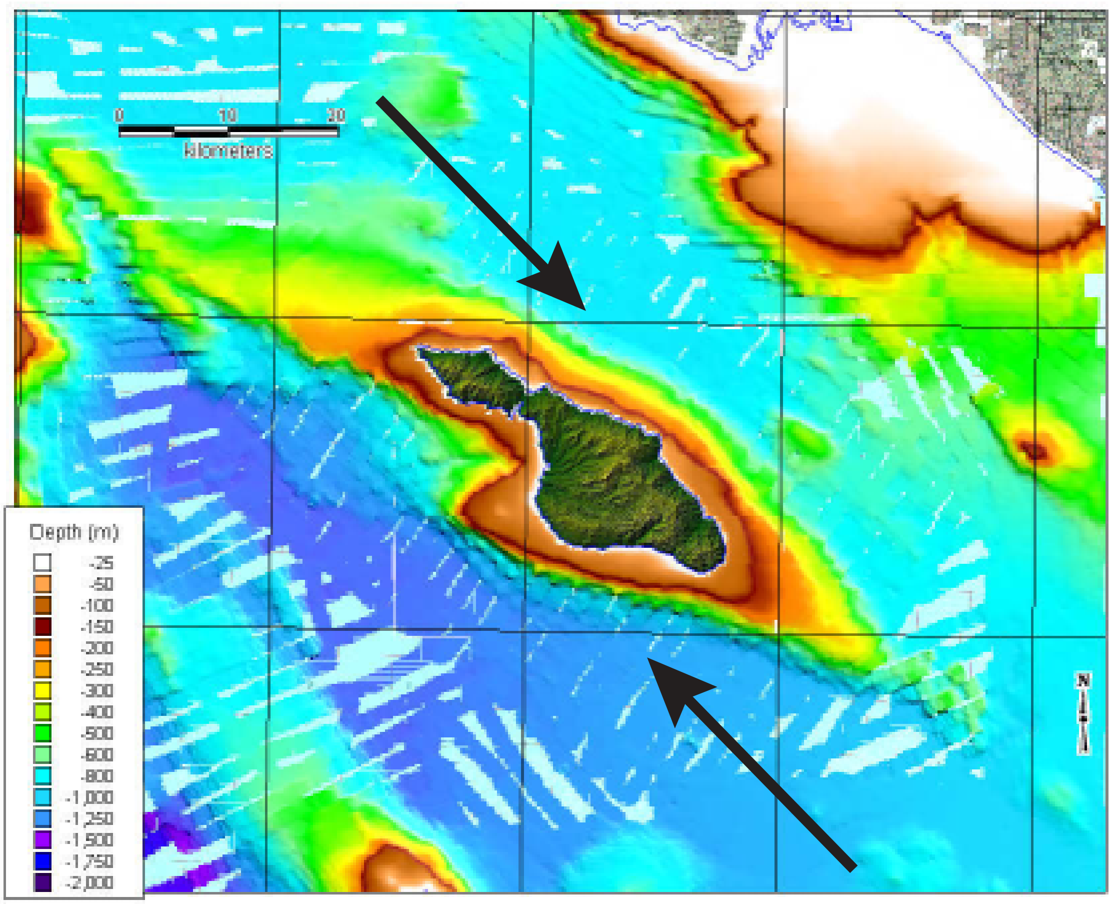
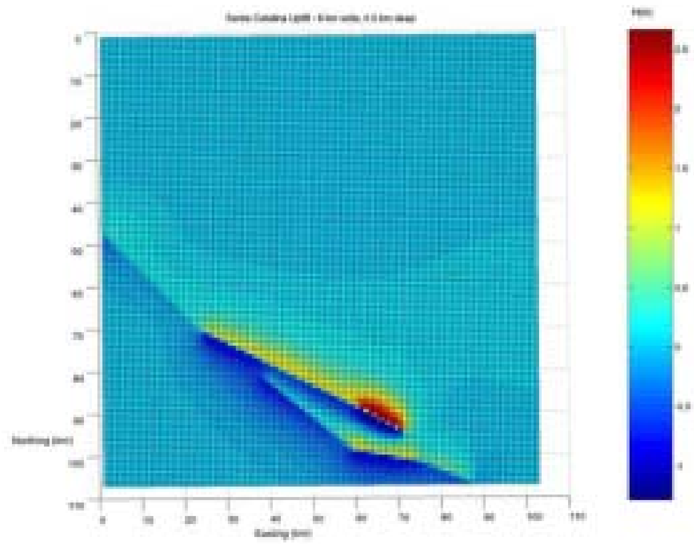
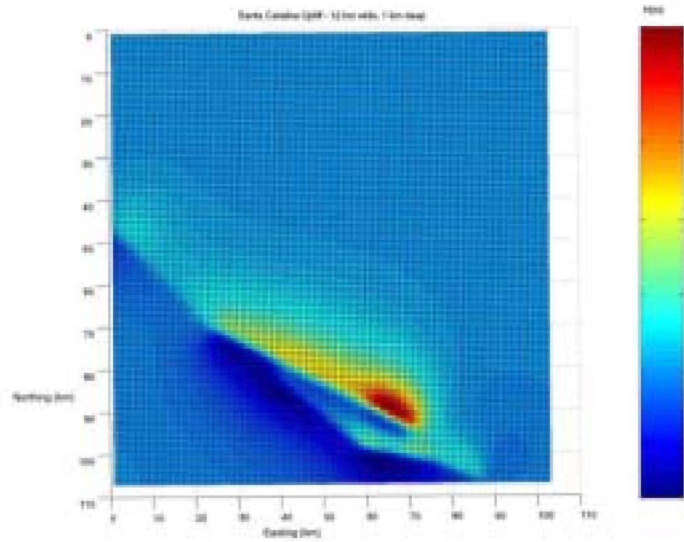


