V41D-0143 Evidence for Increases in Biological Productivity from Deposition of Volcanic Ash near Low Latitude Volcanoes Located Outside the Gyres

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Some satellite data show an increase in ocean chlorophyll in areas affected by volcanic eruptions. These increases in ocean color are thought to reflect an increase in photosynthetic activity by phytoplankton. These increases in primary production have been attributed to iron (Fe) from volcanic ash, particularly in high-latitude regions where primary productivity is limited by low Fe (the iron fertilization hypothesis). However, photosynthesis also appears to increase in the tropical ocean, for example in the Sunda and Ryukyu arcs and the Bismarck Sea, areas usually not thought to be iron limited. To examine the effects of volcanic ejecta on productivity in other areas, we examine relationships between ash deposition and biological productivity in three cores, RC14-44 (Sunda arc), VM28-309 (Ryukyu arc) and VM33-116 (Bismarck Sea). These cores contain volcanic ash layers with black or dark-colored foraminifera, different from the bright white foraminifera found outside of the ash layers. This dark coloration results primarily from organic carbon. In RC14-44, some foraminifera are coated with FeS and also contain high amounts of internal carbon. In VM28-309 and VM33-116, some foraminifera are filled with organic carbon rich materials, or have coatings rich in carbon. Occasionally, there are local enrichments in Fe within the foraminifera, indicative of extensive redox cycling. We attribute this carbon to increased biological productivity in these intervals. Barium (Ba) concentrations, a proxy for primary productivity because most or all Ba originates from organic matter contained in the sediment, is also enriched by up to 30-fold in the sediments containing ash. The ash layers with the highest amounts of fine material exhibit the largest enrichments in Ba, suggesting ash texture may influence the resulting changes in marine productivity. Overall, we find clear evidence that ash depositions increase both primary production and carbon export to sediments. Loss on ignition (LOI) and biogenic silica contents between and within ash layers, are potentially useful to further examine both the coupling between production and carbon burial, and the influence of ash deposition on phytoplankton community structure.