

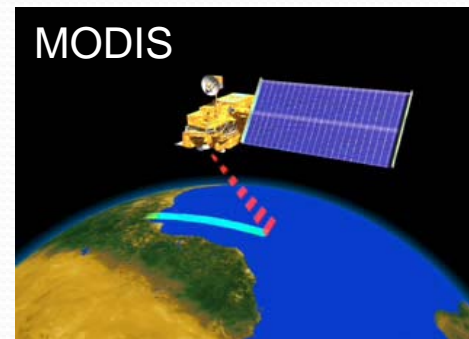
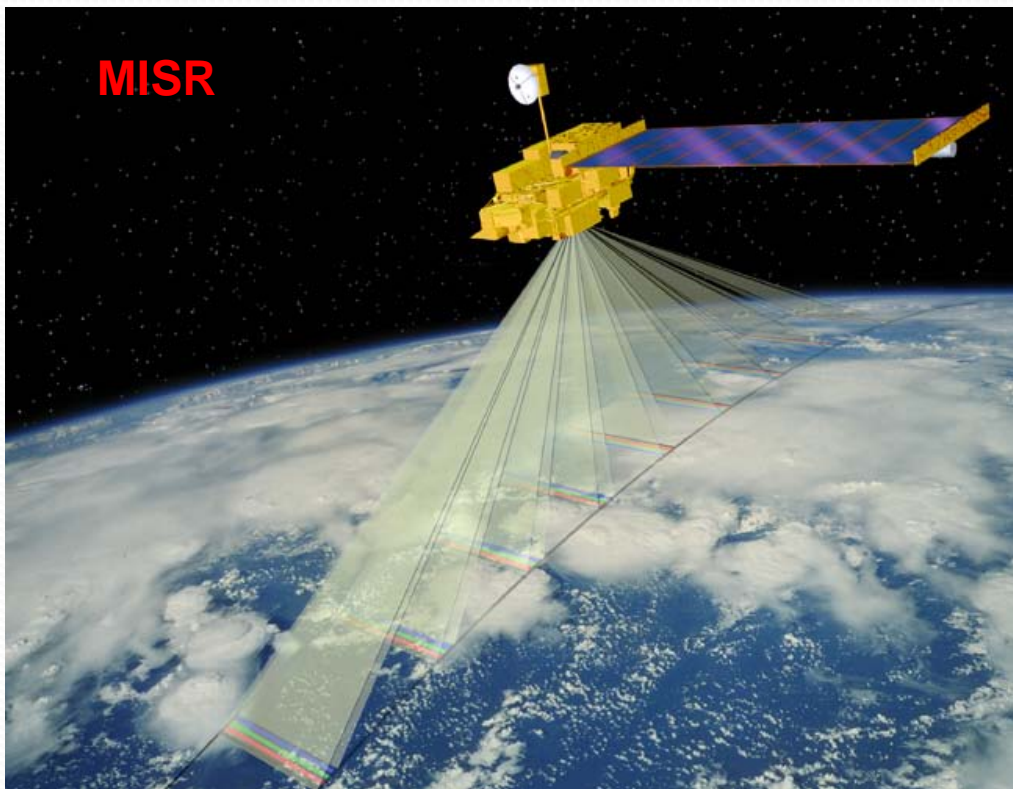
Application of HDF/HDF-EOS data to atmospheric and climate sciences at University of Illinois

Guangyu Zhao
Prof. Larry Di Girolamo

Department of Atmospheric Sciences
University of Illinois at Urbana-Champaign

Experience with HDF/HDF-EOS data

1. HDF-EOS Datasets









Experience with HDF/HDF-EOS data

1. HDF-EOS Datasets

Level-1 data

One orbit of MISR level-1 radiance product

$\sim 600 \text{ (Mb)} \times 1 + 200 \text{ (Mb)} \times 8 \sim 2.2 \text{ Gb}$

Level-2 data

One orbit of MISR level-2 cloud and aerosol products

$\sim 1 \text{ Gb}$

Level-3 data (only monthly)

11-year $\sim 100 \text{ Gb}$

As of today, over **56300** orbits of data have been collected. In total $\sim 200 \text{ Tb}$

