Video of Saharan dust inputs into Amazon Basin.

Use hyperlink below.

Video: Sahara Dust Inputs into Amazon Basin

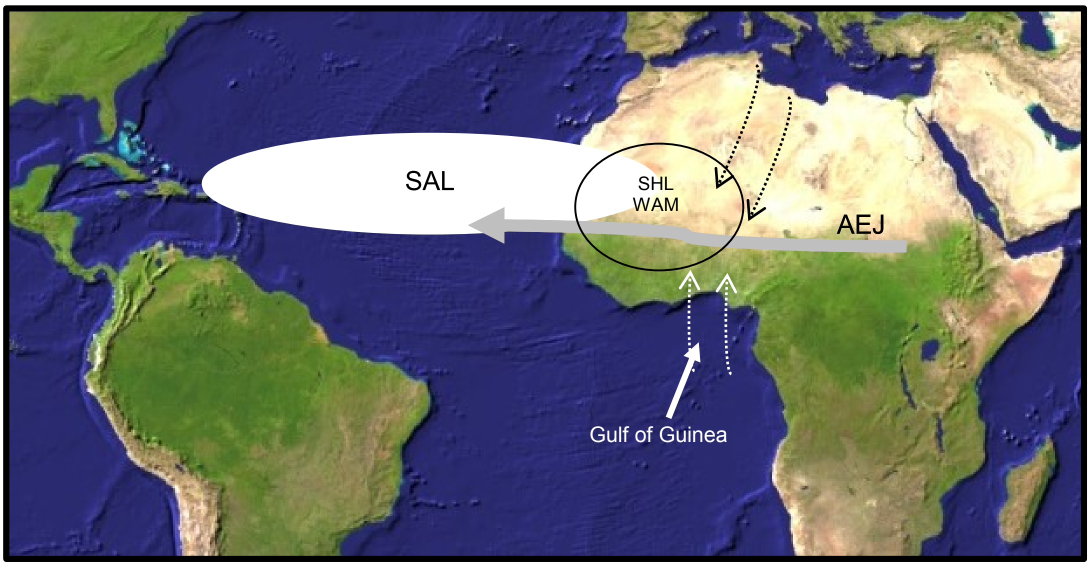
This is a 3 minute video produced by NASA using LIDAR technology to show the movement of the Saharan Air Layer (SAL). It contrasts from the activity in that it emphasis the essential element phosphorous and its deposition into the Amazon Basin. However, the take-home points are identical to the calcium and Puerto Rico story from the AGI activity.

It is important to note that tropical ecosystems like the Amazon basin often lose critical nutrients due to hydrological processes and run-off. Thus inputs like these that enter via the SAL are essential to replenishing the lost stocks of nutrients.

Light Detection and Ranging (LIDAR) is a type of remote sensing and satellite technology that uses light to make high-resolution maps of Earth. LIDAR is the light equivalent of sonar.

Please see the following web-page from another Critical Zone AGI activity based on using LIDAR technology within Critical Zone Observatories.

