Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01715, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01715
EGU General Assembly 2008

Apparent stability of GPS monumentation from long-running short baselines

M. King

School of Civil Engineering and Geosciences, Newcastle University, Newcastle upon Tyne, UK (m.a.king@ncl.ac.uk / Fax: +44 191 222 6502 / Phone: +44 191 222 7833)

Long-running short GPS baselines offer an insight into the accuracy budget of GPS-based geophysical estimates inferred from continuous GPS coordinate time series. The results of an investigation into the apparent stability of 10 long-running short baselines will be presented. Baseline coordinates were estimated every 30 s over several years and deviations from a constant baseline length examined. It is shown that annual signals with amplitude $>$0.5 mm are evident in various coordinate components at 6 of the 10 sites, with amplitudes exceeding 2.5 mm on two baselines. Semi-annual signals are generally $<$0.2 mm. These signals are largely invariant to elevation cut-off angle, suggesting that they are related to real relative monument motion. Linear trends $>$0.25 mm/yr are evident on 5 baselines in at least one coordinate component. Sub-daily signals are present at all sites at the $\sim$K1 ($\sim$23.93 h) period, $\sim$K2 ($\sim$11.97 h), and higher harmonics of $\sim$K1. Increasing the elevation cut-off angle from 7° to 20° decreases the magnitude of these signals, but not to negligible levels. At some sites S1 (24 h) signals are evident, with amplitudes generally $<$0.5 mm. These sub-daily signals will propagate to longer period signals in conventional 24 h analyses.

Analysis of temperature records using a simple model of linear thermal expansion suggests that thermal expansion cannot explain the annual signal at most sites. Further, simulation shows that only a small portion of the annual signal could be related to static multipath or mis-modeled antenna phase centre variations, suggesting that time-dependant multipath effects may be responsible. If these baseline motion results were representative of the $\sim$300 currently active IGS sites, 180 would have annual signals $>$0.5 mm in at least one coordinate component, 150 would have linear rates $>$

0.25 mm and almost all sites would have sub-daily signals $>$0.1 mm (which would in turn propagate to longer periods in 24 h solutions), each solely due to local site effects.