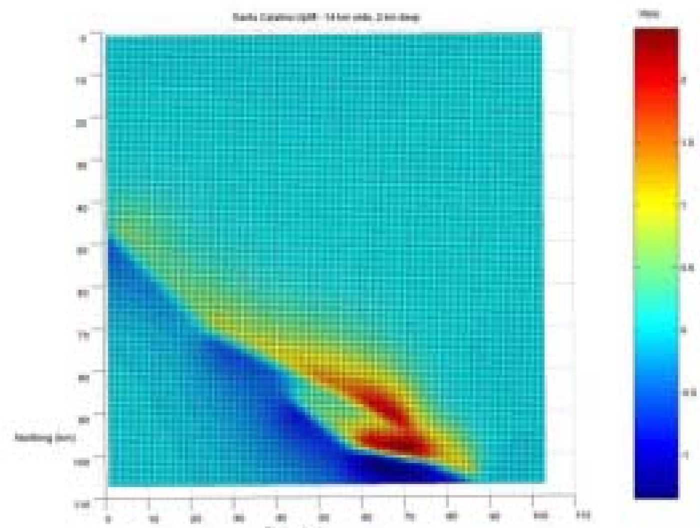
Figure 6b. Shaded Relief Map for the Santa Catalina Island Restraining Bend Pop-Up.
Note the Rhomboid Shape. Arrows show inferred direction of right-slip.



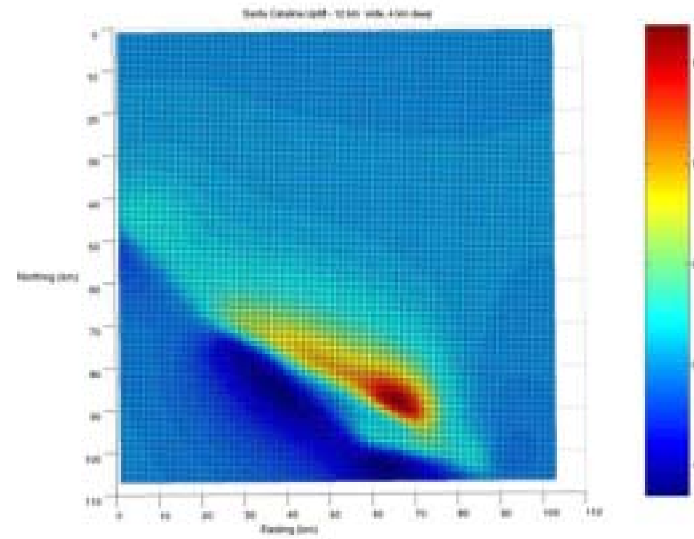
a) Narrow fault (8 km) and shallow depth (0.5 km) produces narrow seafloor uplift and initial wave.



b) Wide fault (12 km) but shallow depth (1 km) produces better fit to island, but still too narrow.



c) Wide fault (14 km) and moderate to shallow depth (2 km) produces uplift that matches island.



d) Wide fault (12 km) but greater depth (4 km) produces uplift that is too broad.

Figure 7. Elastic dislocation models of the surface uplift predicted using seven planar, rectangular, segments along the Catalina fault showing the variation with regard to fault width and subsurface depth.