http://criticalzone.org/national/publications/ pub/harpold-agi-lidar-handout

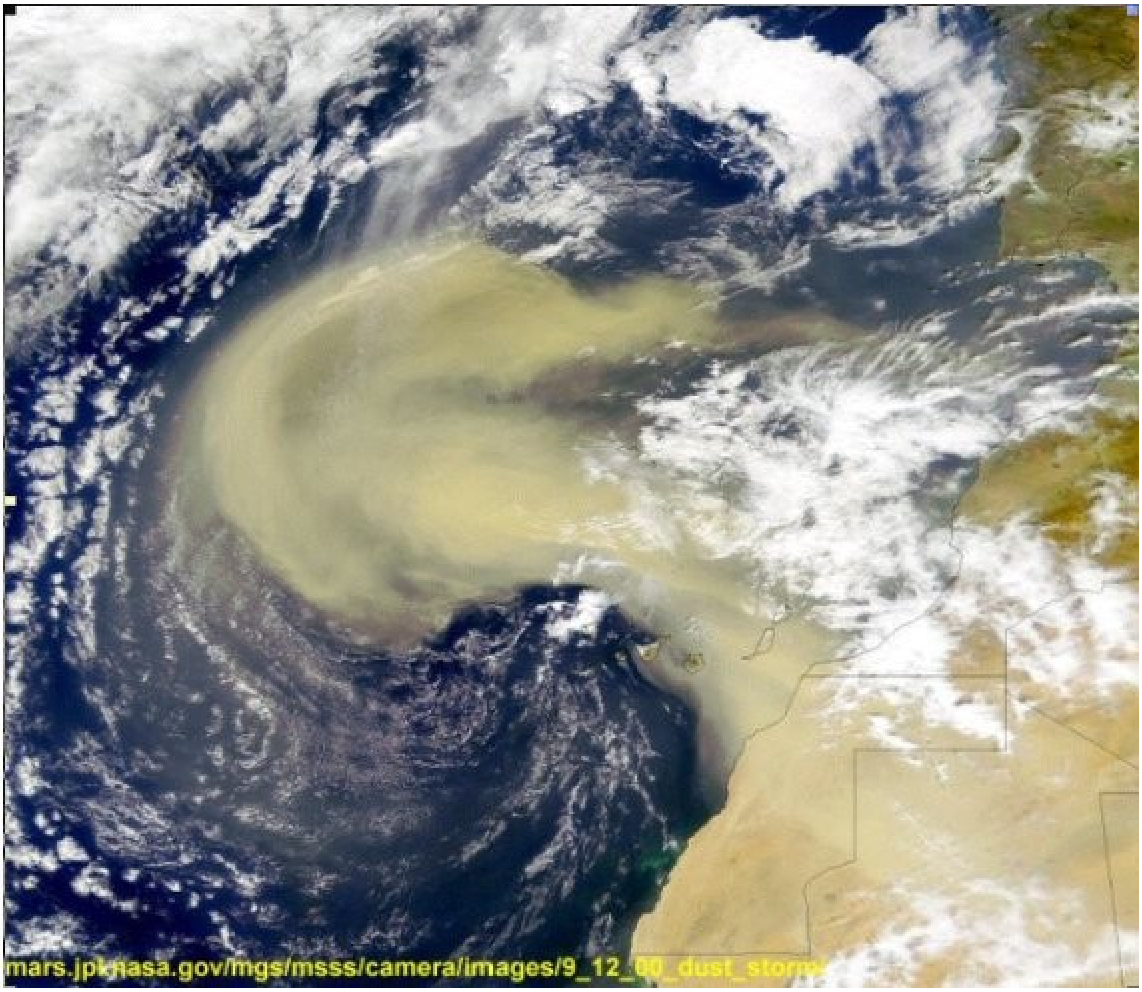


Page 1: Part I Fig A.