Experience with HDF/HDF-EOS data

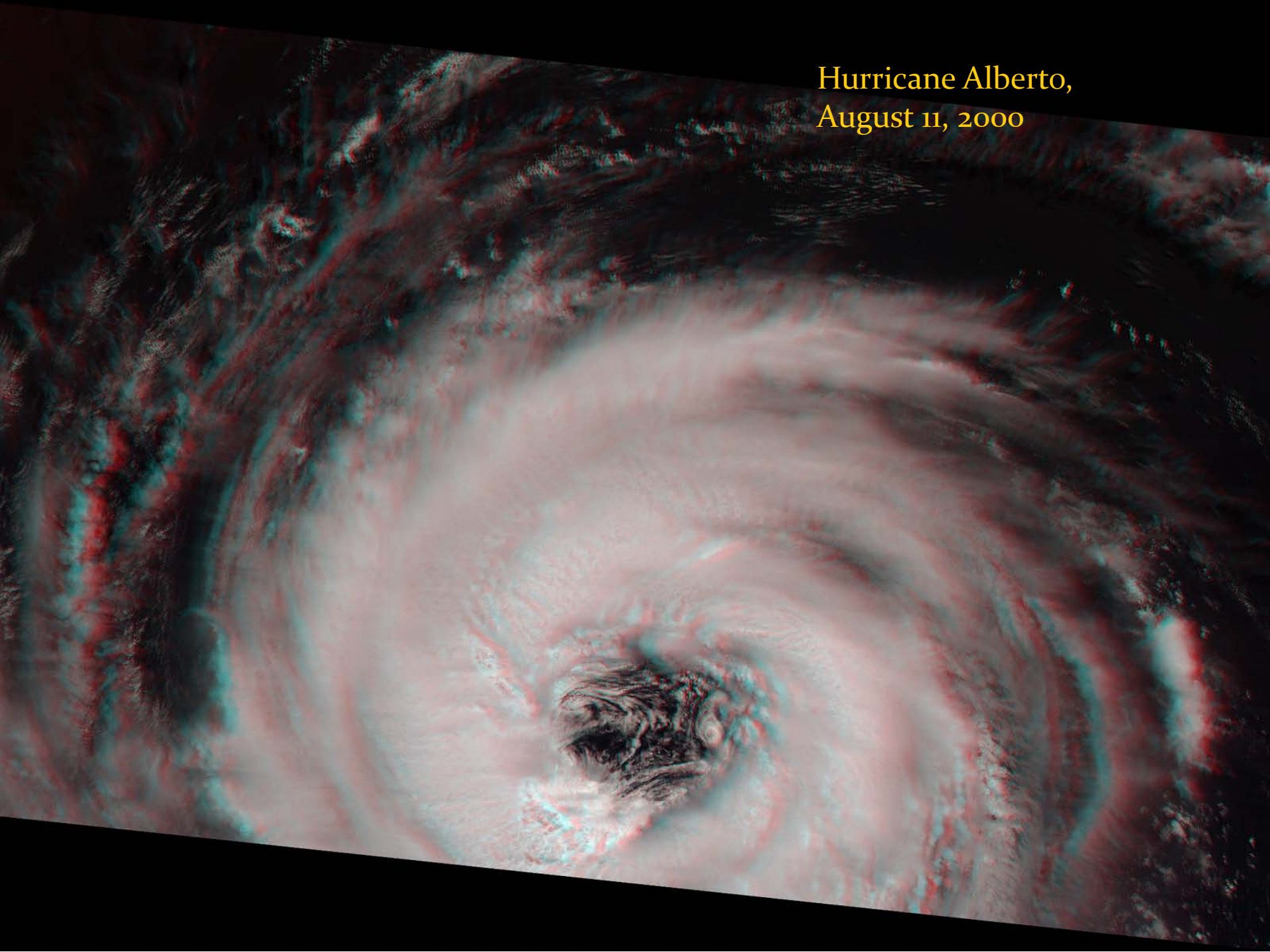
2. HDF data processing and visualization

- Format Conversion
 - HDF \leftrightarrow Binary
 - HDF \rightarrow Netcdf
- Re-projection
 - Data fusion
- Visualization
 - Image display and manipulation
 - Stereoscopic display