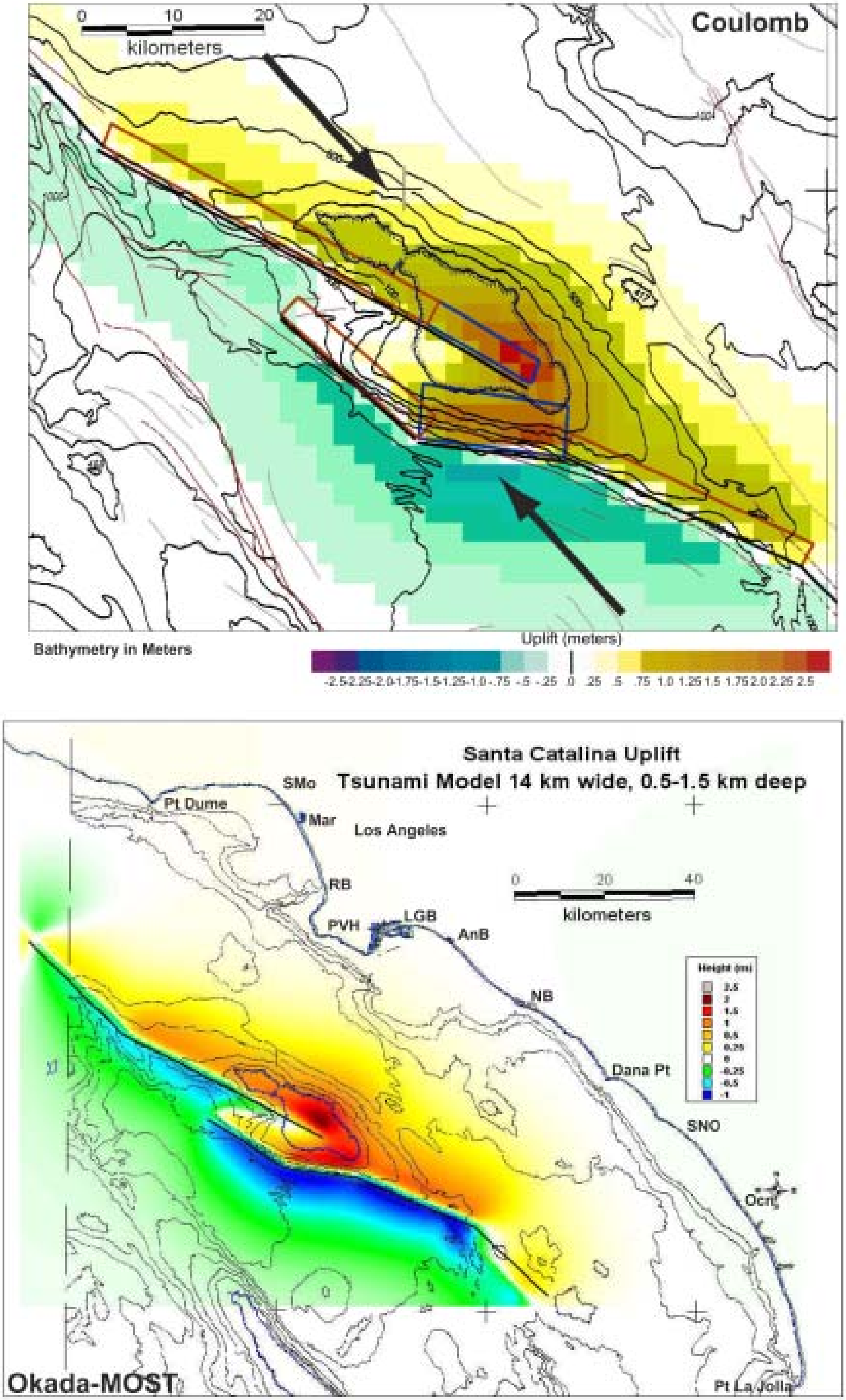


Figure 8. Map comparing uplift produced by elastic dislocation model with 7 segment Catalina fault using the Coulomb program (top) and the initial sea surface uplift condition using the Okada dislocation model for the MOST program (Bottom). Final fault parameters are shown in Table 2. Uplift matches bathymetry contours.

