G11B-0634

HARMONIC ANALYSIS OF IGS STATIONS TIME SERIES

James Mtamakaya[1], Marcelo C. Santos[1] and Michael Craymer[2]

[1]Dept. of Geodesy and Geomatics Engineering, University of New Brunswick, Canada
[2]Geodetic Survey Division, Natural Resources Canada
{r774p@unb.ca; msantos@unb.ca; craymer@nrcan.gc.ca}

1. Introduction

- There have been significant efforts to improve the modeling and parameterization of global GPS solutions.
- One of the latest improvements is the new absolute phase center variations models
  - ✓adopted by the International GNSS Service (IGS) in all their products since November 5, 2006 (GPS Week 1400) [Schmidt et al., 2007].
- This adoption has caused changes in the IGS solution processing strategy and necessitated the reprocessing of all of the historical GPS data.
- Therefore, the best possible time series of IGS stations is about to be made available.
  - ✓ With the added benefit of being consistently expressed in the same reference frame.
- Are there any unmodelled or mis-modelled effects still present?
- If so, what?

2. Objectives

- investigate and identify mid to long periodic effects coming from mismodelled or unmodeled errors in the reprocessed IGS weekly coordinate time series.

3. Procedures and tools

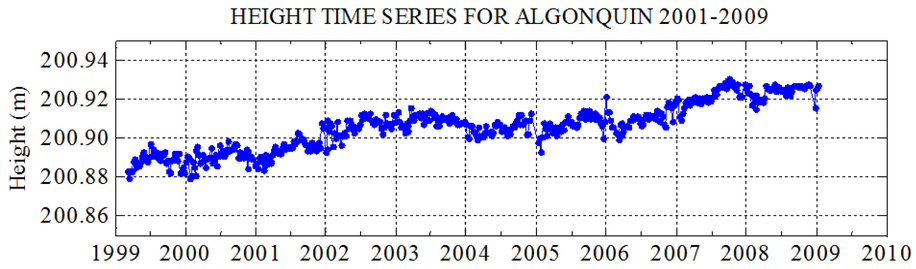
- Harmonic analysis of IGS times series, in residual and coordinate domains.
- Identify statistically significant peaks in the least squares spectrum, as well as their amplitude and phase.
- Correlate with spectrum of candidate phenomena.
- Apply model of candidate phenomena and test in processing of actual data.
- Compare with solution generated without model.

- Tools include Least Squares Spectral Analysis (LSSA) package version 5.4 [Pagiatakis, 1998].
- Bernese software for data processing.

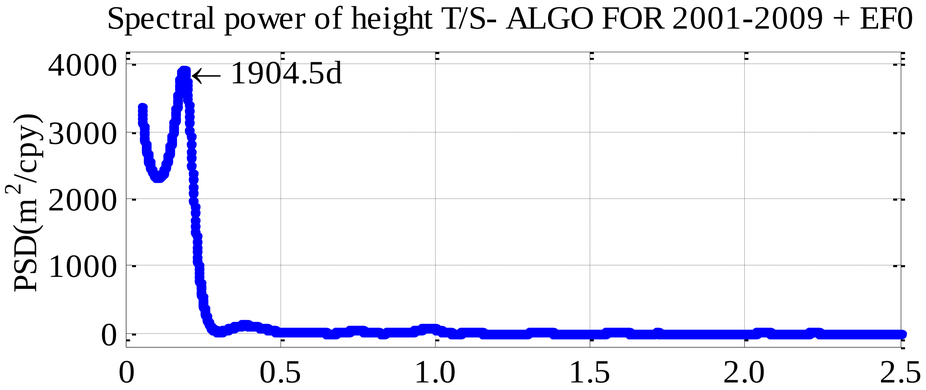
4. Test Case

- Approach partly tested using IGS Stations in Canada.
- Analysis using vertical coordinate only.
- Harmonic analysis of IGS times series, in residual and coordinate domains.
- Example shown, station Algonquin (ALGO).
- (paper submitted to IAG2009 Proceedings)

- Vertical time series shown below:



- Shown below is the resulting spectrum: power spectral density (PSD) Vs frequency in cycles per year (CPY)



References:

Pagiatakis, S. (1998). "Stochastic significance of peaks in the least-squares spectrum". *Journal of Geodesy, vol. 73, issue 2, pp. 67-78*)

Schmid R., P.Steigenberger, G.Gendt and M. Rothacher M (2007). Generation of a consistent absolute phase center correction model for GPS receiver and satellite antennas. *Journal of Geodesy, Vol. 81, No. 12, pp. 781-798*

5. Acknowledgments

Spiros Pagiatakis (York U.) for discussions on the LSSA v.5.4. Remi Ferland (NRCan) for providing data sets. Government of the United Republic of Tanzania (funding)