

Transition of groundwater level change pattern after the earthquake off the western part of Fukuoka prefecture, 20 March, 2005

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Characteristic precursor, that is, groundwater level change pattern, which shows firstly groundwater level increase, secondly gradual decrease in groundwater level and thirdly quick increase in groundwater level, was observed accompanying the earthquake off the western part of Fukuoka prefecture, 20 March, 2005 (MJMA is 7.0.). The mechanism of the groundwater level change is interpreted in terms of the dilatancy-diffusion model. We think that the observation of groundwater level change is very important in earthquake prediction.

The above mentioned characteristic changes in groundwater level were also observed before several larger aftershocks. The duration time of the first groundwater level increase stage and the total duration time of anomalous groundwater level change correlate with the magnitude of earthquake, that is, longer the duration time, the larger the earthquake magnitude.

However, the above-mentioned correlation between duration time and magnitude may change with time. We also detected anomalous groundwater level changes twice from middle May to early July, 2005. In these cases, the earthquake magnitude was smaller than that was estimated from the above-mentioned duration time-magnitude correlation.

We detected another anomalous groundwater level change from early January, 2006. In this case we detected the first and second stages of groundwater level change. An earthquake of M3.1 occurred without the third stage of groundwater level change. The magnitude of the event was much smaller than that (M5 class) expected from the above-mentioned correlation between duration time of the first stage of groundwater level change and earthquake magnitude. Therefore we thought that the expected earthquake did not occur. However, a larger earthquake (M4.5) occurred on 31 January. Then we are investigating the relation between groundwater level change and earthquake occurrence.

As mentioned above, the correlation between duration time and magnitude may change with the change of regional stress state or the change in the underground structure in after shock sequence. Therefore it may be difficult to predict the occurrence of aftershocks throughout long term. However, we believe that it is possible to apply the above correlation for the mainshocks.

At present many citizens in Fukuoka city worry about the occurrence of the large earthquake which may be caused by movement of the Kego Fault in the central part of Fukuoka city. Therefore we are trying to detect the anomalous groundwater level change before the above mentioned earthquake by setting eight groundwater level stations around the Kego Fault.