Adapted from: Introduction to Tropical Meteorology. 2nd Edition

Chapter 3: Global Circulation

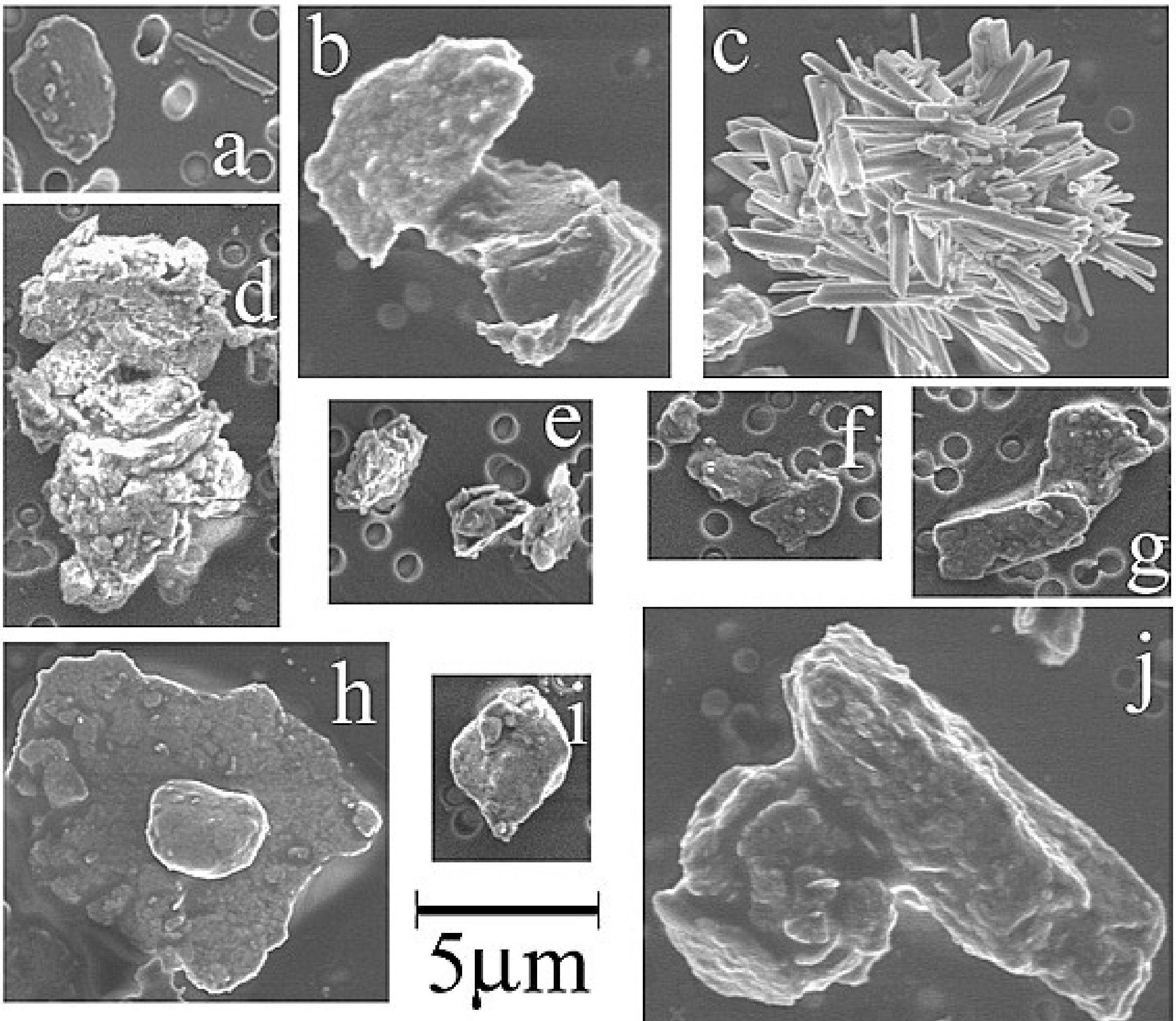
Produced by The COMET Program: http://www.comet.ucar.edu/



Page 1: Part I Fig B.

http://capita.wustl.edu/CAPITA/CapitaReports/031001IntercontinentalDustTransport/IntercontDustTransport.htm

Page 1: Part I Fig C.



Page 1: Fig C.

Detailed electron micrographs of individual dust particles common to the Saharan Air Layer and that arrive in Puerto Rico.

