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Hydrology and Earth System Sciences Discussions

Interactive comment on "Anomalous frequency characteristics of groundwater levels before major earthquakes in Taiwan" *by* C.-H. Chen et al.

Anonymous Referee #2

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It is an interesting report about the anomalous changes of groundwater level before earthquakes in Taiwan Island. Taiwan island is seismic area which can be a good natural test site for earthquake prediction practice. Groundwater level of wells proves to be effective approch to earthquake prediction by some countries and/or areas. So the observed phenomena should be encouraged to publish.

In this paper, the authors used HHT method to extract the anomalous information in frequency domain as 0.02-0.04 1/day which is equivalent to the "short-term precursor" on common view. This type of anomalous information was widely observed in the monitoring network of Chinese Mainland (see published series books of <earthquake cases in China> in Chinese with English Synopsis) and is quite useful and very

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important for short term earthquake prediction/forecast practice. While from Figure 5, we can find the same features from panel a: the 3 earthquakes occurred in the similar background of high ground water level, which is also widely discovered in the monitoring network of Chinese Mainland. This information is another type of precursors which is named as “long-term precursors” in the earthquake prediction practice. The combination of different type anomalies formed the step-by-step earthquake prediction methodology. Based on this step-by-step prediction methodology, including Haichen event case, there have had more than 2 decades successful cases in the earthquake prediction practice history according to Dr. Chen Qifu’s statistical research (http://www.kl-edi.ac.cn/Member/Details/71). But the latter type anomaly need long time data accumulation observed in a relatively stable technique condition in a well site. It is not widely accepted by scientists who have no long time data set. So according to the short time data set, the authors easily focused on the short-term anomalous changes. It is understandable.

On my view, the long time data should be analyzed to get the frequency spectra of the well water level changes and pick up all the common frequency spectra of well and/or well-aquifer combination of the monitoring network. From my preliminary look of Figure 5, I found the common water level changes of the 3 wells have common well-aquifer system with aquifer I+II+III, which is related to the common tectonic settings. According to the former research the water level of well-confined well/aquifer system can be cosidered as a kind of strain meter. Then phenomena of the high water level relted to strong seismic event can be discussed based on poroelastic theory.

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