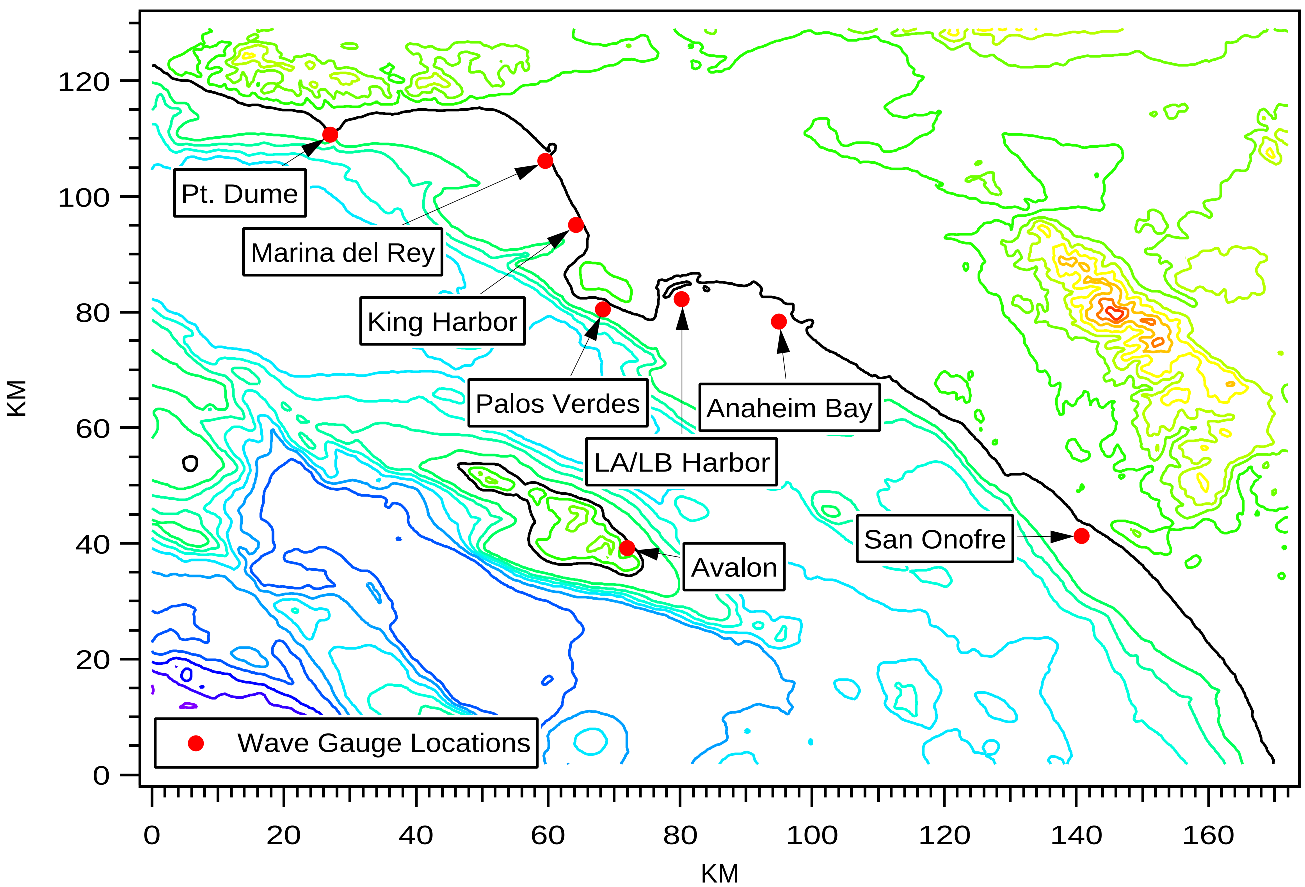


Figure 9. Map showing the extent of the bathymetry/topography grid where the MOST tsunami propagation calculations were performed. Wave gauge locations are plotted and wave gauge parameters are listed in Table 3.