Passive Stereo Wall



Hurricane Alberto,
August 11, 2000



Experience with HDF/HDF-EOS data

3. Computer languages

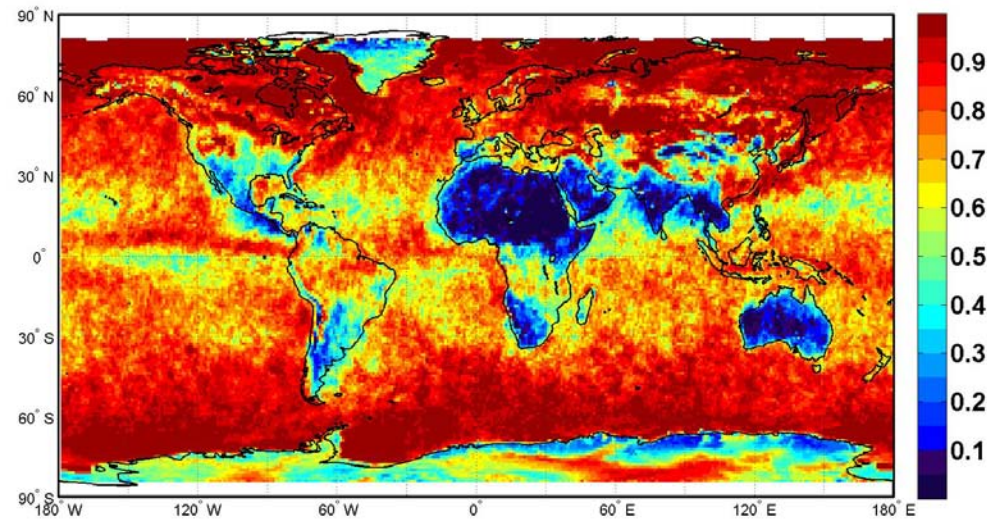
- C/C++, Fortran (...<-shell scripts), Python
- Matlab

4. Computer support from JPL

- HDFscan, MISR toolbox...

Example : winter global map of cloud cover producing

RCCM CF



Data ordering from DAAC

3 month Level-1B data [2.5 Tb]

Applying cloud mask algorithm

Level-2 cloud mask product [75 Gb]

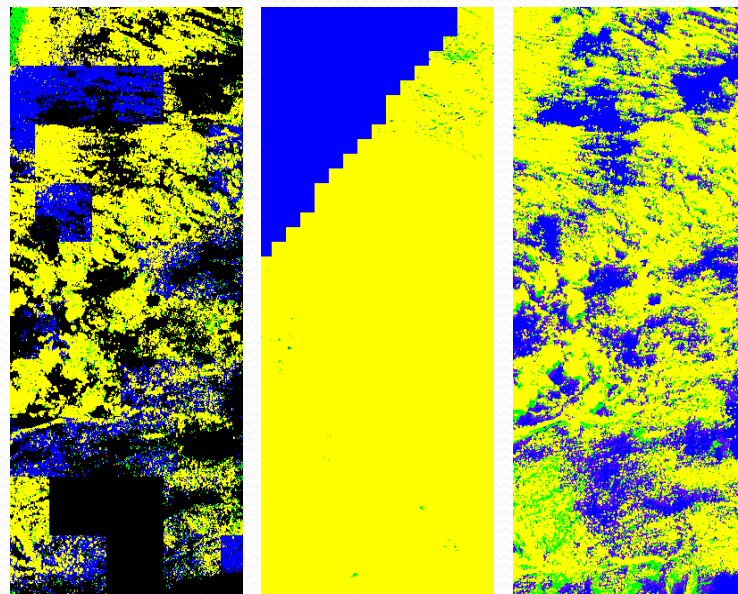
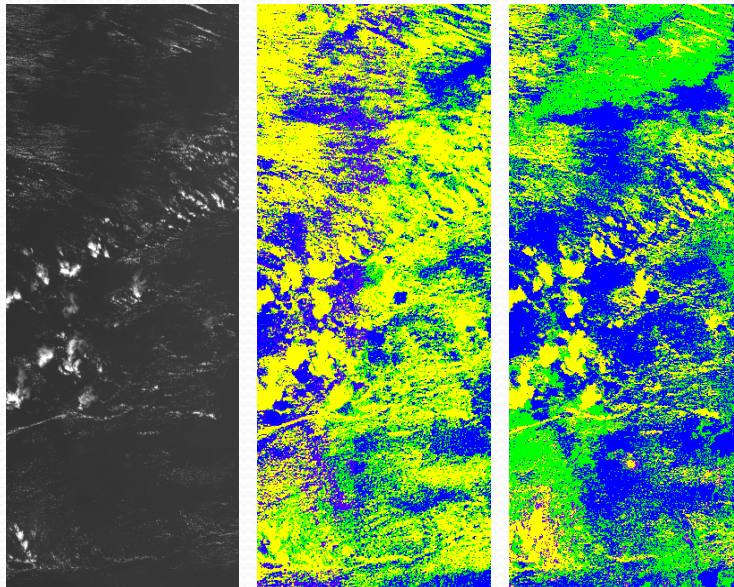
Level-3 cloud cover [20 Mb]

