

Title: Understanding the Transport of Patagonian Dust and its Influence on Marine Biological Activity in the South Atlantic Ocean

Matthew Johnson¹, Nicholas Meskhidze¹, Velayudhan Praju Kiliyanpilakkil¹, Santiago Gassó²

¹ Marine Earth and Atmospheric Science, North Carolina State University, Raleigh, NC, USA

² Goddard Earth Science and Technology Center, University of Maryland Baltimore County, Baltimore, Maryland, USA

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Friendly Abstract: Modeling and remote sensing techniques were applied to examine the horizontal and vertical transport pathways of Patagonian dust and quantify the effect of soluble-iron-laden mineral dust deposition on marine primary productivity in the South Atlantic Ocean (SAO) surface waters. The global chemistry transport model GEOS-Chem, implemented with an iron dissolution scheme, was applied to evaluate the atmospheric transport and deposition of mineral dust and bioavailable iron during two dust outbreaks originating in the source regions of Patagonia. In addition to this “rapidly released” iron, offline calculations were also carried out to estimate the amount of bioavailable iron leached during the residence time of dust in the ocean mixed layer. Model simulations showed that the horizontal and vertical transport pathways of Patagonian dust plumes were largely influenced by the synoptic meteorological patterns of high and low pressure systems. Model-predicted horizontal and vertical transport pathways of Patagonian dust over the SAO were in reasonable agreement with remotely-sensed data. Comparison between remotely-sensed and offline calculated ocean surface chlorophyll-*a* concentrations indicated that, for the two dust outbreaks examined in this study, the deposition of bioavailable iron in the SAO through atmospheric pathways was insignificant. As the two dust transport episodes examined here represent typical outflows of mineral dust from South American sources, our study suggests that the atmospheric deposition of mineral dust is unlikely to induce large scale marine primary productivity and carbon sequestration in the South Atlantic sector of the Southern Ocean.