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Crustal Motion Monitoring Using GPS in China

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ABSTRACT

Two GPS networks were installed nationwide in China in recent years mainly for the crustal motion monitoring purpose. One is the 23 station Crustal-Motion-Monitoring Network (CMMN); the other is the Crustal Movement Observation Network of China (CMONC) ", which contains 25 continuously operating fiducial stations, 56 base stations, and about 1,000 local stations. The CMMN was observed in 1994, 1996 and 1999. For the CMONC the fiducial stations have been operational since January 1999, while the base stations have been observed three times: i.e., 240 ~249 of 1998, 162 ~171 of 2000, and from March through October in 1999, all together with fiducial stations.

We produce the horizontal velocity field by using the fiducial- and base station data spanning six years, and the vertical velocity field by processing the fiducial station data of 1999 and 2000. In the paper we describe the methodology used, with the emphasis on the definition of reference frame, and present the results achieved, and try to explain our findings.

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Geodetic Observation at Earthquake Area in Mongolia

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ABSTRACT

Results of Geodetic observation of most earthquake active zone Mogod area in Mongolia

Gravimetric Network in Mongolia

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ABSTRACT

Contents of this poster would include followings:

- History of building Gravimetric Network in Mongolia.

- Today's situation of Gravimetric network in Mongolia

Geodynamic Applications of Space VLBI

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ABSTRACT

In this paper, the basic principle of space VLBI's geodynamic applications was discussed. The space VLBI data process program for geodynamic parameters estimated (SPVK) was introduced, using that program some real observation data of space VLBI satellite VSOP was processed and analyzed. Finally, the design of a space VLBI-SLR-GPS synthetic satellite for geodynamic purpose was presented.

The Study on the Relation between Tidal Force Triggering to Significant Shocks and the Later Large Earthquake and its Application on Earthquake Prediction

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ABSTRACT

In this paper, it is proposed that before some large earthquakes, the angles $\acute{a}_{ij}$ between $\bar{F}i$ and $\bar{F}j$ are small, here $\bar{F}i$ and $\bar{F}j$ are the tidel force vectors of the significant event i and j separately occurring in the source region of a large earthquake and its vicinity ($i=1,...,n-1,\ j=i+1,...,n,\ i\ j$). This phenomenon is applied to short term -- impending earthquake prediction by the author of this paper and several earthquakes have been predicted successfully. Critical phenomena and the IPE seismic generation model are used to analyze the phenomenon that the angles $\acute{a}_{ij}$ small.

Variation of Luni-Solar Tidal Force and Earthquakes in Taiwan Province of China

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ABSTRACT

The luni-solar tidal force can cause deformation and substance redistribution at the surface and interior of the Earth. It can affect on some geophysical phenomena. The influence on earthquakes has paid attention all along. It seems difficult to explain the influence of the luni-solar tidal force action, especially triggering on earthquake since the order of magnitude of the lunisolar tidal force is inferior. However, we note that the variance ratio of the tidal force is greater than the tectonic stress by about 2 orders of magnitude. It is worthy to study the trigger action of the lunisolar tidal force on earthquakes.

We primarily analyze the relationship between the variation ratio of each component of the luni-solar tidal force and 21 major earthquakes （$M_s \geqslant 7.0$） occurred in land and offshore area of Taiwan province of China in 20th century and discuss the possibility of the trigger action of the tidal force on earthquakes. The result indicates, most of the earthquakes occur in the period around the extreme value of daily variation and hourly variation of the horizontal component. About 71% of the earthquakes occur in about 6 days around the west-east horizontal component extreme of the daily variation (2 days before and after the positive extreme and 1 day after the negative extreme). About 81% of the earthquakes occur in about 5 hours around the west-east horizontal component extreme of the hourly variation (1 hour before and after the positive extreme and the negative extreme and 1 hour after it). All the earthquakes occur in about 7 hours around the west-east horizontal component extreme of the hourly variation. And they all occur in about 5 hours around the extreme of the horizontal component. The result indicates that the occurrence times of these earthquakes is closely correlated with the variation of east-west horizontal component and the horizontal component of the tidal force in the seismic region，and the lunisolar tidal force maybe play an important action in triggering some earthquakes.

With comparison and analyses in other belts and area in China, details of the correlation are found to be different for seismic belts with different geologic structure. Further investigation and study of more data probably generate a method that can improve the precision of short-term and impending earthquake prediction.