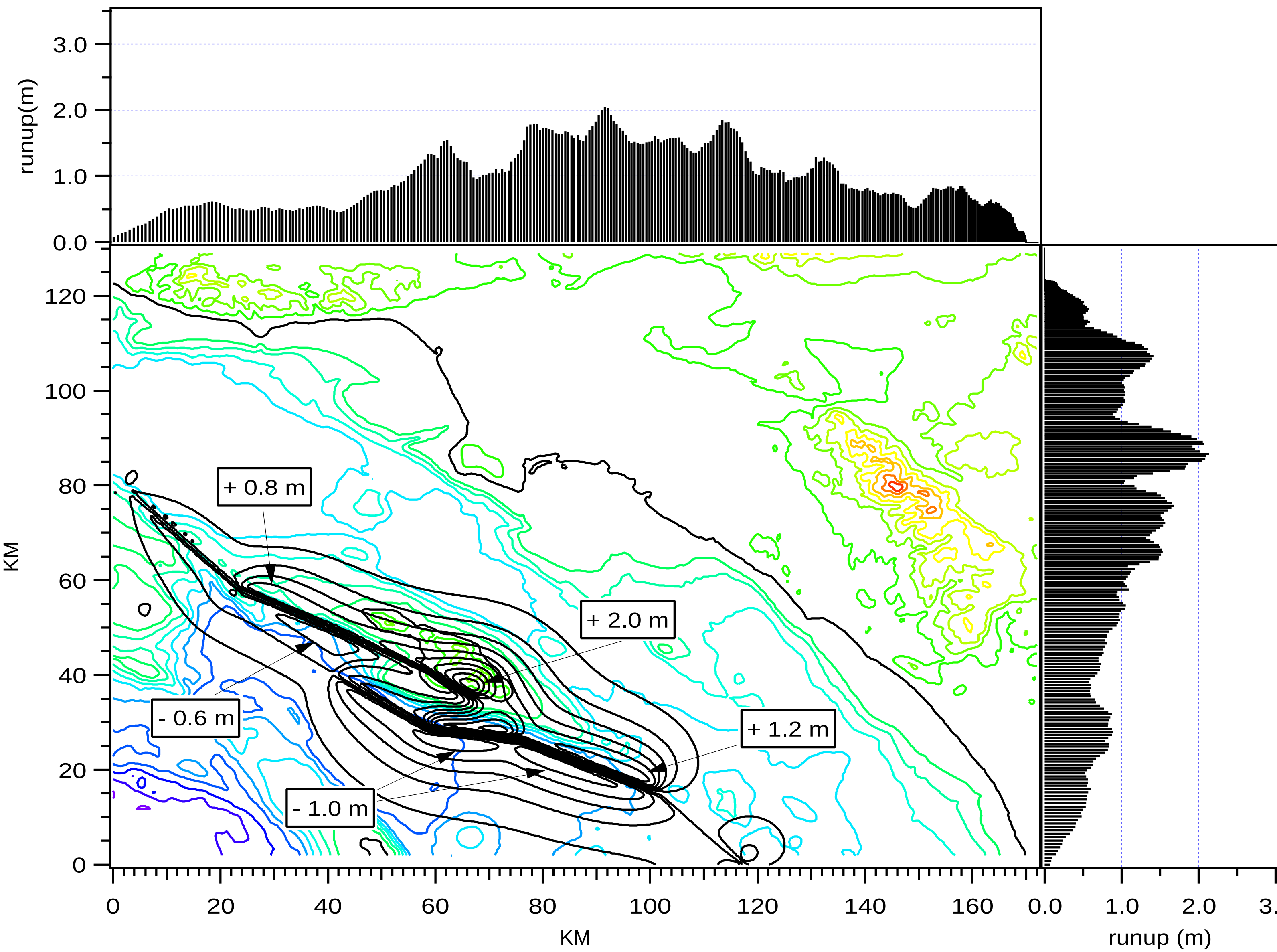


Figure 10. Map showing initial wave height for the full seven segment Catalina fault model with graphs of run-up along the south-facing and west-facing shorelines.

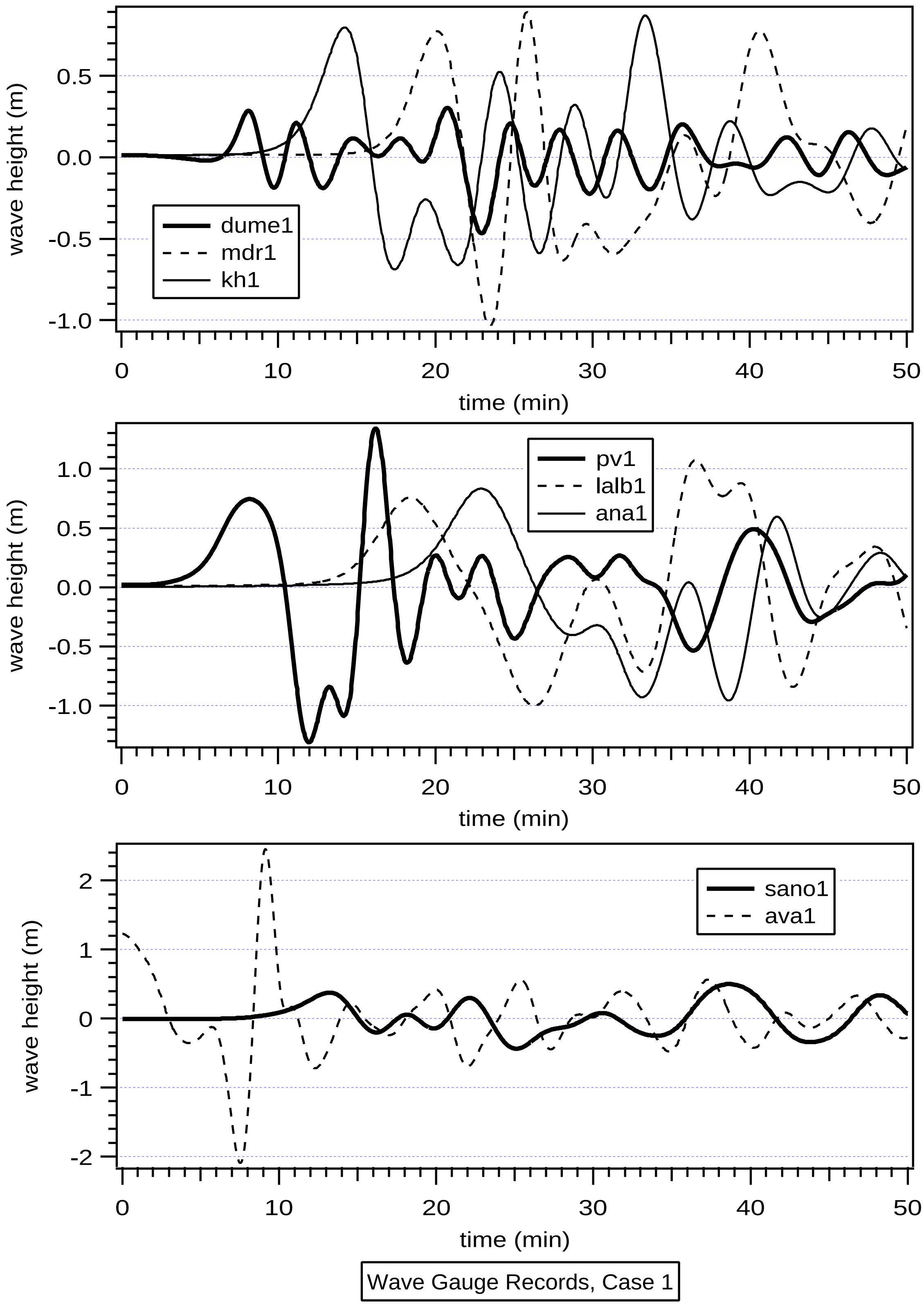


Figure 11. Wave gauge records for the full 7-segment Catalina fault (M=7.7) earthquake (Case 1).

