

Some problems on the deformation of the back arc region of Northern Honshu arc, Japan

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Deformation of the overlying plate is mainly controlled by the coupling condition on the plate interface. Next factors are geometry of the lithosphere on the overlying plate, such as cold and strong mantle wedge, thin strong layer in volcanic arc and thick lithosphere in the backarc. However, actual structural data using seismic waves are still not available. If the above mentioned structure has certain reality in northern Honshu, the deformation does concentrate on the volcanic arc. Geological strain is concentrated along the Sea of Japan coast and subordinate along the volcanic front, suggesting the factor of effective thickness is so thin, due to the Miocene rifting and concentration of fault, which produced during rifting. Present shortening deformation has been performed by reactivation of normal faults. However, the zone of reactivation has a western limit. It was produced by the limit of volcano-plutonic influence to the backarc or the eastern limit of underplated mantle lithosphere beneath the Sea of Japan. To reveal this problem, new project of seismic observation in the Sea of Japan will be needed.

There is a big difference on the convergent rate determined by GPS and geological information. Later is much smaller. To understand this phenomena is important to understand the stress and strain build up on the hangingwall of the subduction megathrust. Before the 2011 Tohoku-oki earthquake, the occurrence of the devastative earthquakes were focused in the relation between the existence of high convergent rate zone measured by GPS. However, another high zone was developed just behind the maximum slip area of the 2011 Tohoku-oki earthquake and in this region 2008 Iwate-Miyagi inland earthquake and 2003 Northern Miyagi earthquakes occurred. These phenomena can be understand as stress concentrating processes caused by the 2011 Tohoku-oke earthquake.

For the understanding whole processes of strain and stress build up in the overlaying plate, the budget of the strain rate, including nonelastic deformation of the hangingwall, in the subduction system is very crucial. For this purpose, we need to start construct numerical model, which includes whole subduction system in different time duration.