Some Results on the Correlation between the Earthquake and the Anomalous Variation of Azimuth of Photoelectric Meridian Transit Instrument

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ABSTRACT

The variation of azimuth of the Photoelectric Meridian Transit Instrument would be a remarkable factor which reflects local crust motion such as earthquake.

To investigate correlation between the variation of azimuth and earthquake, the Tendencies of azimuth variation were obtained from the observational data for 9 Years between February 1981- May 1990. Among the variation, the components of annual and semi-annual variation which were not in associated with the local crust motion were eliminated from our consideration, and the remainder mutations, that is, anomalous variations of azimuth were comparatively analyzed with the earthquake data in the vicinity of Pyongyang at the same interval of time. The analyzed result shows that earthquake occurs within 1-2 months when the value of anomalous variation converts to be decreased in the negative direction after remarkably increasing in the positive direction, Whole 8 earthquakes of M=4-6 which occurred on the period between February 1982 – March 1989 in the vicinity of Pyongyang (in a circle with 80 km in radius from the observational station) coincided with the anomalous variations of azimuth. Within that time interval there were entirely 11 anomalous variations of azimuth and were 8 earthquakes, that is, the rate of coincidence is 72.7%. Therefore, it comes to the conclusion that we have to pay attention to the fact that the formation of observation network with the opical observational device such as Photoelectric Meridian Transit Instrument would be very effective for the prediction of earthquake.

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Effect of Circular Satellite Orbits Assumption on Inverting Earth's Atmospheric Parameters by GPS Radio Occultion

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ABSTRACT

The analytic expressions for bending angle are presented in GPS radio occultation. Taking the bending angle under circular orbit assumptions as a priori bending angle, iterative processing is employed to derive bending angle series devoid of circular orbit assumptions. Further, differenced atmospheric parameters are calculated based on an inverse method, taking into account the two different cases (inclusive of and exclusive of circular orbit assumptions). It has demonstrated that effect of circular orbit assumptions will bring about, at large, one milli-bar bias in pressure and up to one Kelvin bias in temperature. On one hand, this result supports those researchers who are engaged in qualitative error sources analyses and are liable to employ circular orbit assumptions; on the other hand, it suggests it is necessary to keep in mind forsaking the circular orbit assumptions when demanding accuracy is required of the atmospheric parameters.

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Non-tidal Acceleration of Earth Rotation, Secular Polar Motion and the Estimate of Mean Lower Mantle Viscosity

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ABSTRACT

By using nine long sequences of international latitude observations, the secular drift of the Earth's pole was re-estimated as such that the drift rate is $(3.356''\pm0.142'')\times10^{-3}$/a with its direction along the meridian in west longitude $78.7°\pm2.5°$.Based on the Post-glacial rebound (PGR) model ICE-4G, the theoretical direction of drift

with 74.8°(W) was obtained by using the parameters of eight ice sheets on Earth, the mean lower mantle viscosity with $n_{LM}=0.5\times10^{22}\sim1.7\times10^{22}$ P$_{a\cdot s}$ was estimated under the constraint of the observed secular polar motion.

Over the last about million years, the extensive ice complexes over north America and northwestern Europe have repeatedly advanced and retreated almost with a characteristic period of approximately $(1.0\text{-}1.2)\times10^5$ years. In the last deglaciation event began at 21000 years ago, the total mass of the eight ice sheets adopted in this paper has the ratio of at least 99.9 percent of all the ice sheet's mass on Earth. In addition, we note that the mean geographic mass centric position of zone of the PGR on the Earth's surface is 61.6° in north latitude and $72^{°}.4$ in west longitude, which probably represent the real direction of secular drift of the Earth's pole. Therefore, the estimated n_{LM} in this paper can probably be acceptable. The estimation of n_{LM} by using non-tidal acceleration term of the Earth rotation was also discussed.

Variability of Excitation of the Chandler Wobble

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ABSTRACT

Chandler wobble is a mode of free oscillation of the anelastic earth, If there was no excitation, the Chandler wobble would have been vanished by damping. Though it has been deeply studied for over century, the excitation mechanism of Chandler wobble seems remain unsolved. Power spectra of two atmospheric excitation series, derived from atmospheric angular momentum of NCEP (1977.0-2001.0) and JMA (1984.0-1996.0), at Chandler frequency are analyzed and compared with that of the observed excitation series derived from polar motion series of space2000 of JPL for different lengths of data series and sub series for different time periods. The results show that the excitation of Chandler wobble from atmosphere is quite variable from time to time, and quite different for two data series of NCEP and JMA.