Example : winter global map of cloud cover

validating

MISR

MODIS



Data ordering from DAAC

3 month Level-1B data [2.5 Tb]

Applying cloud mask algorithm

Level-2 cloud mask product [75 Gb]

Level-3 cloud cover [20 Mb]

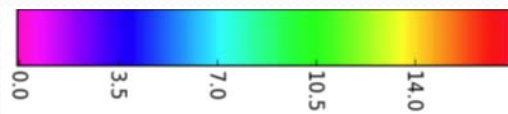
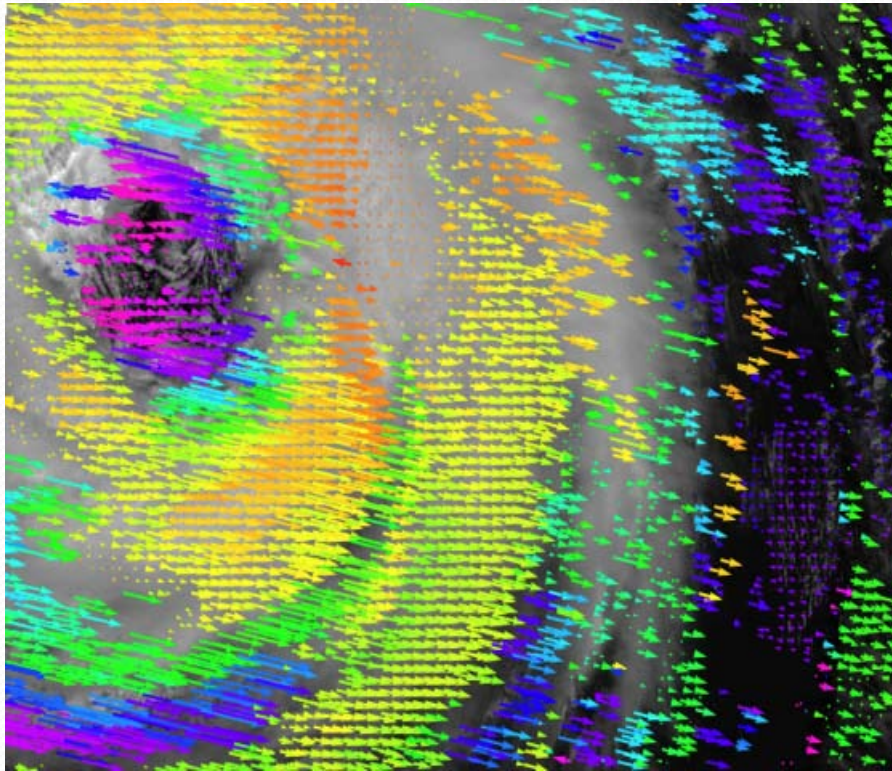
Application of HDF/HDF-EOS data

