

Estimation of fault models of the short-term SSE using groundwater pressures at the Hokusei observation site

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One of the problems is the lack of high quality crustal deformation/groundwater observation sites in the western part of Aichi prefecture and the northern part of Mie prefecture around Ise Bay, in terms of the estimation of short-term slow slip events (SSEs) occurring at the plate boundary of the Nankai Trough. One of the causes is that unconsolidated sedimentary layers such as the Tokai Group are thickly deposited in this area. In May 2016, the inner pipe of the observation well at the Hokusei observation site located in the northern part of Mie prefecture was sealed with a packer in order to improve the response of groundwater level to crustal deformation. Because the permeability of the target aquifer at this site is low, the groundwater level before the sealing was poor in response to crustal strain changes before the sealing. The groundwater pressure is observed after sealing, then tidal fluctuation clearly appeared in the groundwater pressure, therefore we found the response of the groundwater pressure to crustal deformation to be clearly improved. The response of the groundwater pressure to crustal strain after sealing improved about 10 times than that of the groundwater level before the sealing. By eliminating the tidal component, barometric pressure response, and rain response from the groundwater pressure data, short-term SSEs were detected by the changes in groundwater pressure in July 2016, November 2017 and April 2018. And then slips of the short-term SSEs were estimated to be spread to Northern Ise Bay by the data of strain, tilt and groundwater pressure. In the area around Northern Ise Bay where deep low frequency tremors are not active, it is shown that short-term SSEs repeatedly occurred. In soft sedimentary layer which is unsuitable for observation of crustal deformation by strain meter and tilt meter, it is showed that the measurement of groundwater level (pressure) is a powerful means of crustal deformation observation.

Keywords: groundwater, strain sensitivity, closed well, slow slip event