

Teaching Calculus with NASA via PBL Techniques

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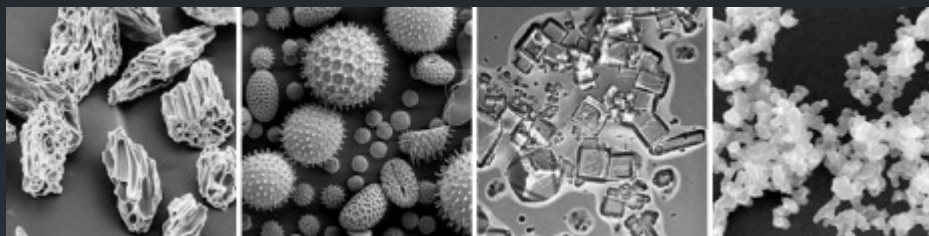
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AEROSOLS PBL

What are they ?

- Aerosols are minute particles (solid or liquid)suspended in the air (atmosphere)
- They have a short life. It is the reason of why they are difficult to study and understand
- Just like a human each particle is unique.
- They can change their size and composition and travel long distances (like African dust)
- They play a mysterious and important role in the climate change.



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Where are they coming from?

•Aerosols coming from:

- Desert dust, wildfire smoke and sea salt particles are naturally produced.
- Manmade aerosols, (anthropogenic) arising mainly from a variety of combustion sources (e.g., “smog”) like: manufacturing, farming, and transportation.



Photos of Mexico City



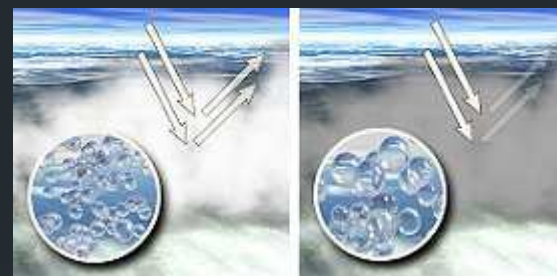
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Why are they so important?

Because , aerosols affect the Earth's energy budget (direct effect) and by modifying the cloud amount, lifetime, and microphysical and radiative properties (indirect effects).
Consequence they are changing Climate and Ecosystems.



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How?

Changing the Earth's Temperature

–Aerosols affect the Earth's energy budget by scattering and absorbing radiation (direct effect) the direct absorption of radiant energy by aerosols leads to heating of the troposphere and cooling of the surface, which can change the relative humidity and atmospheric stability thereby influencing the clouds and precipitation (semi-direct effect).

Affecting Clouds

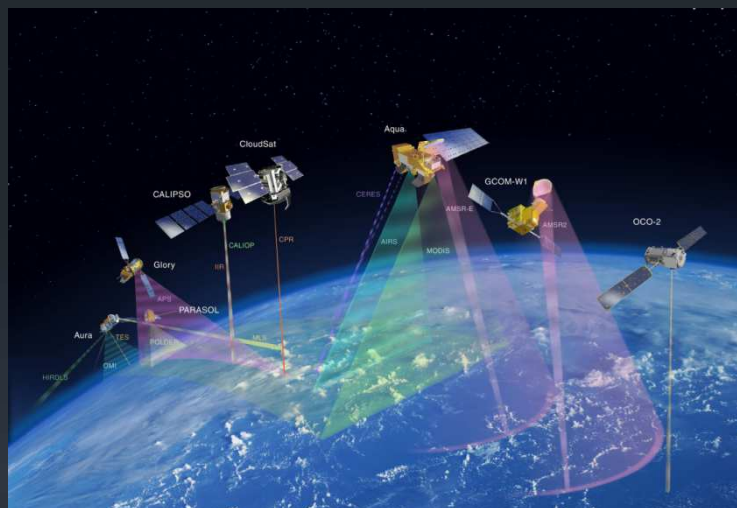
- Clouds play an important role in regulated climate.
- Without the aerosols the clouds could not exist.
- Acting as “Seeds” They can change the cloud properties making them: by modifying the cloud amount, making them bigger, brighter, and possibly also their life time.
- Aerosols can change the relative humidity and atmospheric stability there by influencing the clouds and precipitation (semi-direct effect). "e addition of manmade aerosols to the atmosphere may change the radiative fluxes at the top-of-atmosphere (TOA)

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What we need to know about them?

- Aerosol climate forcing .

The tools to reduce uncertainties are still urgently needed. improvement in measurement based systems is necessary to identify remaining outstanding issues and improve quantification of aerosol effects on climate. Improvement in modeling is necessary to confidently extend estimates of forcing to prior times and to project future emissions. Achieving these capabilities will require a synergistic approach between observational systems and modeling.



AEROSOLS PBL SCENARIO

NASA invites you to make a mathematical model that represents the implication of aerosols emissions by the “ Human activity” to the troposphere when they interact with the solar radiation incident to the Earth's surface. Identify what are the consequences in our local climate change .



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Eight steps for PBL



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Links

Aerosols & the CALIPSO satellite :

- <http://www.youtube.com/watch?v=34AXOmshQbw>

Links:

- <http://www.youtube.com/watch?v=NxjD6lXZdl8>
- <http://www.youtube.com/watch?v=2wgiy3Qo6gg>

Links from Glory:

- http://www.youtube.com/watch?v=xnQcpDeBB_M
- <http://www.youtube.com/watch?v=pavwPNbZX5Y&feature=related>