➤ Algorithm Development

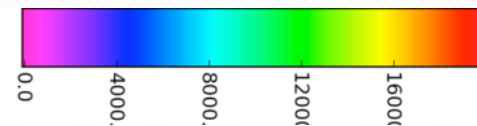
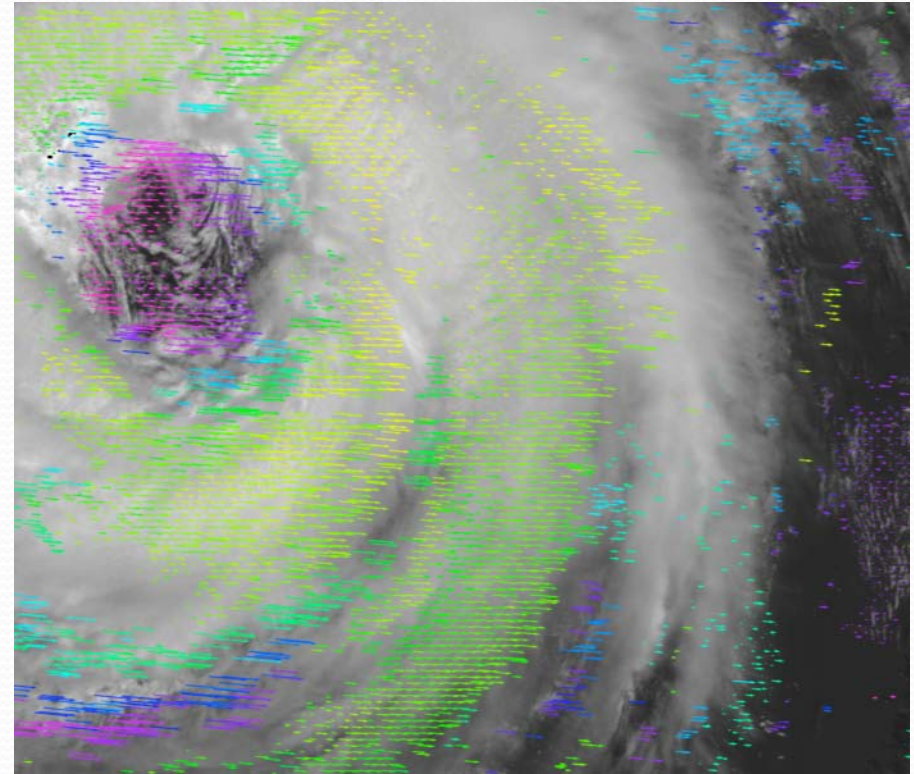
➤ Science Exploration

Algorithm Development

Winds [m/s]



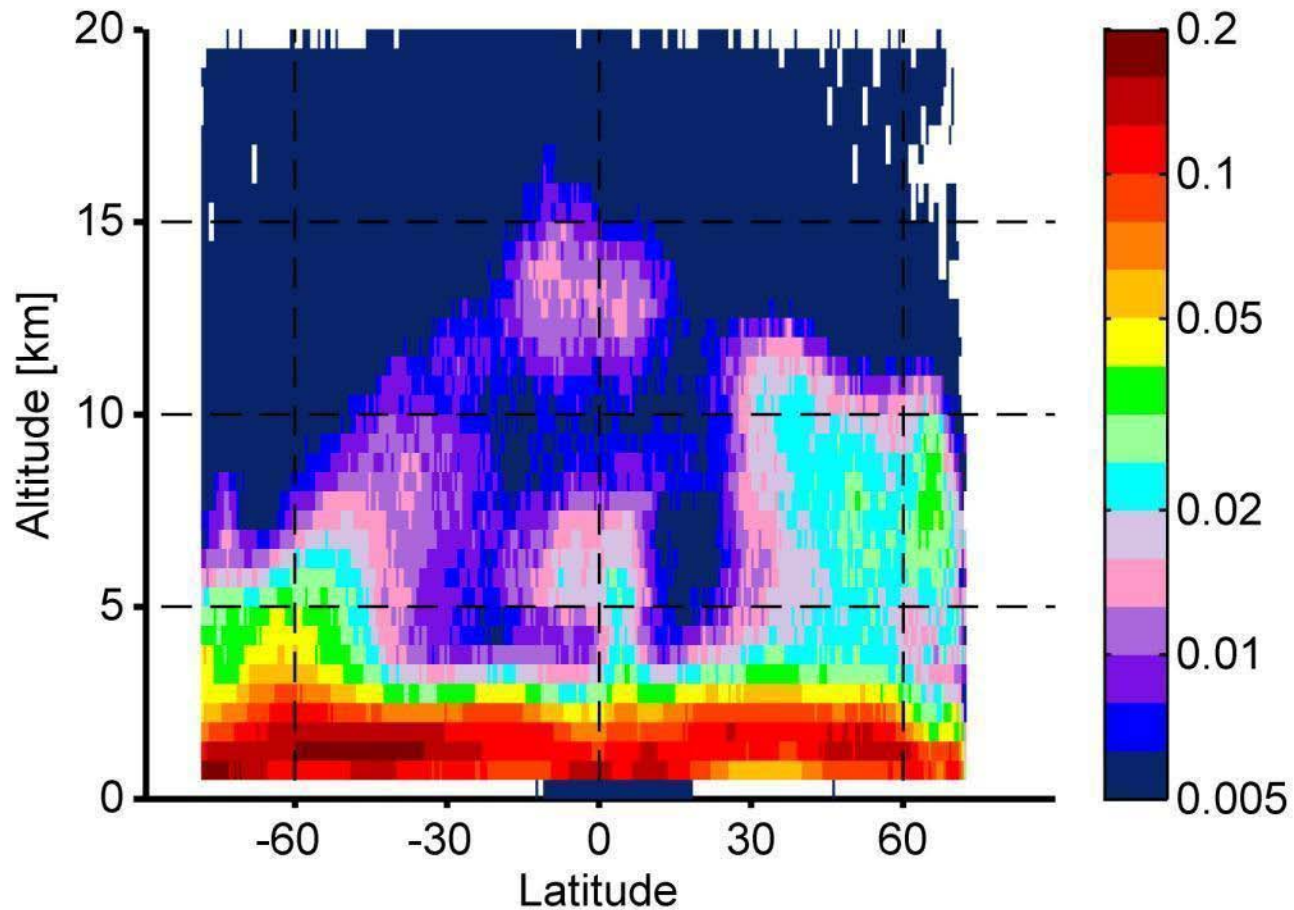
Heights [m]



