Revealing high-resolution volcanic stratigraphy and rock-fluid interaction by XRF core scanning

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X-ray fluorescence core scanning (XRF-CS) is a well-proven, non-destructive method in paleoceanography and paleoclimate research to acquire high-resolution data sets of chemical variability in sedimentary successions. It has, however, remained poorly explored how XRF-CS can assist in studies of other rock types, such as igneous rocks. Here, we report XRF-CS data obtained from volcanic sequences that were recovered at the South China Sea rifted margin by the International Ocean Discovery Program.

Two different drill sites (U1500, U1502), located on distinct structural highs, penetrated up to 200 m of numerous basaltic lava flows. These comprise four volcanic sequences at each site based on patterns of the Ti/Cr value. Overall, ratios of incompatible trace elements (e.g., Zr/Y) are lower at U1500 than at U1502, with the latter being closer to the margin. This suggests magma source depletion or increased degree of partial melting over time. Additionally, the data reveal alteration patterns, showing systematic variations of, e.g., Ca/S and V/La. Next, it is intended to correlate the XRF-CS record with physical properties, such as natural gamma radiation, magnetic susceptibility, and color reflectance data.