Reid EA, Reid JS, Meier MM, Dunlap MR, Cliff SC, Broumas A, Perry K, Maring H. 2003. Characterization of African dust transported to Puerto Rico by individual particle and size segregated bulk analysis. Journal of Geophysical Research. 108: doi:10.1029/2002JD002935
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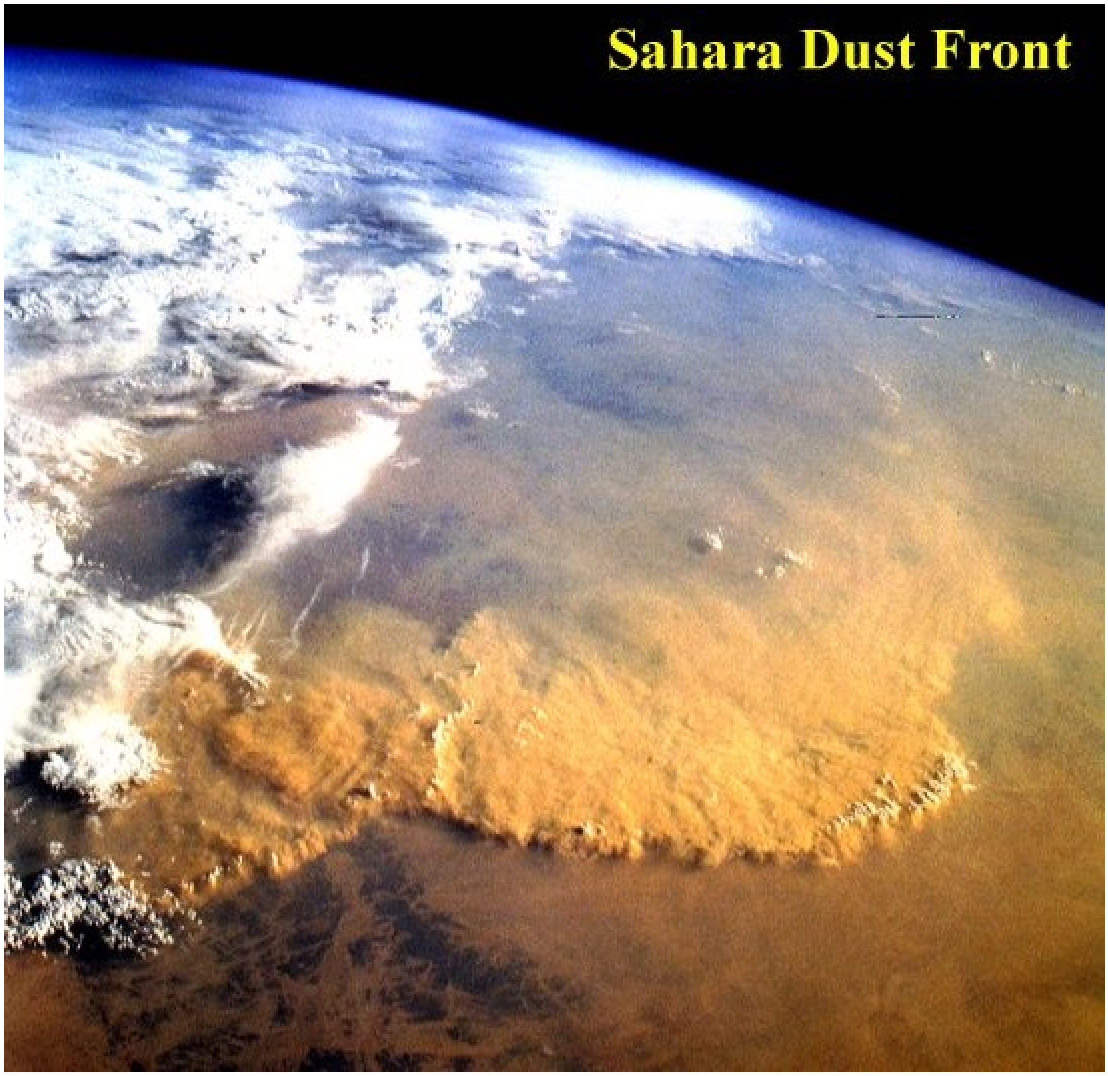
Supplementary Figure 1: Dust storm on mars. Notice the formation of the dust-jet similar to the African Easterly Jet (AEJ) from the African continent.