Courtesy of Kevin Mueller at JPL, California

Science Exploration

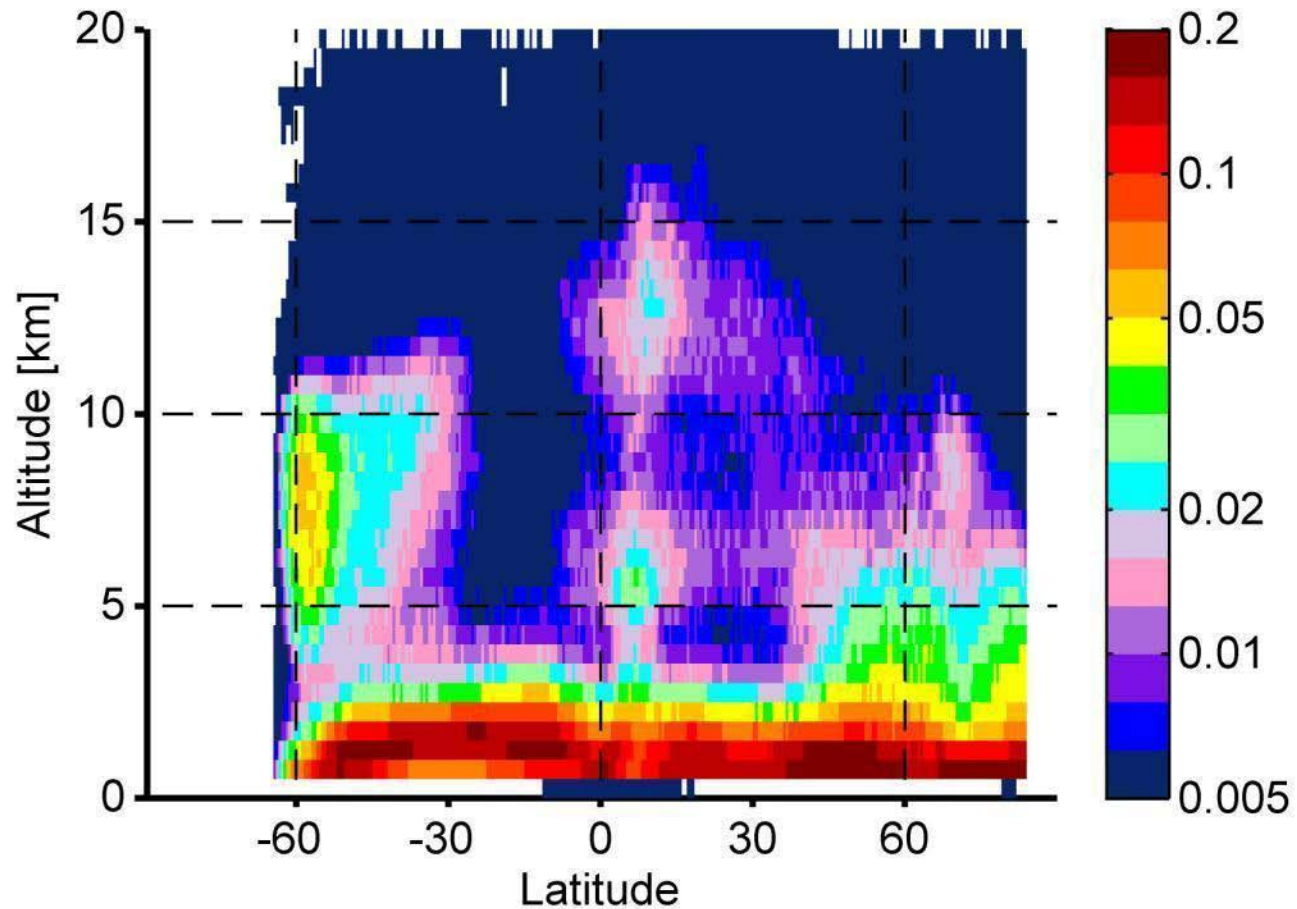
Jan



Zonal Monthly Mean (2000 — 2009; ocean only)

Science Exploration

Jul



Zonal Monthly Mean (2000 — 2009; ocean only)

Science Exploration

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LATEST NEWS

Satellite data reveal seasonal pollution changes over India



U. of I. photo

Larry Di Girolamo led the Illinois atmospheric scientists who documented some surprising trends in aerosol pollution concentration, distribution and composition over the Indian subcontinent.

◀ Click photo to enlarge

STORY PHOTOS EMAIL SHARE

9/7/10 | Liz Ahlberg, Physical Sciences Editor | 217-244-1073; eahlberg@illinois.edu

CHAMPAIGN, Ill. — Armed with a decade's worth of satellite data, University of Illinois atmospheric scientists have documented some surprising trends in aerosol pollution concentration, distribution and composition over the Indian subcontinent.

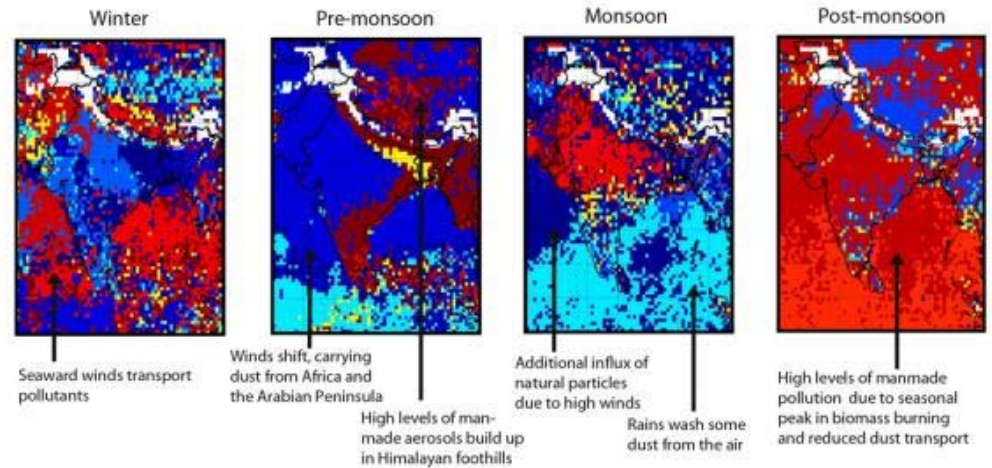


Seasonal changes in man-made and natural aerosol properties relative to previous season | Graphic courtesy Larry Di Girolamo

In addition to environmental impact, aerosol pollution, or tiny particles suspended in the air, can be detrimental to human health by causing a range of respiratory problems. Aerosols can come from natural sources, such as dust and pollen carried on the wind, but the most hazardous aerosols are generated by human activity — soot and other hydrocarbons released from burning various fuels, for example.

"The man-made aerosols tend to have a nastier effect on human health," said Larry Di Girolamo, a professor of atmospheric sciences at U. of I. "Once we have a handle on how much, and the factors that influence the amount of aerosols that can build up, we can propose emission regulations."

Red indicates manmade aerosols, blue indicates natural aerosols. Darker color indicates higher concentration.



Seasonal changes in manmade (red) and natural (blue) aerosol properties relative to previous season

Sep. 16, 2010

Computational Prosepection

- Data I/O Speed

About 30% of computation time is spent on I/O...

- File size

> 50% of content not used

- Visualization

- Synchronizing multiply fields from multiply HDF files
- Simple manipulation (+, -, x, G(L)T_mask,...)
- Fast, Fast, Fast!!!

Summary

- We are willing to collaborate with HDF developers
- **Free** software support is always welcome