



From soft sediments to hard rocks: experimental study of consolidation processes

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We have carried out in samples from Nankai accretionary prism the experimental characterization of mechanical and acoustic response to variations in confining and pore pressures. The samples were collected during 315 and 316 NanTroSeize expeditions at various depths (up to 1000m of sediments) and show accordingly a large range of porosity (60 to 30%) and consolidation state. We characterized the sample consolidation using 2 distinct variables: the variations D_{Vp}/D_{Peff} in elastic wave velocity (V_p) to changes in effective pressure ($P_{eff} = P_{confining} - P_{pore}$) and the occurrence/absence of plastic (irreversible) deformation for increasing effective pressure. We show that there is a relatively sharp transition between high porosity samples, with (i) little effect of P_{eff} on V_p (low D_{Vp}/D_{Peff}) and (ii) occurrence of plastic deformation when P_{eff} gets large and low porosity samples, with (i') a large D_{Vp}/D_{Peff} and (ii') no occurrence of plastic deformation even for large P_{eff} . The two variables (D_{Vp}/D_{Peff} and response to increasing P_{eff}) seem to be correlated and to express the progressive evolution of the samples with increasing burial from soft sediments to "real" rocks. In addition to mechanical response, the measure of V_p seems therefore to be a significant variable to be integrated in the modeling of sediment-rock transition.