

GPS and Groundwater Observations on Precursor Studies in Taiwan

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After the 1999 Chi-Chi earthquake, the Central Weather Bureau of Taiwan (CWB) has carried out a 5-year GPS program and an underground water level program. The purpose of these two programs is to observe earthquake precursors from both GPS data and the change of underground water level. This paper presents some results from the two programs.

The GPS program plans to setup 150 stations in the region of Taiwan. From 1992 to 1999, there were only 17 GPS stations operated by CWB. Up to date, there are 87 stations. The GPS data of the new stations are sampled by two ways, 1 point per second and 2 points per minute, and separately transmitted to CWB by ADSL and Telecom. The routine data processing includes the following calculations: the daily coordinate variation of each site, variation of baseline length, regional strain and velocity, epoch by epoch solution, and variation of ionospheric total electron content (TEC). The results of the calculation provide information for crustal deformation and daily change of TEC that probably is an important earthquake precursor.

The underground water level program plans to analyze the relationship between the change of underground water level and the occurrence of earthquakes. The data of ground water are observed from eight wells that are operated by Water Resource Agency. Seven of them are sampled by 1 point per two minutes, the other one from the well at Hualien Weather Station provides real-time data with 1 point per second. Since this April, the real-time data show 30 waveforms resulting from earthquakes and 4 anomalies. Among 3 of the 4 anomalies, each is associated with an earthquake with magnitude 4-5 occurred in a few hours after the appearance of the anomaly. In order to observe more anomalies, the data of other three wells will be modified into real-time observation this year.