**Z177-011** **Room: Exibition hall 7 sub** **Time: May 20 11:45-12:00**

# Environmenntal Rimote Sensing by GPS for Observation of Atmospheric Pollution - Section1- Error within Satellite-free Area

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http://home.att.ne.jp/iota/bluedoor2001/index33.html

The possibility to use GPS (Global positioning system) as an environmental remote sensor was suggested in the last conference (2008) on the basis of observation of geographical distribution of secondary correlations r (A:B) between air pollution (A) and the correlations (B) between 1.atmospheric tide (tidal and centrifugal force), 2.atmospheric expansion by solar radiation 3.geo-magnetism and GPS data, respectively.

This section includes concrete explanations about the errors of this technology.

The method is as follows:

A GARMIN GPS II and ProAtras2000 were used as a GPS receiver and a data logger, respectively. The web-pages of SORAMAME-KUN of NIES were cited as air pollution data.

Discontinuous time series (N=30) of GPS positioning data were correlated with atmospheric factors such as 1.Tidal force and centrifugal force, 2.Solar energy radiated on ground, 3.Geomagnetism, and the running averages of air pollutants concentration were taken in the corresponding period (N=30). These series of running averages (A1-An) and running correlations (B1-B3) were correlated again. As a result, several totals r (An:Bn) of correlation coefficients were located on each observation point for air pollution. In the geographical distribution map of these correlations, taking running averages with plane filters can transform discontinuous plot data to continuous plane data.

GPS satellites (Navstar) have ellipsoidal orbits crossing at 55 degrees angle with the equatorial plane of earth. As a result, there are a couple of satellite-free areas around the rotation axis of earth. Therefore, a blank area emerges at the north side of an observation point in Japan. In this area the secondary correlation r (A:B) is likely to be zero in principle, but errors cause that as high correlation efficients are observed as that around this area in reality. This reasons are expected (1) accidental errors in a mountain area containing only a few observation points and (2) a widely covering correlation due to wide-range atmospheric pollution. About (1), filters of 100km radius produced a better-formed map with interference fringes than 40km in the previous study.

So, even on the assumption that it contains large errors, in total view it is clear that the secondary correlation is relatively lower in the blank area around north-pole axis, which is regarded, as well as interference fringes, as an evidence of efficiency of environmental remote sensing by GPS.

Moreover, it is supposed that the determination of the position and shape of the lower correlation area leads to the estimate of mechanism of GPS radio wave disturbance by atmospheric pollution. That is to say, a notched shape, which is produced from a pile of several ellipses in the satellite-free area in the secondary correlation map in this study, suggests that both stratosphere ozone and ionosphere relate to GPS radio wave disturbance by atmospheric pollution together with troposphere, as well as the fact that there is no blank area within 100km distance from the observation point. This leads to the presumption that there may be an electric phenomenon that electrons are radiated from troposphere to upper atmosphere due to photochemical reaction, which influences to ozone-layer and ionosphere, and which may be the cause of GPS radio wave disturbance by atmospheric pollution.