Detection of GPS station position errors due to instrumentals and environmental effects.

Thomas Herring, Massachusetts Institute of Technology, Cambridge, MA 02139.

We examine methods for detecting anomalous GPS station position changes that arise from instrumental and environmental errors rather than from physical motions of the antennas. The metrics we examine are changes in the root-mean-square (RMS) scatter of phase residuals, changes in the average signal-to-noise ratio from the receiver (not always available in rinex files), and the levels of L1 and L2 pseudorange multipath (called MP1 and MP2 in the teqc data quality measures). Specific examples will be shown for failures in Dorne-Margolin elements that generate temperature dependent seasonal signals with amplitudes of up to 25 mm that clearly correlate with variations in the multiple path measures MP1 and MP2. The stations NDAP, OEAS and LTUT showed large seasonal type signals, mostly in the horizontal positions estimates, for several years that were completely removed when the antennas at the sites were replaced. The other examples to be considered are detecting the effects of snow and ice on antennas through a combination of multipath measures, signal-to-noise ratios and phase RMS. For sites located in volatile regions such as volcanoes, it is important to be able to differentiate between environmental changes and actual motion events on the volcanoes. The heights of sites on volcanoes also make them prone to having snow and ice accumulations.