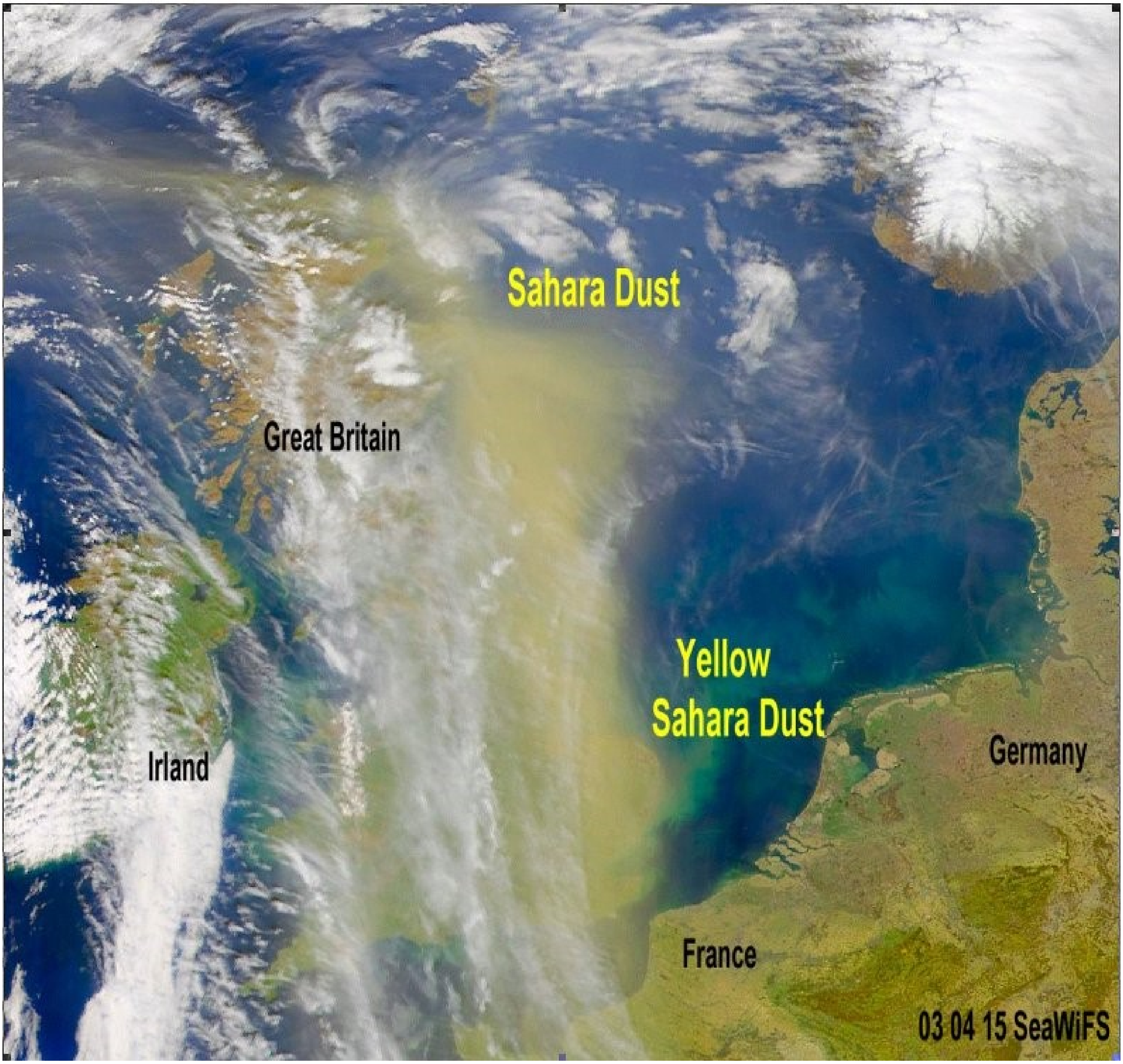
Extension: Have students discuss how this observation supports the hypothesis that Mars did/does/could support life.

http://capita.wustl.edu/CAPITA/CapitaReports/031001IntercontinentalDustTransport/IntercontDustTransport.htm



Supplementary Figure 2: Satellite image of dust storm moving west across Africa. Dust front is moving towards lower right hand corner of image.

http://capita.wustl.edu/CAPITA/CapitaReports/031001IntercontinentalDustTransport/IntercontDustTransport.htm



