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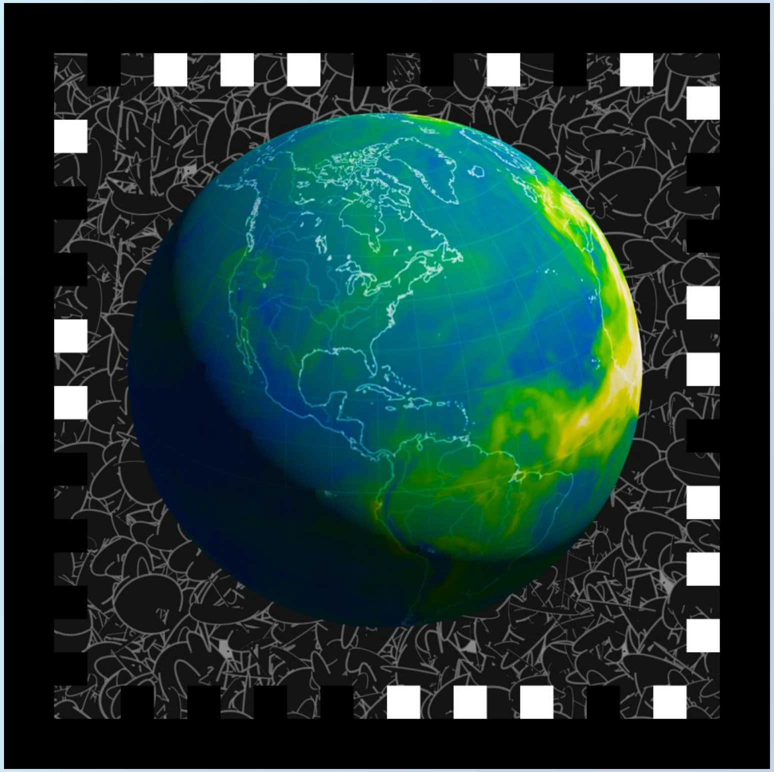
To learn more about this science topic visit the Exploring Atmospheric Dust and Climate website: scied.ucar.edu/atmospheric-dust-climate

SIParCS

This project is sponsored by the NCAR 2016/2020 SIParCS Internship Program.

Developers:
Nihanth Cherukuru, Shiqi Sheng

Science Topic: Dust and Climate (Part I)



Data description: The Dust and Climate (Part I) visualization was created using model data from Nullschool. Part I shows the circulation of dust in Earth's atmosphere throughout one calendar year (2018). The animation time step is three hours. Yellow indicates a higher volume of dust, green indicates moderate dust volume, and blue indicates lower dust volume.

Visualization: Cameron Beccario, nullschool.net

Dust is fine-grained sediment that erodes from rocks on the land, is carried into the atmosphere by wind, and eventually settles back onto the land and into the ocean. At any time, there is between 17-20 million tons of dust in the atmosphere.

Some places on Earth are dustier than others – notice that there is more dust around the desert regions. The Saharan Desert is the largest source of dust in the world! Dust moves in predictable patterns because it is carried by the winds, and some places, like the Atlantic Ocean, end up with more dust than others. Certain times of year are dustier, too. From about February through May, the Northern Hemisphere is really clouded with dust!

Scientists have known for a long time that dust in the atmosphere influences cloud formation, and that this can affect storms and surface temperatures. But we now understand how iron-rich dust deposited in the ocean can help to cool the climate by stimulating the growth of phytoplankton that remove carbon dioxide (CO_2) from the atmosphere during photosynthesis. When there is more dust, there is also more CO_2 being removed from the atmosphere.

Atmospheric Dust and Climate (Parts I and II) was developed in conjunction with the NSF funded project *PIRE: DUST stimulated draw-down of atmospheric CO_2 as a trigger for Northern Hemisphere Glaciation.*

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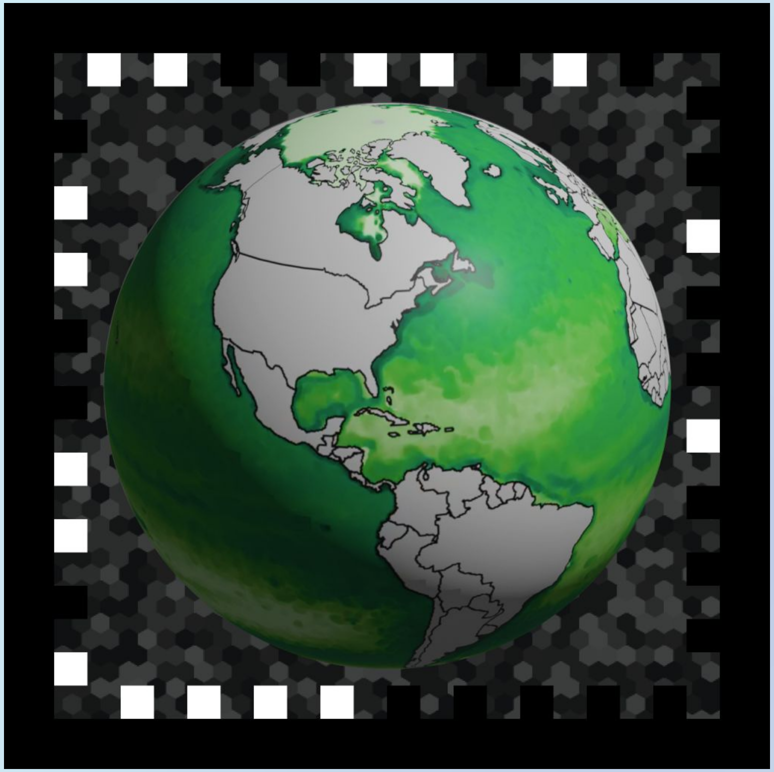
Science Topic: Dust and Climate (Part II)



Data description: The Dust and Climate (Part II) visualizations were created using model data from MIT's Darwin Ecosystem Model. Part II includes three complementary datasets that suggest how iron-rich dust entering the ocean can affect the climate: chlorophyll concentration, iron concentration, and nitrate concentration. Darker colors indicate higher concentrations. The animation time step for each dataset is every three days, throughout one calendar year(2015).
Visualization: Jonathan Lauderdale and Oliver Jahn, MIT.

Three buttons labeled CL, FE, and NI let you toggle between chlorophyll concentration (CL), iron concentration (FE), and nitrate concentration (NI).

High chlorophyll concentrations indicate places where phytoplankton are abundant. Notice that the concentration of chlorophyll (phytoplankton) changes throughout the year. When chlorophyll concentrations are high there is more carbon dioxide (CO_2) being removed from the atmosphere.

In order to live, phytoplankton need both iron and nitrate. Toggle between the iron and nitrate videos to compare iron and nitrate concentrations in two different areas – the North Pacific and the Atlantic. In the North Pacific there is not very much iron but there is plenty of nitrate. During dusty times when more iron-rich dust enters the sea there is an increase in phytoplankton. However in the Atlantic, even though iron is plentiful, there isn't very much nitrate. Adding dust to the Atlantic doesn't have the same effect on phytoplankton abundance. Dust is only part of the story!

Dust and Climate (Part II) illustrates the connections between the Earth system and climate, which help us to understand natural processes that can provide solutions to climate change.

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