

SEIZE	Strike-Parallel Variations in Clay Mineralogy and Their Impact on the Cascadia Seismogenic Zone	
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	9/1/2000 – 8/31/2002	OCE 00-01768

Accomplishments:

- We completed a preliminary assessment of how clay content and clay mineralogy change the coefficient of internal friction for naturally occurring mudstones entering the Nankai subduction zone (with Kevin Brown). Our results reveal substantial strike-parallel variations in frictional properties beneath the frontal décollement. Additional lab tests are ongoing and will be an important component of NanTroSEIZE.
- We completed analyses of more than 200 piston- and gravity-core samples from throughout Cascadia Basin, plus DSDP Site 174 and ODP Site 888. Inputs to the Cascadia subduction zone show significant but erratic spatial-temporal variations in clay mineral abundance, especially in the abundance of smectite. Modeling (in progress) will show how this complicated 3-D heterogeneity changes frictional properties and effective stress at depth.
- We completed analyses of piston- and gravity-core samples from the TicoFlux expedition, Costa Rica, plus ODP Site 1040 (with Glenn Spinelli). Hemipelagic inputs to the Costa Rica subduction zone show very little compositional variability (high smectite, moderate biogenic silica). Modeling (in progress) will determine how much water is released during smectite and opal dehydration at depth.

Figures and Captions

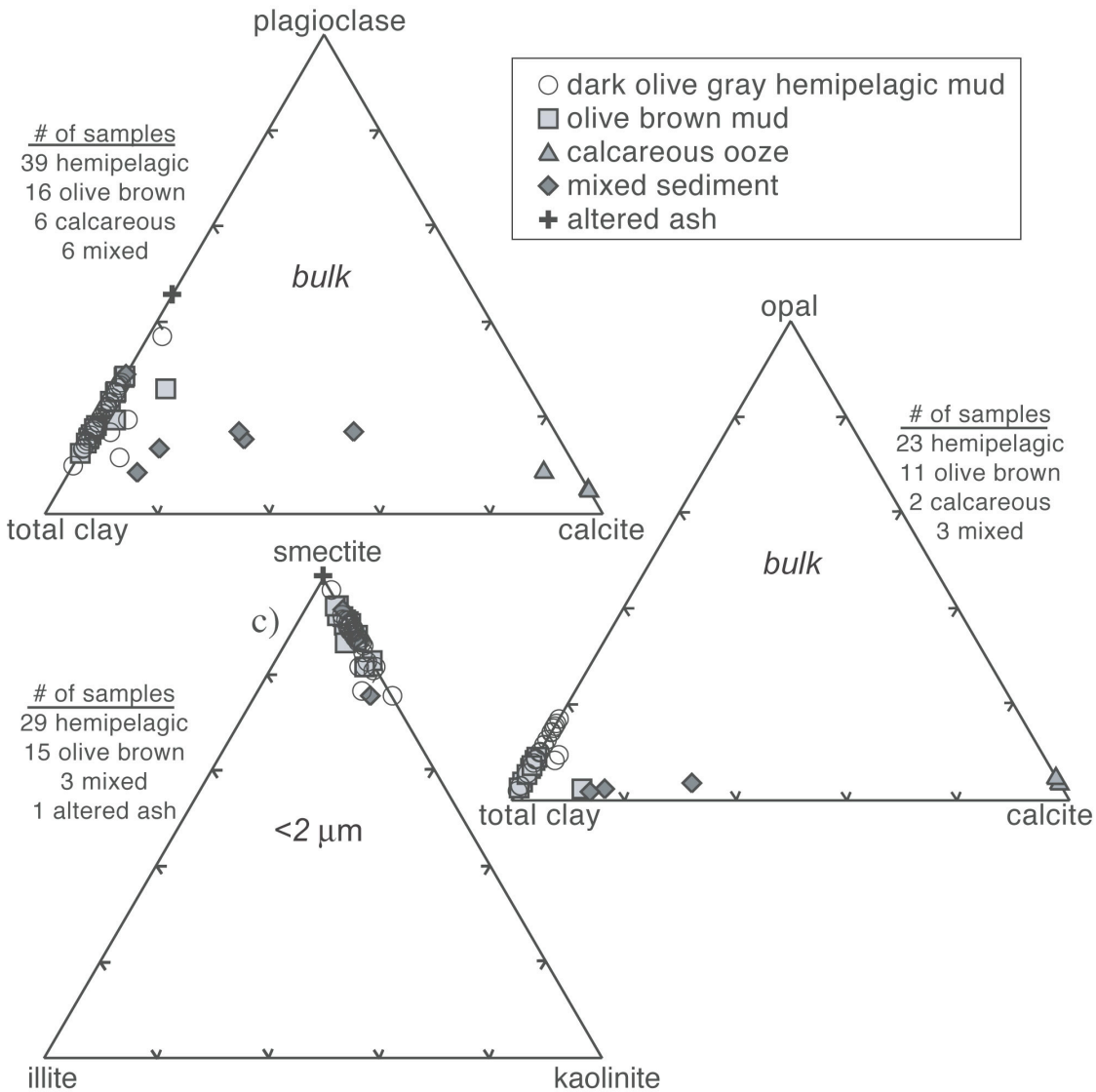


Figure 1: Bulk sediment composition and clay mineral abundance of sediments entering the Costa Rica subduction zone. Hemipelagic mud is the most widespread sediment type and composed mostly of detrital smectite, with less than 10 wt-% biogenic opal. From Spinelli and Underwood (submitted).