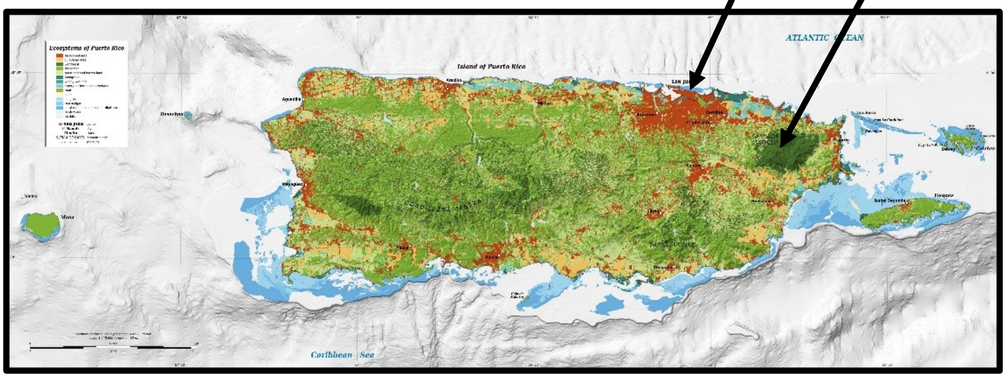
Supplementary Figure 3: Saharan dust arriving over the United Kingdom. March, 2003.

http://capita.wustl.edu/CAPITA/CapitaReports/031001IntercontinentalDustTransport/IntercontDustTransport.htm

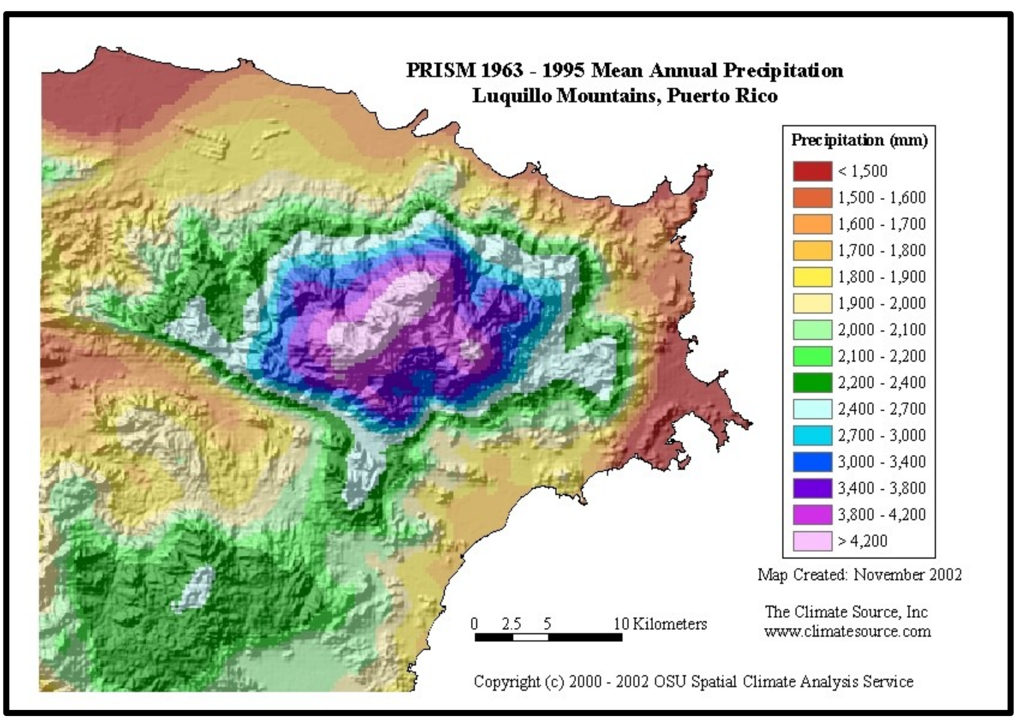
Page 2: Part II Fig A.
The Luquillo Mountains, Puerto Rico

http://criticalzone.org/luquillo/infrastructure/field-area/northeastern-puerto-rico-and-the-luquillo-mountains/

Page 2: Part II Fig B.



