

Distribution and evolution of thin-skinned and thick-skinned domains in the back-arc region of Northeast Japan

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There are a wide variety of subduction-related orogens in the world. One extreme is the Marianas type orogens, which are characterized by back-arc spreading; the other extreme is the Andean type orogens, which are characterized by a fold-and-thrust belt on the back-arc side. The Northeast Japan arc has changed from a Mariana-type orogen in Miocene time to an Andean-type orogen since Pliocene time to the present. Therefore, detailed studies on the tectonic evolution of the Northeast Japan arc, with the use of exceptionally dense observational data on it, would place an important constraint in understanding subduction-related orogeny in general.

It has been widely accepted that fore-arc deformation is important in the evolution of subduction-related orogens, and therefore a lot of previous studies have focused on the forearc. However, recent studies on the Andean Orogen have revealed that large horizontal shortening in the back-arc region plays an important role in thickening the crust beneath, and hence uplifting isostatically, the Andean Mountains. Deformation styles in back-arc regions are divided into two types: the thick-skinned type and the thin-skinned type. The most significant difference between these two types is in the amount of shortening; thin-skinned type deformation can result in a large amount of horizontal shortening, whereas thick-skinned type deformation causes much less shortening.

In Northeast Japan, these two types of deformation have never been distinguished clearly. We revealed in this study that the study area is divided into two tectonic domains; (1) the thin-skinned domain, including the Uetsu-Northern Fossa Magna basin and its seaward extensions, and (2) the thick-skinned domain, including the Sado Ridge and its northeast extension. We then demonstrate a potential role of Miocene extension structures, which have been inherited to, and have been reactivated to produce contractive deformation in the present-day Northeast Japan arc.

In this presentation, we will demonstrate the structural differences between thin-skinned and thick-skinned domain and moreover detail subsurface structures and its evolution of thin-skinned domain in the back-arc region of Northeast Japan since Miocene time.