GEODETIC OBSERVATIONS RELATED TO THE NORTHRIDGE EARTHQUAKE IN THE VENTURA BASIN REGION

Andrea Donnellan (Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109; e-mail: andrea@cobra.jpl.nasa.gov), Gregory A. Lyzenga (Harvey Mudd College, Clairmont, CA \ 91711; e-mail: lyzenga@hmcvax.ac.hmc.edu), Bradford H. Hager and Robert W. King (Both at: EAPS, MIT, Cambridge, MA 02139; e-mail: brad@meinesz.mit.edu, rwk@chandler.mit.edu)

GPS measurements indicate that during the period 1987-1992 the Ventura basin shortened at a rate of 7+-2 mm/yr with the highest strain concentration occurring in the Fillmore/Santa Paula area or east-central basin. In contrast, we observed negligible strain in a block that is bounded by the southern margin of the basin and the coast, although the block rotated clockwise 0.3 microradians during the 4.6 years of measurements. Assuming a constant rate of rotation, the block rotated 14 microradians clockwise during that last 200 years, during which time there were few significant earthquakes within the block. This block rotated counterclockwise 0.5 microradians during the Northridge earthquake suggesting that the GPS observations reflect the long-term geologic motions. If the model is correct, we would expect more slip on the faults to the west on the Oak Ridge than to the east in order to continue the clockwise rotations.

Following the earthquake we have continuously monitored a site on Oat Mountain, which is located in the Santa Susana Mountains, above the greatest concentration of aftershocks. We also located sites in the Granada Hills and at the Cal State Northridge campus (CSUN). Oat Mountain rose 38 cm during the earthquake and a preliminary look at the data suggests that it continued to rise 1.0-2.5 cm in the first few days after the earthquake. While the site moved up and to the northwest (21 cm) during the mainshock, it's trend of motion is now to the south. The site moved approximately 3.5 cm south and 1 cm west during the January 29, M 5.1 aftershock with no discernible vertical motion, which is consistent with a left-lateral strike-slip event. CSUN shows an easterly drift of 7 mm during an 11 day period in the first two weeks after the earthquake. We expect continued postseismic geodetic measurements to provide additional information, and clarify the relative roles of afterslip on the primary rupture, slip on secondary structures and possible viscoelastic relaxation.

Submitted to American Geophysical Union 1994 Spring Meeting
Special Session: Geodetic Results 1994 Northridge Earthquake