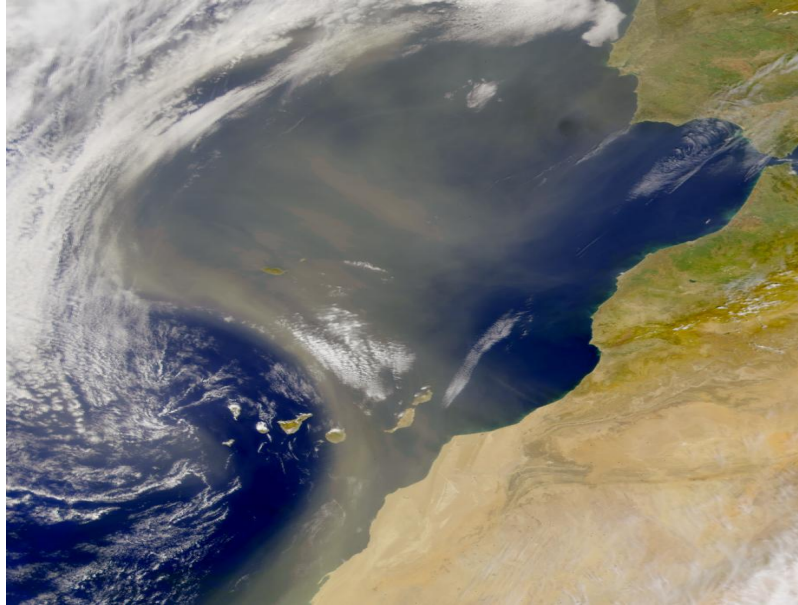




National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

A preliminary concept of a coordinated research program for the coming decade on cloud, precipitation aerosol processes



Three concepts all with emphasis on microphysics:

- I) add cloud microphysics and aerosol capability to GPM constellation spacecraft (eg *spectral polarimeter*)
- II) An aerosol element - *profiling HSRL* system and *spectral polarimeter* –
- III) Atmospheric dynamics mission - *dual frequency radar (35/94 GHz), Doppler, scan TBD* and *microwave radiometry* - emphasis on cloud and precipitation microphysics - fly with II) above - *also recognized loss of EGPM*

The NRC panel packaged this concept together with Ocean ecology (AKA ocean color) into the ‘ACE’ mission

Under study by both GSFC and JPL (directed by NASA HQ)



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US NRC Decadal Survey Recommended Mission: The Aerosol/Cloud/Ecosystems (ACE) Mission

Mission Science Objectives and Questions

- Reduce the uncertainty in cloud-aerosol-precipitation interaction through simultaneous measurement of aerosol and cloud & precipitation properties.
- Estimate the carbon uptake by ocean ecosystems through global measurements of organic material in the surface ocean layers
 - How do aerosols deposited on the ocean surface influence nutrient levels and stressors for ecosystems?
 - How do climate and habitat changes influence the productivity and elemental cycles of the global oceans?

Instrument Requirements

- Multi-beam cross-track dual wavelength lidar (cloud and aerosol profiles) **ACE A**
 - 30m vertical resolution; 532 & 1024 nm; Dual polarization
- Dual frequency (94/34GHz) Cross-track scanning cloud radar (cloud profile and characterization) **ACE B**
 - <200m vertical resolution; <1km footprint; >-30dBze Sensitivity
- Multi-angle Multi-spectral Polarimeter (cloud and aerosol properties and height) **ACE B**
 - 5 angles; 380-164 nm; >350km swath; 500m resolution
- Multi-band cross-track visible/UV spectrometer (aerosols and ocean color)
 - 2nm ozone band (317nm); 5nm resolution 345-800nm; 58.3 cross-track scanning

Mission Description

- One or more spacecraft (flying in formation) making simultaneous measurements of clouds, aerosols, and ocean biological processes
- 'Four' instruments (see below, left)
- LEO, Sun-Synchronous early afternoon orbit, to minimize sun glint and optimize passive instrument performance
- 500-650km orbit to optimize coverage, and active instrument requirements

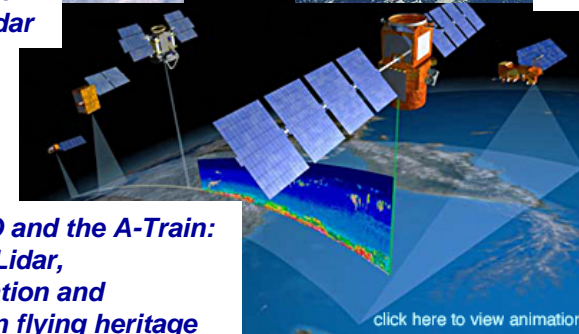
Mission Depictions



CloudSat:
Heritage for
Cloud Radar



MISR on Terra:
Heritage for
Multi-Angle
Polarimeter



CALIPSO and the A-Train:
Aerosol Lidar,
constellation and
formation flying heritage

[click here to view animation](#)