# Influences of a fault fracture zone and sea level variations on crustal strain changes due to typhoon passages

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Strain changes that are significantly different from predicted ones based on the assumption of a uniform elasticity have been observed at Rokko-Takao station in the southern area of Hyogo prefecture as each typhoon passes near the station. In this study, we investigated the inhomogeneous dynamic structure in the surrounding crust and the oceanic responses to atmospheric pressure variations, which could cause the discrepancy between the observed strain changes and the predicted ones, by using the observed crustal strain changes due to the typhoons passing nearby Kobe in 2004.
We can estimate strain changes due to a typhoon passage by applying the loading Green function to the atmospheric pressure distributions, when the crust is assumed to be a laterally uniform and homogeneous elastic body. However, such estimated results do not always agree to the observed ones. We observed extension in the northwest direction due to the typhoons passing by Kobe in 2004, although the predicted strain changes based on the assumption of a uniform elasticity show contraction in every direction. A part of this discrepancy might be caused by the inhomogeneous dynamic structure in the surrounding crust. Rokko-Takao station crosses Manpukuji fault with nearly east-west strike, and the strain changes have been observed nearby its fracture zone. It could be suggested that the inhomogeneous structure in the fault fracture zone has a significant influence in the strain changes observed at the station, because the observed ones due to each typhoon passage show the extension at the strainmeters in the direction nearly parallel to the fault strike.
When we assumed an extension in the fault fracture zone for each typhoon passage considering the increase in the groundwater discharge at the station, we could reproduce the observed ones to some extent. However, the discrepancies between the observed and the predicted ones were still remained. It is considered that the discrepancies might be caused by the sea level response to the atmospheric pressure variations. In general, just a part of the atmospheric loading affects the sea floor, because oceanic mass migrates due to a local atmospheric pressure variations. Osaka Bay and the Inland Sea are located just about 5km south and 20km west of the station, respectively. Loading strength on the sea floor due to atmospheric pressure variations is dependent on the period of the variations and the topography around the sea. For example, it is considered that short period variations in atmospheric pressure cannot make sea water migration sufficiently, and major part of the atmospheric loading acts on the sea floor. Inland sea connected with an open ocean through narrow straits has the similar effect. Therefore, strain changes due to typhoon passages might have some information about response properties to atmospheric loading for each sea area. In this study, we report on the response properties to atmospheric loading for Osaka Bay and the Inland Sea, as well as the effect of the fault fracture zone on crustal strain changes due to typhoon passages.

Keywords: strain changes, fault fracture zone, sea level variations

 