

Constraining the Timing and Chemical Composition of the Mid Sixth Century Submarine Volcanic Eruptions Between 45 North and 30 South

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Historical records between 533 and 544 indicate that many large volcanic eruptions caused major environmental cooling. Our study of the GISP 2 ice core from Greenland indicated the presence of dacite and rhyolite ash along with tropical diatom assemblages. The latter are inferred to come from tropical submerged volcanoes. Our research focus is investigating the chemical composition and volcanism of submarine volcanoes, because most of their eruptive history and chemical composition is poorly known. We studied the top 30 cm of nine cores from Lamont Core Repository, from which we were able to obtain SEM images and EDS XRF chemical analyses by using an electron microscope on the grounds of City College. We split our most promising cores among the group, hence I was allocated the VM33-116 and RC12-209 cores. Core VM33-116 is located in the Bougainville Trench in the Pacific Ring of Fire. EDS XRF analyses of the 25-26 cm layer determined it to be a rhyolite. The chemical composition of ash from the central Bismarck seamount near VM33-116 was previously unknown, and the new data may constrain its composition. Core RC12-209 is located in the Tonga Arc in the Pacific Ring of Fire. Chemical analysis of the 25-26 cm layer by EDS XRF found an iron rich dacite. The ash from RC12-209 is dacitic, similar to that of Fonualei volcano, located around 150 kilometers away. Most significantly, EDS XRF analyses of inferred equatorial ash from the GISP 2 ice core dating to 541.3 ± 0.26 C.E. match an EDS analysis of dacitic glass from RC12-209. We found pumice fragments in RC12-209 exceeding 3 cm in diameter, as well as the mineral olivine. Olivine can form when a more basic magma interacts with a more silicic magma. Such interaction might also explain the high Fe content of the dacite (4% FeO at 74% SiO₂). El Ilopango has been credited with the eruption of 541 for the past decade, however recent publications have disproved this claim, leaving the question unanswered.