Long-Term Records of Dust Transport over the North Atlantic Ocean Based on Measurements Made at Island Stations

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The University of Miami aerosol group has operated a network of aerosol sampling stations in the North Atlantic for decades. Measurements started on Barbados in 1965 and in Miami in 1974. In the mid 1980s, as a part of the AEROCE program, measurements were extended to five other sites in the North Atlantic. All stations followed a protocol of daily measurements. Among the measured species were nss-sulfate, nitrate, and mineral dust. Dust concentrations show large variability on time scales ranging from a day to decades. We find that the variability is linked to a variety of factors including climate variables (e.g., ENSO, drought in Africa) and, possibly, land-use in the source regions. Nitrate and nss-sulfate show great short-term variability at all sites. Especially notable is the impact of pollution events at many stations, evident as "spikes" in the concentrations. The longer term record at Bermuda and Barbados suggest that sulfate transport has decreased substantially since the late 1980s, a reflection of decreasing emissions in the US and Europe. In contrast, there is no evidence of any substantial change in nitrate concentrations. In closing my review, I will comment on the importance of long-term measurement programs and the need to ensure that such measurements continue in the North Atlantic in coming decades.

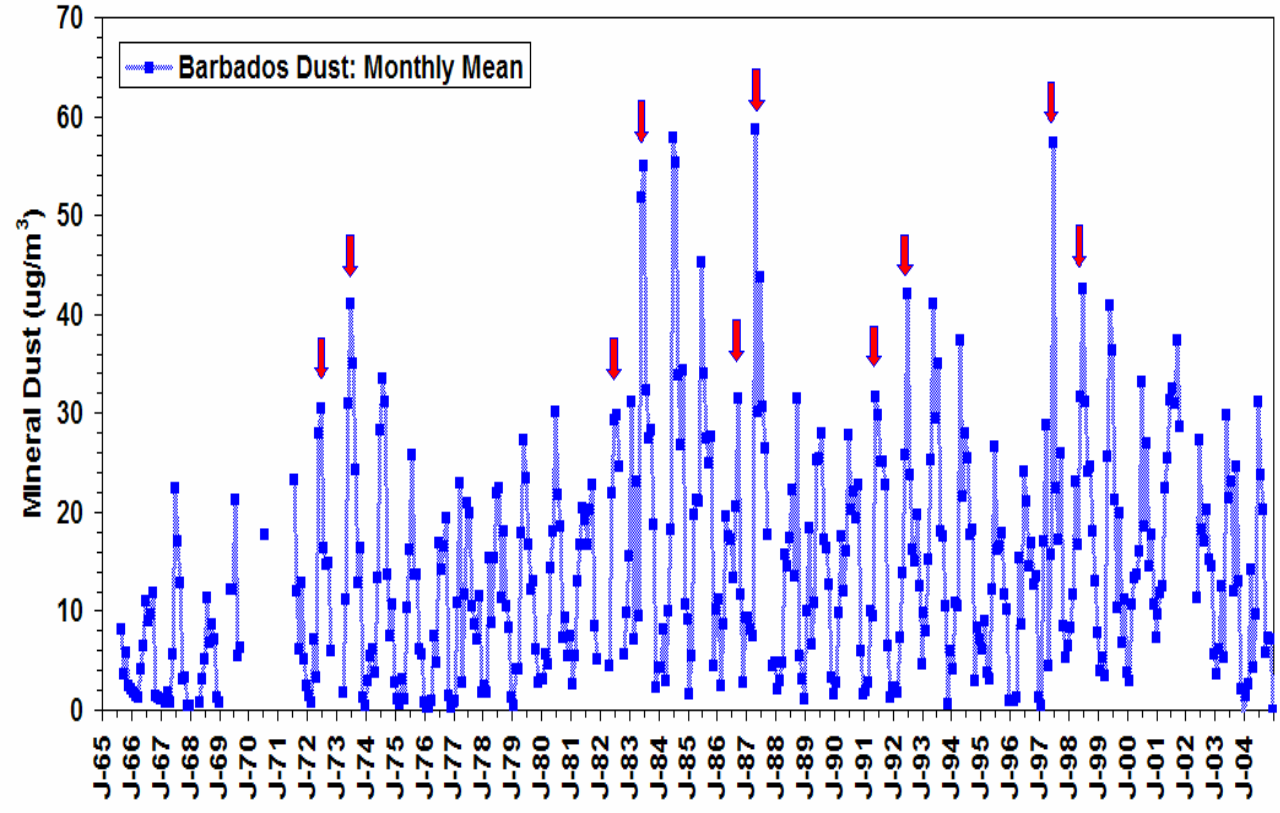

Figure 1. Monthly mean mineral dust loading at the Barbados AEROCE station for the years 1965-2004.