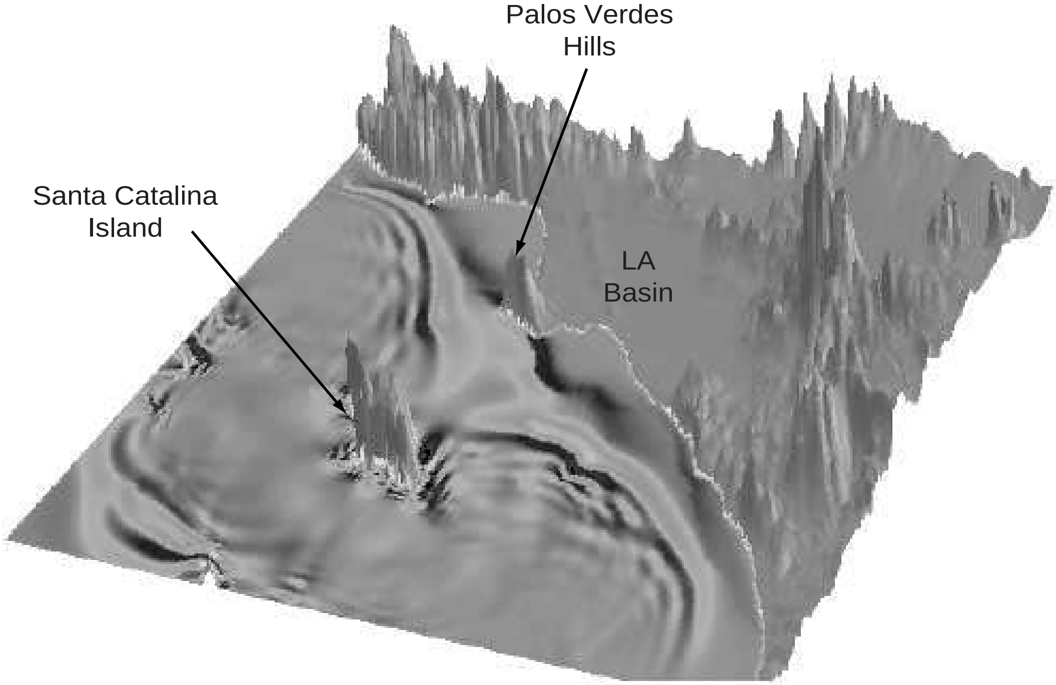


Figure 12. Time step in the MOST tsunami propagation simulation showing the two principal wave fronts generated from the northwest end and southeast end of the submerged Santa Catalina Island platform. Topography has large vertical exaggeration.

