

Increased Biological Productivity and the Appearance of Black Foraminifera due to Large, Low-Latitude Volcanic Eruptions in the Past 150,000 Years

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Volcanic eruptions deposit Fe bearing volcanic ash in the ocean, thereby increasing biological productivity. The increased organic matter in areas of high biological productivity uses up oxygen as this organic matter decays and sinks through the water column. Past living beings, like foraminifera, ate organic matter that was carbon-rich and sometimes had metals absorbed to their carbon, creating coatings inside and outside their shells. These coatings can tell us about how the biological productivity was affected before, during, and after volcanic eruptions. The studied cores are from the northwest Pacific Ocean, and they are close to geologically young volcanoes that are not well understood. The two cores that we focused on were VM28-309 and VM36-15 both taken by the Vema research ship. We studied the relationship between ash deposition and biological productivity by looking at all the ash layers in both cores. We found that in most of the ash layers there were black or dark-colored foraminifera with coatings inside and outside the shells that were often carbon-rich and sometimes metal-rich. We attribute this coating to the increase of organic matter in surface waters when there was deposition of large amounts of volcanic ash. We also found high concentrations of Barium in VM28-309. Barium (Ba) is a marker for biological productivity because most or all Ba originates from the organic matter contained in sediments. We found that ash layers containing the finest materials (<38 micrometers in size) had the highest Ba content. For accurate results we must sample above and below ash layers and select more sediment cores in the area. Also, Barium corrections must be corrected using data on biogenic silica contents. Loss on ignition (LOI) data will give us an estimate of the total organic carbon in each sample-allowing a second direct assessment of the increase in biological productivity produced by the deposition of volcanic ash.