

Measures of noise reduction as common users of GEONET day data

Sou Kinjo[1], Ichiro Kawasaki[2]

[1] Earth Sci., Toyama Univ., [2] RCEP, DPRI

1. Motivation

GPS data of GEONET developed by GSJ has been contributing for understanding the dynamics on Island-arc-scale. However, they seem to include some biases such as oversimplification of time series of day data at Tsukuba (the reference site of the GEONET), nationwide annual variation and irregular noises of strong spatial coherence. In this study, as common users of time series of GPS day data, we attempt to minimize these biases by simple computations with a few simple assumptions.

2. Data

We analyze GPS day data for a period from March, 1996, to the end of 2002, which are called original data in this abstract.

3. Procedure of computation

(1) Data from GPS sites in source regions of earthquakes of Mw6 or larger and volcanic eruptions are excluded.

(2) Nationwide spatial averages of the day data are computed by three subnets of Trimble, Ashtech and Leica. Subtracting linear trends from the nationwide averages, we have nationwide biases. These could be attributed to the oversimplification of the time series of GPS day data at Tsukuba.

(4) Subtracting the nationwide biases from original data of all GPS sites, we replace them with the original data.

(5) A nationwide average of vertical velocities is -4.3 mm/yr. A linear trend of 4.3 mm/yr is added to vertical displacements of all sites. Thus, the nationwide average of vertical velocities is reduced to 0.0 mm/yr. This is consistent with tidal data within a range of 0.1 mm/yr.

(6) Displacement field thus obtained from (1) to (5) is called effective displacement field.

4.. Summary

Within a framework of the effective displacement field, we can say :

(1) A nationwide average of standard deviation of irregular noise is 7.7 mm, while 10.5 mm in original data. Thus, the variance reduction is around 43%.

(2) A nationwide average of amplitudes of annual variations is 2.4 mm while 7.2 mm in original data.

(3) Thus, horizontal displacements in areas excluding those in source areas of tectonic events are stable with less irregular noise and smaller annual variation.

No significant regional crustal movements, except the Kanto and the Tokai districts, in association with the 2000 Miyakejima volcanic and seismic activity.

(5) Spatial distribution of annual variations of vertical displacements is free from fixed-site-derived biases.

(6) Spatial pattern of vertical displacements by GPS for 7 years is consistent with that by levelling survey in the past decades.

(7) Overall subsidence along the Itoigawa-Shizuoka and Niigata-Kobe tectonic lines is around 5 mm.