Cretaceous subduction zone in the East-Asian margin: implication from geology of Hokkaido.

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Basement geology of Hokkaido has a potential to improve our understanding of tectonic evolution of subduction zone in the East-Asian margins. Here I will present two topics from geology of the Cretaceous central Hokkaido.

1. West-Pacific type subduction in the Cretaceous

The Idonnappu Zone consists of two types of accretionary complexes: the Early Cretaceous complex with abundant and old oceanic rocks, and the clastic-dominant Late Cretaceous complex with scarce and young oceanic rocks. Along their boundary lies a mid-Cretaceous ophiolitic accretionary complex, in which earliest Cretaceous chert overlies andesitic metavolcanics. Such peculiar strata are comparable to those of intra-oceanic remnant arcs such as the Kyushu-Palau Ridge left after back-arc spreading. This suggests that a marginal basin plate like the present-day Philippine Sea, rather than huge oceanic plate such as Izanagi and Kula, was subducted during the Cretaceous.

Cretaceous ophiolites and intra-oceanic arc terranes, which imply existence of marginal basin plates, are common in and around the Philippine Sea plate and around the Sea of Okhotsk. To improve the East-Asian tectonic evolution, it might be important for us once to be free from the traditional 'East-Pacific scenario', and to try constructing evolutionary models more suitable for the West-Pacific with paleo-geography of oceanic plates by integrating geological records in accretionary complexes and ophiolites.

2. Forearc tectonics in non-accretionary stages

Subduction zones are classified into accretionary and non-accretionary margins. A single subduction zone might also have experienced accretionary and non-accretionary stages in its long history. Radiolarian biochronology defines an accretionary (140-125 Ma) and the subsequent non-accretionary (125-100 Ma) stages in the Early Cretaceous of central Hokkaido. In the Kamuikotan Zone, a blueschist unit, whose metamorphic age lies in the accretionary stage, was exhumed during the non-accretionary stage. Clastic rocks of the underlying lower-grade unit were deposited in the accretionary stage, and suffered very low-grade HP metamorphism in the non-accretionary stage. Parts of this unit show characteristics of off-scraping, in terms of imbricate of turbidite with soft-sediment deformations by lateral shortening. It is thus suggested that the lower-grade unit was originally formed in shallow portions of the wedge and subsequently transported into the depth, and this process is regarded as tectonic erosion. It is considered that both the tectonic erosion and the blueschist exhumation contemporaneously occurred in the non-accretionary stage.

In an accretionary stage, dominant frontal accretion under relatively low basal friction constructs a laterally extensive accretionary wedge. Whereas in a non-accretionary stage, the wedge is shortened and steepened as dragged by the greater friction force. The traction might promote downward transport (tectonic erosion) and presumably resultant upward counter flow (blueschist exhumation) Complicated geologic structures of the forearc could generate by oscillation of accretionary and non-accretionary stages.