Impact of African Dust on Tropical Atlantic Climate and Extreme Weather

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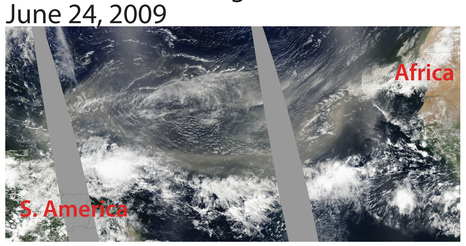
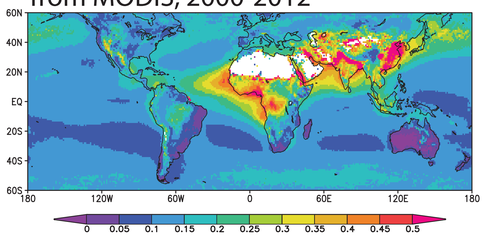
Objective: Quantify the impacts of African dust aerosols on decadal-multidecadal climate variability and hurricane activity in the tropical Atlantic.

Dust in the tropical Atlantic

Visible satellite image from MODIS
June 24, 2009

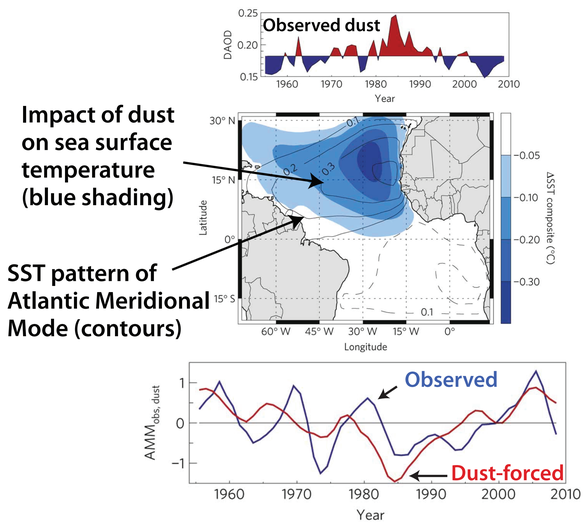


Annual Mean Aerosol Optical Depth
from MODIS, 2000-2012



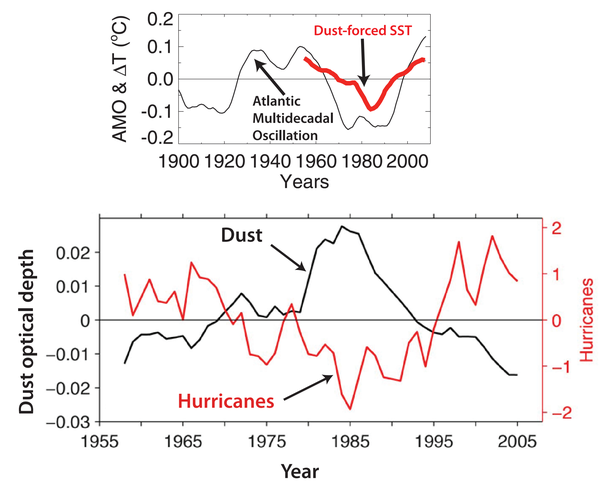
- Sahara/Sahel is the largest source of mineral dust on the planet. Most is blown westward over the tropical Atlantic Ocean.

Dust as a Trigger for Tropical Atlantic Decadal Variability



- The amount of dust blown into the tropical Atlantic changes from one decade to the next. Associated changes in surface radiation drive decadal fluctuations of tropical Atlantic climate.

Multidecadal Fluctuations of Dust and Tropical Atlantic Climate



- Dust-forced changes in SST are an important component of the Atlantic Multidecadal Oscillation. Multidecadal changes in dust are strongly anticorrelated with Atlantic hurricane activity.

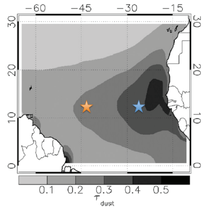
FUTURE WORK

Dust Deposition Moorings

Aerosol Collector

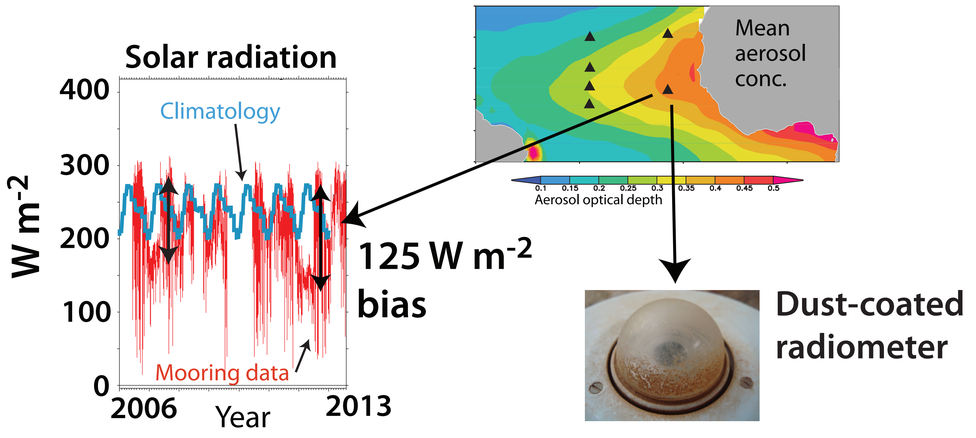
T-Flex Buoy

Locations of Planned Dust Deposition Moorings



- We are working with our partners at Scripps and NOAA/PMEL to develop an automated dust deposition mooring and deploy two of them in the tropical North Atlantic.

Biased Measurements from PIRATA Moorings



- Dust buildup on PIRATA solar radiometers leads to large negative biases. We are developing an automated cleaner that will rinse the radiometer domes periodically while deployed at sea.