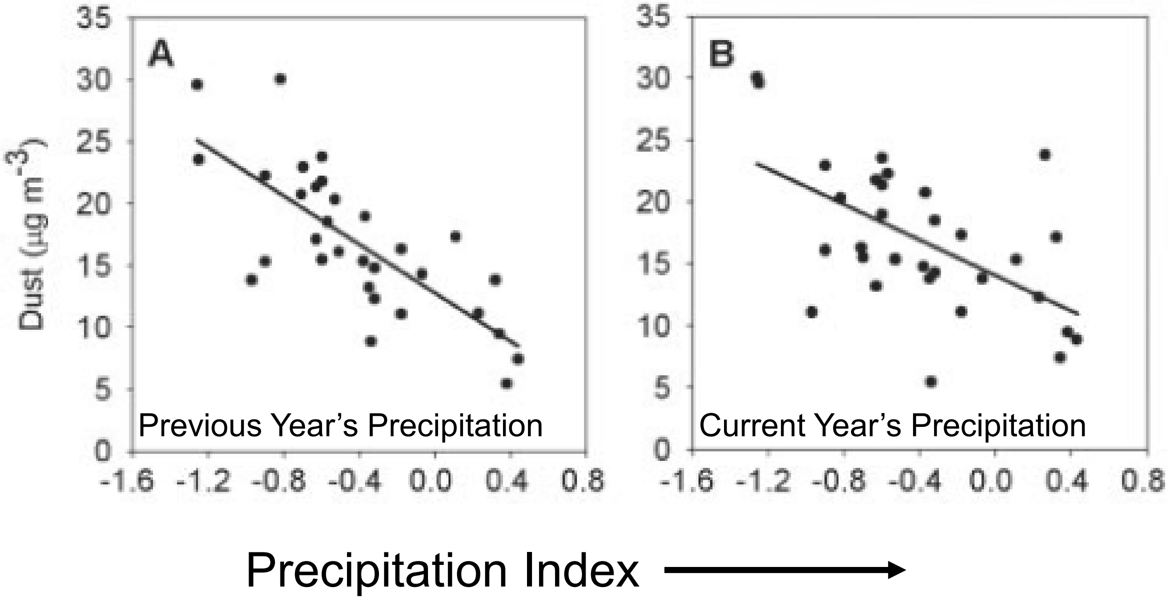
http://en.wikipedia.org/wiki/Geography_of_Puerto_Rico



http://www.climatesource.com/pr/fact_sheets/fact_precip_pr.html

Page 2: Part II Fig C.

Page 2: Part III Fig A.



These scatter plots are from Prospero and Lamb (2003): African droughts and dust transport to the Caribbean: climate change implications. Science 302: 1024-1027.

These dust measurement come from the island of Barbados.

The x-axis (***independent variable***) is a composite precipitation measurement describing precipitation in the Sahel. The important feature of the independent variable is that precipitation increases going from left to right.

The y-axis (***dependent variable***) shows mean dust loads from May-September in Barbados.