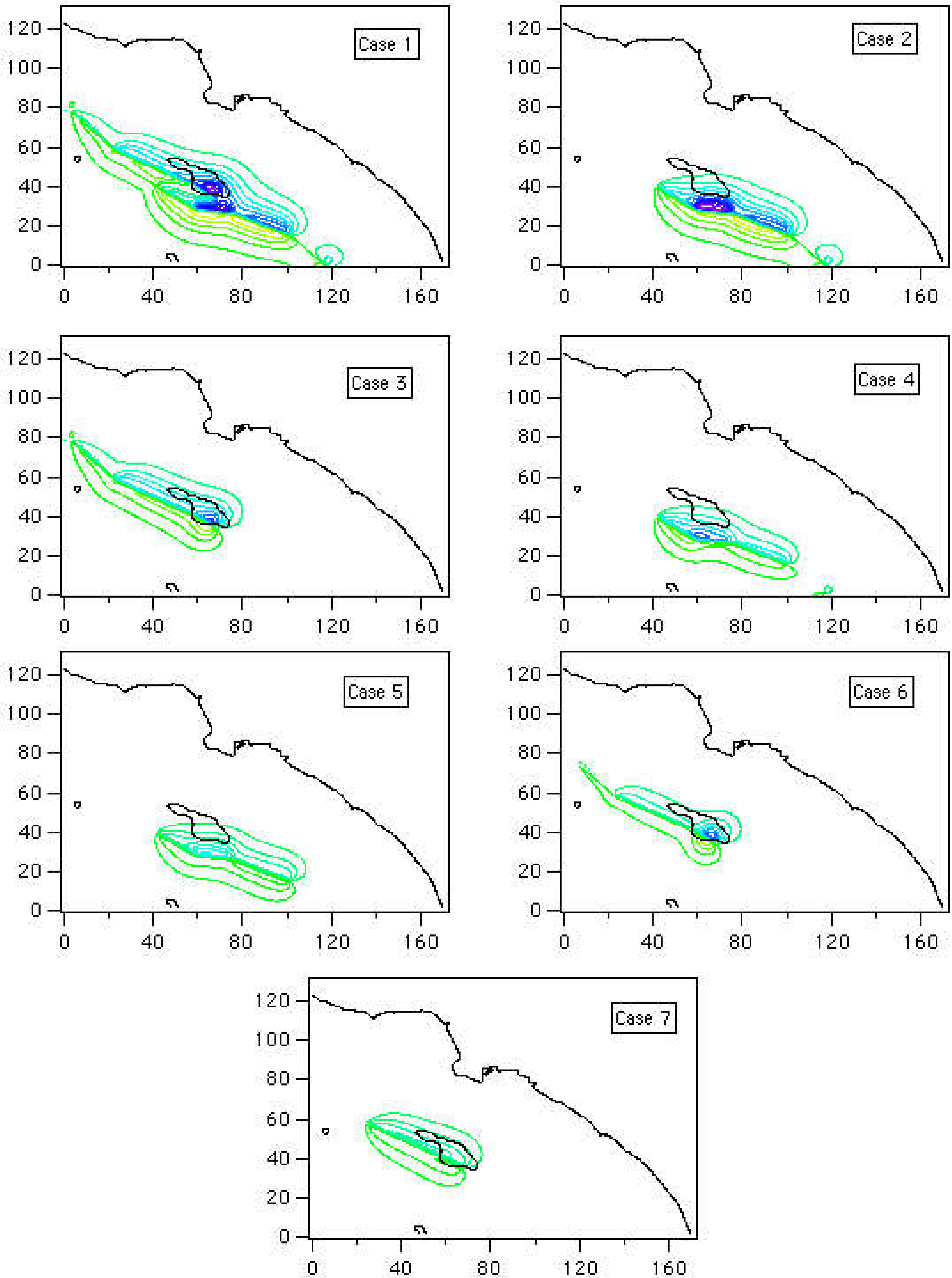


Figure 13. Maps of the initial wave height conditions for the seven Catalina fault tsunami scenarios (Table 4).

