



New insights into the stress state of underthrust sediments at the Nankai margin

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The Nankai Trough is one of the best-studied convergent margins worldwide. Numerous multi-methodological surveys have been focused on this area and it has been a high priority scenario location for DSDP, ODP and IODP drilling. Based on these expeditions several studies addressed to the stress state of the underthrust sediments and its implications for the nature of the plate boundary thrust. However, none of these studies regarded temperature effects on the consolidation state of sediments along the Nankai margin, where the basement temperature has been found up to ~ 110 °C. To prevail this limitation, we selected end member sediment lithologies from the incoming oceanic plate in the Shikoku Basin and subjected them to isothermal uniaxial consolidation tests at elevated temperatures (20, 100, 150°C) up to effective normal stresses of ca. 70 MPa.

As the first major result, consolidation curves are shifted to lower void ratios with increasing temperature. This implies that pore space is significantly lower at elevated temperatures. Second, the effect is more pronounced in clay mineral-rich than in quartz-rich sediments. Third, we combined our results with in-situ temperature data and examined the stress state of underthrust Lower Shikoku Basin sediments. Key features such as high compression indices of in-situ consolidation curves as well as observed offsets between consolidation curves at different drill sites along the Nankai margin are found to be a combination of mechanical load, thermal state and excess fluid pressure. Hence, temperature corrected excess pore pressure estimations are lower than previously suggested. Nonetheless, it can be suspected that the general trend is in agreement with the assumption that pore pressure increases along the sub-

duction thrust and, together with low basal friction, is thus responsible for the small taper angle along parts of the Nankai margin.

Taken together, our results provide new insights into the physical/mechanical properties of underthrust sediments. Temperature has a major impact on the sedimentary properties and temperature-dependent testing may become increasingly crucial to understand physical property data from deep drillings of the riser-vessel Chikyu within the IODP.