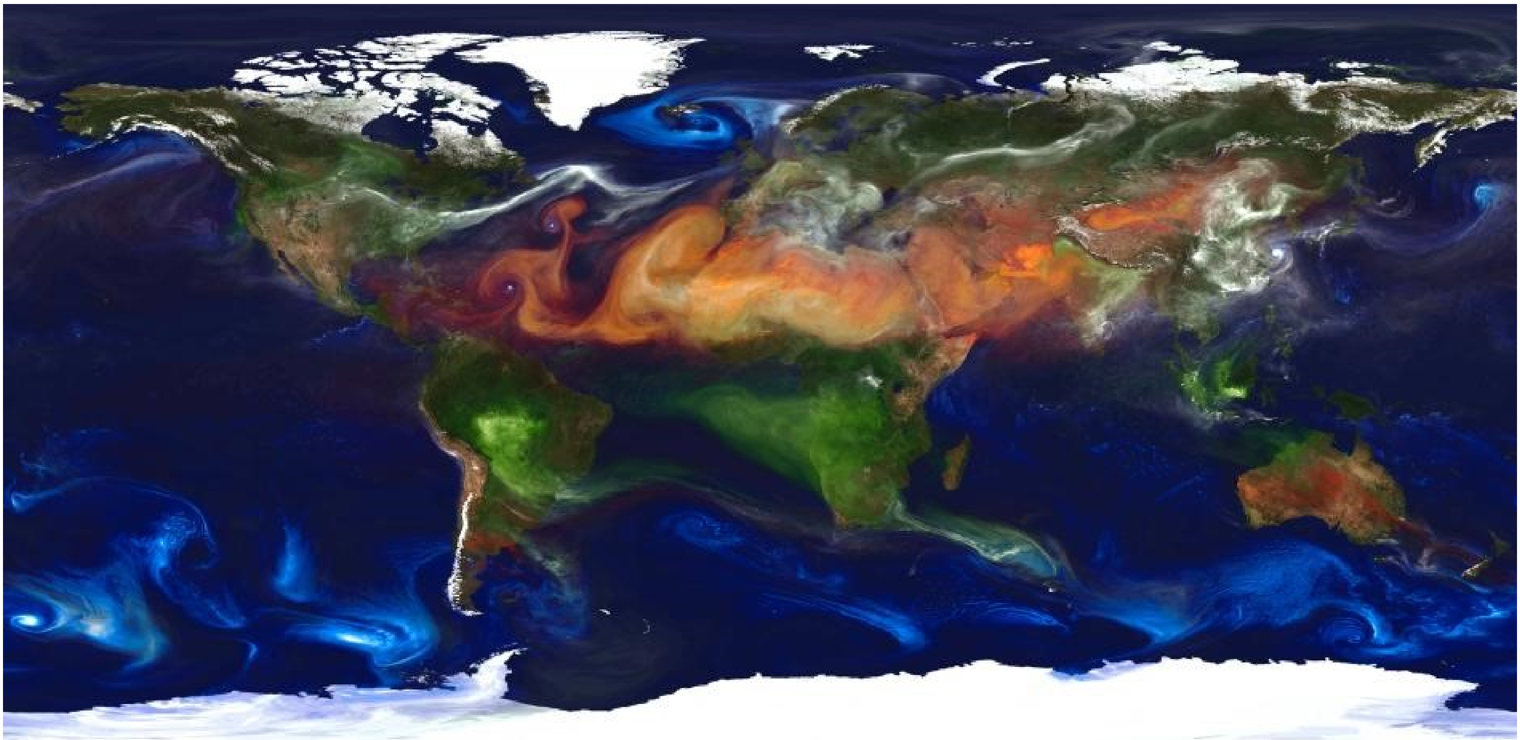
Panel A correlates dust loads against previous year's precipitation index.

Panel B correlates dust loads against current year's precipitation index.

These data show a strong relationship between rain patterns in the Sahel and the amount of dust exported to the Caribbean.

Students can use these data to formulate new hypotheses regarding the relationship between future changes in precipitation in North and West Africa, nutrient inputs into the Caribbean and Amazonia, and subsequent changes in primary production of these rainforest ecosystems.

Page 2: Part III Fig B.



http://gmao.gsfc.nasa.gov/animations/aerosols_geos5.mov

Video requires Quicktime

Simulation of aerosols including dust (red), sea salt (blue), black and organic carbon (green) and sulphate (white) depicted from August 2006 through April 2007. Demonstrates aerosol advection by weather and predominant wind patterns.

Note: Date and time clock in upper-left corner.

Sea-salt (blue) is churned up from the ocean based on surface wind speeds, and most prevalent along mid-latitude storm tracks and frontal regions including the Southern Ocean. Dust (red) is most prominent over the Saharan Desert and can be seen interacting with Atlantic tropical cyclones during the end of the 2006 Atlantic hurricane season (*e.g. @ 15 seconds*). Organic and black carbon (green) are dispensed into the atmosphere from biomass burning, the most prominent for this period being over South America from Aug-Oct 2006, Indonesia from Sept-Nov 2006, Africa in January 2007. Sulphate (white) can be seen from two primary sources: fossil fuel emissions over Asia, Europe and the US, and from volcanic emissions. There is a persistently active volcanic emission from Mt Nyiragongo in the Democratic Republic of the Congo, Africa, and then a large eruption from the Karthala Volcano on Grand Comore Island, Comoros in January of 2007 (@ 1:57).

Adapted from: http://gmao.gsfc.nasa.gov/research/aerosol/