Central American explosive volcanic episodes recorded in ODP Leg 165 sediments

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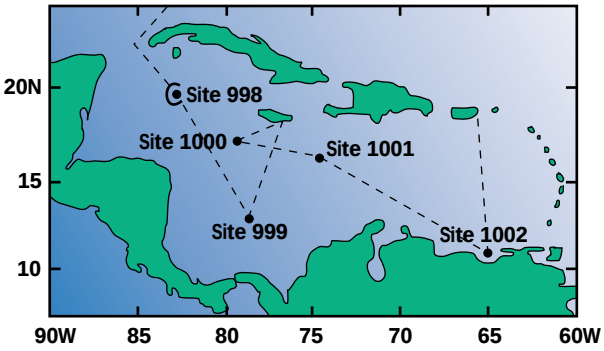

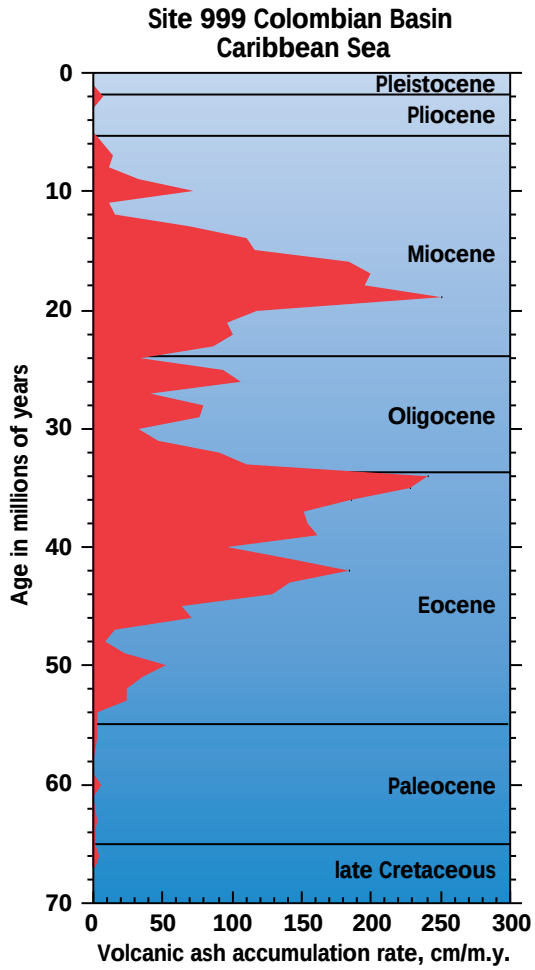

Ash layers in marine sediments are the best geologic record of explosive volcanism. One of the important findings made by DSDP and ODP drilling is the discovery that the frequency of ash layers in the sedimentary record at sites close to volcanic arcs is not uniform, but highly episodic. The cause of this episodicity in explosive volcanism remains an unsolved problem. Drilling during ODP Leg 165 in the Caribbean has provided a near-complete recovery of 76 million years of sedimentation, containing a rich record of episodic explosive volcanism from the Central American arc, in the form of over two thousand silicic volcanic ash layers. The largest episode begins in the early Miocene (21 Ma) and terminates in the middle Miocene (11 Ma), derived from intense ignimbrite volcanism on the Chortis Block in Central America. A second major episode extends from middle Eocene to earliest Oligocene (45 to 33 Ma), also attributed to Chortis Block ignimbrite activity in the Central American arc. A third explosive volcanic episode occurs in early Eocene (50 Ma), derived from volcanic arc activity on the Cayman Ridge. The Caribbean ash layer record of explosive episodes is the largest and most complete recovered to date, and on-going research on this record will help resolve the causes of this episodicity.

Explosive volcanism plays a fundamental role in the exchange of material and energy from the Earth's interior to the hydrosphere and atmosphere, and major explosive events can perturb the Earth's climate on time scales of one to five years, generally resulting in net global surface cooling. Historical eruptions do not, however, represent the range of intensity and magnitude of explosive volcanism. Deposits in the geologic record provide compelling evidence for eruptions that have been orders of magnitude larger than ones witnessed by mankind. Thus many of the Caribbean volcanic ash layers represent enormous explosive eruptions that dispersed fine ash and aerosols through the atmosphere over tens of thousands of km.^{2} Future studies of the ash layers recovered by Leg 165 will provide insights into 1) the potential linkage between episodes of explosive volcanism and climate change, and 2) the ultimate cause of regional and global variations in the rate of explosive volcanic activity.