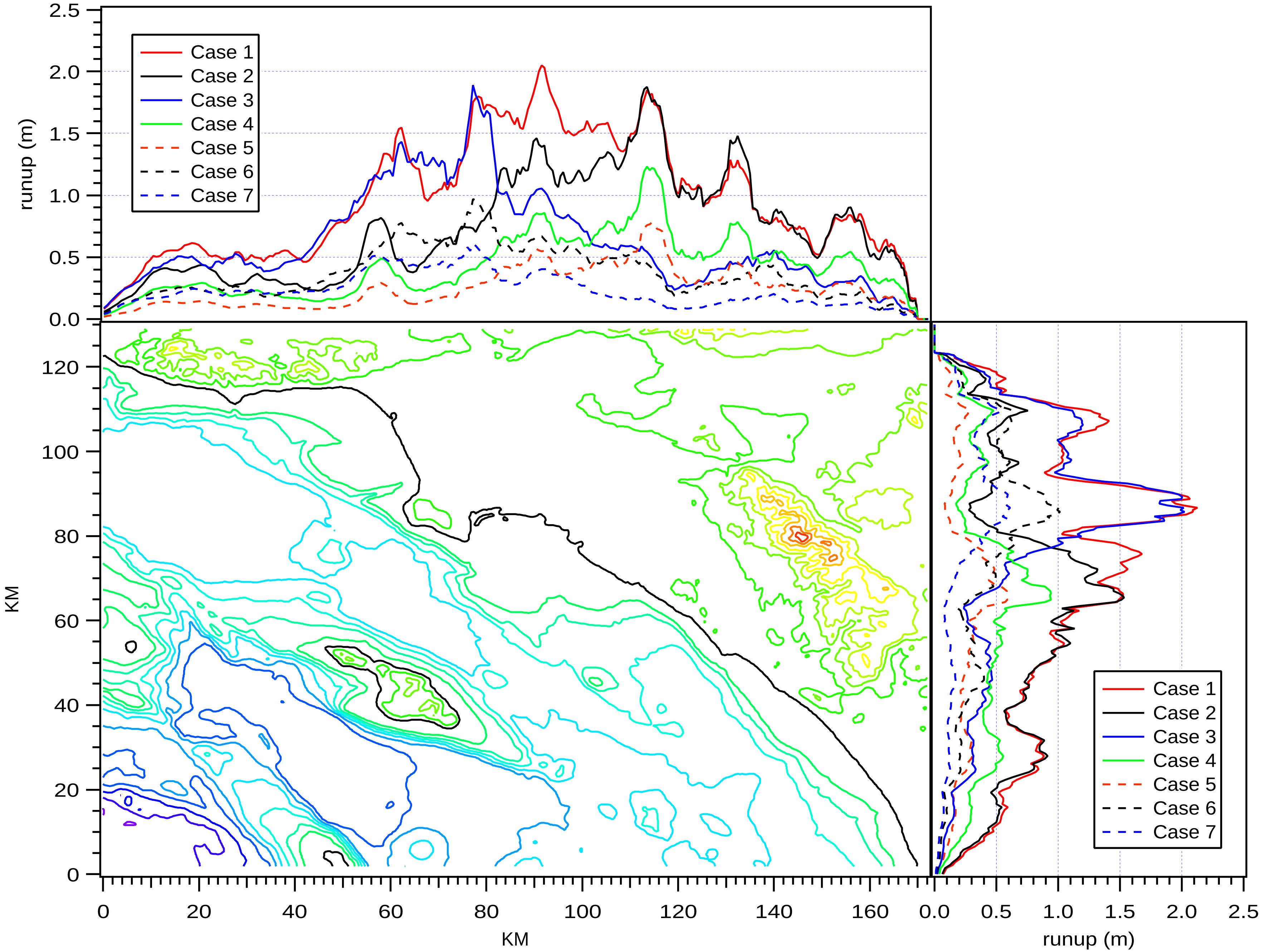


Figure 14. Map showing maximum run-up for each of the seven Catalina fault tsunamigenic earthquake scenarios modeled in this study (see Table 4 for fault parameters).

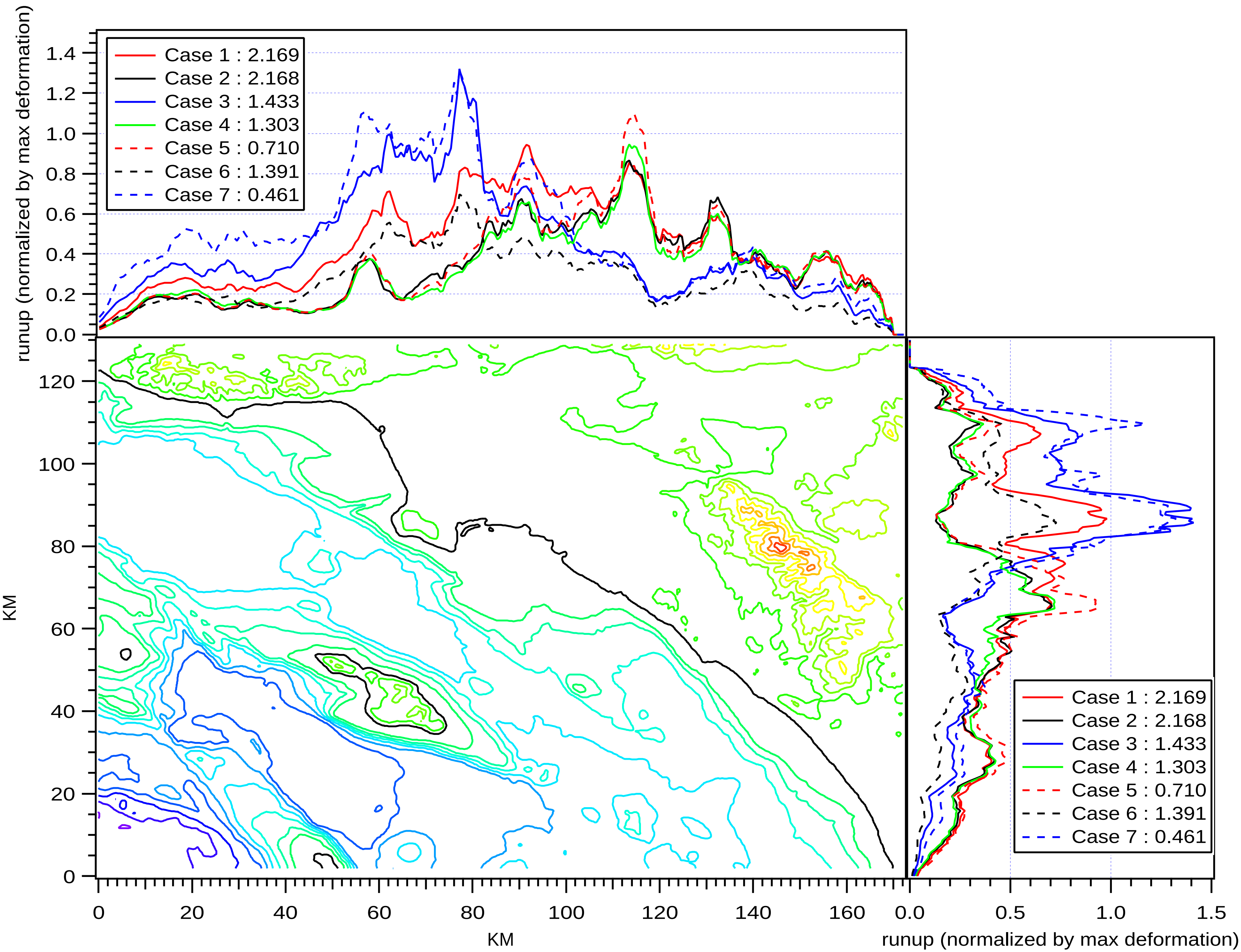


Figure 15. Plot showing maximum run-up for each of the seven Catalina fault tsunamigenic earthquake scenarios modeled in this study (see Table 4 for fault parameters).

EVALUATION OF TSUNAMI RISK FOR COASTAL SOUTHERN CALIFORNIA CITIES

APPENDIX B

Wave Gauges for Cases 2-7