

## Annual Report, 2000

### Improving the SCEC Crustal-Motion Map: GPS Data Processing

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For the past year we proposed five tasks which, together with complementary work at UCLA and UCSD, were aimed at completion and publication of the final version of the CMM. We made some progress in most of the tasks, and worked on some problems that were not anticipated, but much remains to be done.

#### 1. GAMIT/GLOBK models and processing algorithms.

We have implemented ocean tidal loading, accessing either a station-specific table or a global grid produced by Hans-Georg Scherneck. Our tests using data from New Zealand have shown significant improvement in the repeatability of both horizontal and vertical station positions: 1.4/2.0, 2.0/2.9, and 2.7/4.5 mm for N, E, U, respectively. There is greater aliasing of the tidal signal into 24-hour station positions than would be expected from, e.g., the 13.66-day M2 tide. SOPAC has tested the model on a one-week span of global and SCIGN data and found a slight improvement (1-2 mm rss) in the repeatabilities. We have also refined the *sh\_gamit* script for automatic processing of phase data and added *sh\_glred* to efficiently combine local and SOPAC H-files and produce time series. Both are fully documented and available to SCEC analysts. To better handle post-seismic motion, we generalized the *enfit* program to allow estimation of more than one exponential function from a time series. Finally, we developed a new tool (*velrot*) for combining velocity fields from different solutions by estimating translation and rotation parameters between them. This tool will not replace GLOBK or QOCA for obtaining a rigorous solution of the SCEC CMM, but should help us to compare MIT and UCLA solutions and to merge the SCEC field with others for western North American.

#### 2. Data processing.

The Group E goal for this year had been to process or reprocess all of the data in the SCEC archive, 1986-2000. The MIT tasks were to test *autcln* and *sh\_gamit* with both pre-1992 and post-1992 data, and to assist UCLA in using *sh\_gamit* to complete most of the processing. Neither group completed its tasks, but rather spent effort identifying and dealing with several important problems. Analysis of the post-Landers and China Lake data revealed that inconsistencies between the data from codeless Ashtechs and other receivers resulted from a nearly constant clock offset in the former, and allowed us to correct the offset and successfully reprocess the data from 1992, 1993, and 1994. Because of the need to obtain time series for analysis of post-Hector deformation, we redirected our processing efforts during the latter part of the year the last part of 1999 (days 292-365) and first part of 2000 (days 1-88), generating H-files that include all of the continuous and non-continuous data not included in the SOPAC processing. Finally, we processed data from the Navy, USGS, CWU, Harvard/Caltech, and Miami for the eastern California, which can be added to the SCEC solution early next year.

An important goal of the Group E CMM effort has been to establish a structure for processing the survey-mode data so that they can be efficiently reprocessed and combined

with SCIGN as our models and analysis techniques improve. Within the last month, MIT, UCLA, and UCSD analysts have worked out a protocol for doing this using disk space provided at UCSD by SOPAC. The work statement for 2001 discusses how this processing will be accomplished.

*3. Combining H-files to obtain velocities and post-seismic motion.*

Because progress was less than expected in reprocessing, we did not this year regenerate a complete long-term velocity solution for southern California. We did, however, produce (separate) velocity fields from a core set of SCEC/SCIGN stations for 1992–98 and from the ECSZ data, and also time series for the post-Landers and post-Hector deformation.

*4. Produce a combined CMM using VLBI, GPS, and EDM h-files.*

This task must await the completion of Task 3, expected by mid-2001.

*5. Collaborate with UCSD and UCLA in writing up our analysis.*

This task must await the completion of Task 4, expected by mid-2001.