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Solid earth tide influence on the earthquakes triggering and on wave velocity variations

Ping Zhu (1) and M. van Ruymbeke (1)

(1) Royal Observatory of Belgium, Avenue Circulaire, 3, B1180 Brussels, Belgium

(zhuping1124@yahoo.com /Tel:+32 2 3730286)

The rhythmically tidal stress continuously and gently beat our entire planet. It provides a clue to study the different geodynamic process. In this paper, we introduce the HiCum method which could efficiently check the modulation effect of tidal stress and the application of the method in two different geophysical experiments.

We assume that the tidal stress could modulate the crack situation that could affect seismic triggering and also induce small alternation of the seismic wave velocity.

So, the tidal stress was utilized as a well known stress to check eventuality of interaction with (1) seismic occurrence and (2) seismic wave velocity variation.

At first, we check hypothesis of tidal triggering earthquakes in China, with a catalogue of 223,472 earthquakes from 1970 to 2003. The modulation effect of tide for periodicities on the main tidal wave periods S1, S2, M1, and M2 is not significant of whole data bank. However, the modulation effect is going much more obviously after we focused on North-South seismic zone in China and separated it into six zones. In order to promote the research work we selected 73 earthquakes with detail focal mechanism information. Then, we solve the tidal force in focal mechanism's P axis and T axis direction. Analyzing the way of tidal force act on earthquakes, we found that tidal force can trigger earthquakes when it was reaching a rupture criteria.

Secondly, , we compare the ground water record and direct wave velocity change obtained at the same stage. Laboratory study shows that the velocity change is sensitive to the crack of the rock. Therefore, the accurate real time velocity monitoring should include the tidal influence. We detect with HiCum, effect of the tidal signal in the relative P wave velocity change, with periodicities of the diurnal (O1, M1) and

semidiurnal (M2) components of solid earth tide. Coherent patterns exist between the ground water record and velocity changes. It confirmed that the tidal stress could be utilized as a calibration stress in the precise in situ velocity measurement.

In conclusion, the tidal stress could be a fundamental reference of shallow crust dynamic process study, and HiCum method provide a way to check it out.