Underthrust turbidite facies affecting variation in interplate coupling along the Nankai subduction zone

*Jin-Oh Park[1], Tetsuro Tsuru[2]

1. Atmosphere and Ocean Research Institute, The University of Tokyo, 2. Tokyo University of Marine Science and Technology

Trench sediments get involved in subduction-zone processes such as interplate coupling and megathrust earthquake generation. Although recent seafloor geodetic observations have revealed variation in interplate coupling along the Nankai subduction zone, what constrains the variation is not fully understood. Based on seismic reflection characteristics and drilling results, we mapped three Miocene turbidite facies within the Shikoku Basin sedimentary section incoming to the Nankai subduction zone: western turbidite (WT), central turbidite (CT), and eastern turbidite (ET). These turbidite facies are apparently discrete, and also underthrust along the megathrust fault (i.e., décollement) immediately beneath the overlying accretionary wedge. An inferred landward extension of the three turbidite facies correlates well with the recent slip-deficit rates (SDRs) (Yokota et al., 2016) indicative of interplate coupling. The ~200-km-wide, sheet-like WT overlaps partially with a high-SDR region (SDR > 5 cm/yr). The underthrust WT with possibly enhanced drainage could cause low fluid pressures and high effective stresses in the footwall of the décollement, eventually affecting the high-SDR region. The ~115-km-wide, channel-filling CT is almost consistent with a moderate-SDR region (SDR > 4 cm/yr) between the high-SDR region and patch. The underthrust CT deposited within erosional channels or isolated basement lows may generate local compartments of excess pore pressure in the footwall of the décollement and thus the moderate-SDR region, leading to segmentation of the neighboring high-SDR region and patch. The ~100-km-wide, sheet-like ET interbedded with thick hemipelagic mudstone facies coincides roughly with another moderate-SDR region between adjacent high-SDR patches. The underthrust ET with the less-permeable mudstone layer may cause relatively high pore pressures and low effective stresses in the footwall of the décollement, and help low-coupling condition at the moderate-SDR region and thus segment the two high-SDR patches. The shallow décollement with the high SDR in the WT region may be associated with the tsunami earthquake generation.