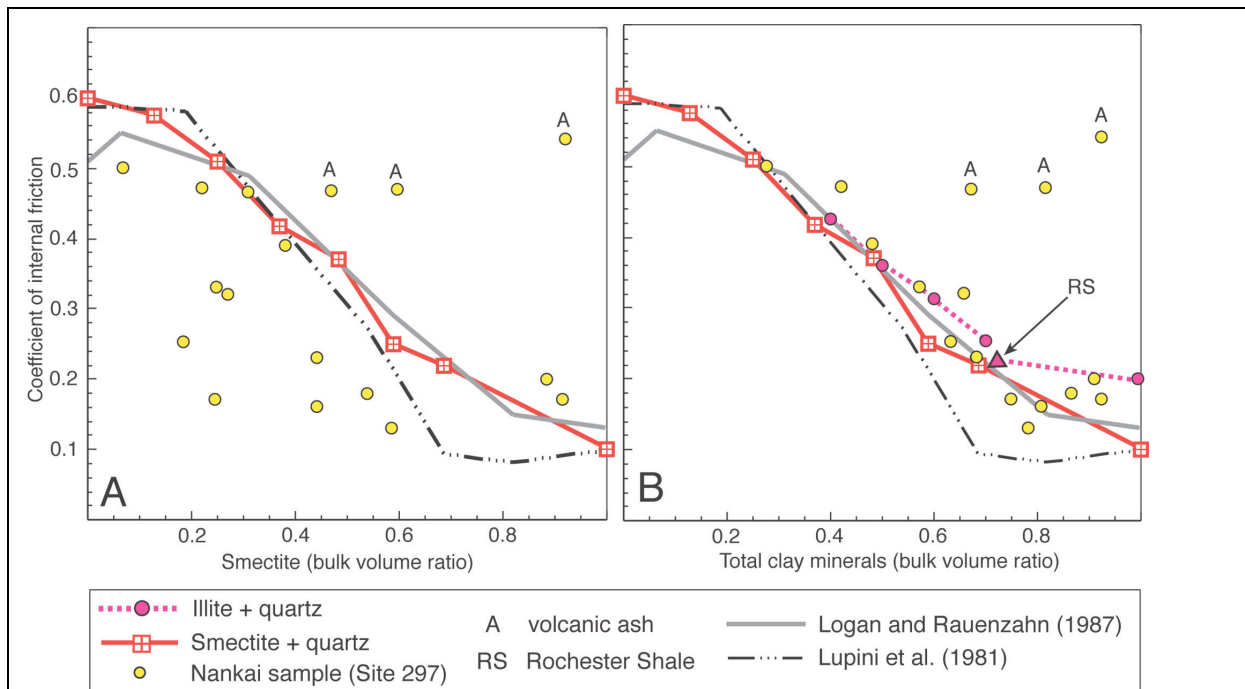


Figure 2: New ring shear data from natural Nankai samples (black dots), and artificial mineral mixtures of smectite + quartz, and illite + quartz. The residual coefficients of friction are plotted against volumetric ratios of smectite and total clay minerals. Additional curves for comparison are from the published literature. From Brown *et al.* (2003).

Publications and Presentations

Keynote Speaker (2003), International Conference on Deep Water Processes in Modern and Ancient Environments, Barcelona and Ainsa, Spain, Title: How Tectonic Processes Affect, and Respond to, Lithostratigraphy and Sediment Composition within Active Subduction Margins.

AGU Featured Speaker (2003), Midwestern Area Regional Convention of the National Science Teachers Association, Kansas City, MO, Title: Scientific Ocean Drilling and the Seismogenic Zone Experiment.

Underwood, M.B., 2003, Spatial and temporal variations of sediment input to the Cascadia subduction zone (abstract): AGU Fall Meeting.

Spinelli, G., Saffer, D., and Underwood, M., 2003, Along strike variations in temperature, sediment diagenesis and dewatering in the Costa Rica subduction zone (abstract): AGU Fall Meeting.

Brown, K.M., Kopf, A., Underwood, M.B., and Weinberger, J.L., 2003, Compositional and fluid pressure controls on the state of stress on the Nankai subduction thrust: Earth and Planetary Science Letters, in press.

Underwood, M.B., submitted, Sediment inputs to subduction zones: Why lithostratigraphy and clay mineralogy matter, in Dixon, T., Editor, The Seismogenic Zone Experiment, Columbia University Press.

Spinelli, G.A., and Underwood, M.B., submitted, Character of sediment entering the Costa Rica subduction zone: Implications for partitioning of water along the plate interface: The Island Arc.