How do trench-fill sediments subduct under the accretionary wedge?

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Ancient exhumed accretionary complexes sometimes have combinations of low-grade accretionary rocks from trench-fill turbidites, high-pressure/low-temperature metamorphic rocks including psammitic schists, and forearc basin deposits composed of sandy submarine fan deposits, whose provenance and depositional ages are similar to each other. For example of the southwestern Japan, sandstones in the Shimanto Accretionary Complex and psammitic schists in the Sanbagawa Metamorphic Complex are derived from terrigenous trench-fill deposits showing the similar geochemical and geochronological characteristics each other; the former is composed of accretionary rocks at the shallow part of the subduction zone and the latter comprises metamorphic rocks subducted to deeper than 10~km. Generally, at accretionary-type subduction zones, because weak layers within sediments deposited on the oceanic plate are used as a decollement, the lower pelagic and hemipelagic sediments can subduct beneath accretionary wedge through the subduction channel, but the upper terrigenous sediments are accreted at the toe of the wedge. Growth of accretionary wedge enabled to develop a forearc basin between the wedge and the backstop. At tectonically erosive subduction zones, most of the trench-fill sediments can subduct beneath the frontal prisms, but accretionary wedge cannot be grew at the same time. Therefore, it is difficult to explain coexistence of growth of accretionary wedge derived from coarse-grained trench-fill sediments and subduction of them deeper than seismogenic zone at the same time. In this study, we attempt to identify an importance of seafloor roughness for transportation of trench-fill sediments to deep during subduction. For this purpose, we conducted sandbox analogue experiments by using an unfixed rigid backstop on a subduction channel with the cases of smooth surface (Exp. A) and rough surface representing a seamount or ridge on subducting lower plate (Exp. B). The results of Exp. A showed progressive thickening of the accretionary wedge pushed the backstop down, meaning stepping down of the decollement and narrowing the subduction channel. On the other hand, Exp. B showed a subducting seamount lifted up the backstop, stepped up the d{\'e}collement, and then widened the subduction channel. Subduction of a rigid material like a chain of seamounts is a possible mechanism to open subduction channels for transportation of terrigenous sediments from the trench to high-pressure condition. Significant sediment supply to the trench and rough surface of subducting oceanic plate are required to enable subduction of protolith of HP-LT metamorphic rocks, accretion of trench-fill sediments at the shallow part, and formation of forearc basin simultaneously.

Keywords: Subduction zone, Accretionary wedge, High-pressure/low-temperature metamorphic rocks, Forearc basin, Seamount, trench-fill sediments

