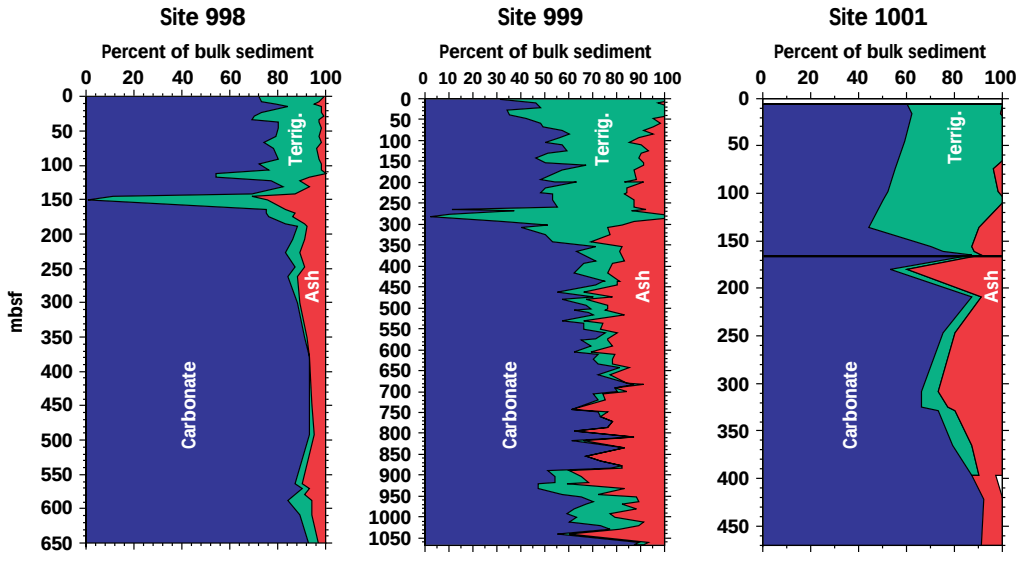
Constraints on Cenozoic explosive volcanism and circum-Caribbean tectonism

R. W. Murray, Department of Earth Sciences, Boston University,
H. Sigurdsson, Graduate School of Oceanography, University of Rhode Island,
D. G. Pearson, Dept. of Geological Sciences, Durham University,
T. Lyons, Dept. of Geological Sciences, University of Missouri, Columbia,
S. Carey, Graduate School of Oceanography, University of Rhode Island,
J. Sparks, Department of Earth Sciences, Boston University, and the
Leg 165 Shipboard Scientific Party

Quantifying the amount of terrigenous material and dispersed ash (i.e., distinct from ash occuring as discrete layers) is critical to many scientific objectives targeting the Caribbean Sea. Distinguishing the terrigenous component allows assessment of tectonically driven changes in magnitude and provenance of continental erosion around the rim of the Caribbean. Quantifying the dispersed ash component allows assessment of arc-related volcanic activity in Central America and provides further support of ash-layer data gathered by volcanologists. Whereas physical core description is able to assess the relative amounts of "clayey" material, the sediment's major and trace element chemical composition can be used to more precisely determine where the "clay" is composed of detrital terrigenous matter and where it is instead composed of altered volcanic ash.

Throughout the Caribbean, the uppermost 100-250 m is composed essentially exclusively of calcium carbonate and terrigenous matter. Subtle variations in terrigenous provenance appear to reflect Andean uplift and the resultant construction of submarine fans. Below the mid-Miocene carbonate minimum is a deeply buried sequence composed of 15-20% dispersed ash. This interval also contains frequent layerings of discrete ash layers. Comparing the details of the timing of the dispersed ash input to that of the discrete layers will provide important data regarding the degree and extent of the largest explosive eruptions (recorded by discrete layers) with respect to the erosion of the massive continental ignimbrite deposits (recorded by the dispersed ash). Such information is being used to deconvolve the geologic history of volcanism in the Central and South American highlands.



Results of chemical compositional-based partitioning of the bulk sediment at Sites 998, 999, and 1001 in the Caribbean Sea. The three dominant components of calcium carbonate, terrigenous matter, and dispersed ash are shown plotted versus depth below the seafloor. Hiatus shown in dark heavy line at Site 1001.