Giovanni for AEROCOM

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Outline

• Multi-sensor aerosol measurements: daily/monthly gridded maps
• Giovanni: online visualization and analysis
• Multi-sensor intercomparison
• Aerosol data fusion
• Comparison with models
• Swath co-location (A-Train)
• Plans for the future
What is Giovanni?
With Giovanni and a few mouse clicks, one can easily obtain information on atmosphere state from around the world.

No need to learn data formats and to retrieve and process data.

Assess various phenomena interactively.

Try various combinations of parameters measured by different instruments.

All the statistical analysis is done via a regular web browser.

http://giovanni.gsfc.nasa.gov/

Caution: Giovanni is an exploration tool.
Giovanni capabilities

**Basic (one-parameter):**
- **Area plot** – averaged or accumulated over any data period for any rectangular area (various map projections)
- **Time plot** – time series averaged over any rectangular area
- **Hovmoller plots** – longitude-time or latitude-time cross sections
- **ASCII output** – for all plot types (can be used with GIS apps)
- **Image animation** – for area plot
- **Vertical profiles**
- **Vertical cross-sections, zonal means**

**Beyond basics:**
- **Area plot** - geographical intercomparison between two parameters
- **Time plot** - an X-Y time series plot of several parameters
- **Scatter plot of parameters in selected area and time period**
- **Scatter plot of area averaged parameters** - regional (i.e., spatially averaged) relationship between two parameters
- **Temporal correlation map** - relationship between two parameters at each grid point in the selected spatial area
- **Temporal correlation of area averaged parameters** - a single value of the correlation coefficient of a pair of selected parameters
- **Difference plots**
- **Anomaly plots**
- **Acquiring parameter and spatial subsets** in a batch mode through Giovanni
Gridded aerosol data in Giovanni

- MODIS Terra
- MODIS Aqua
- OMI Aura
- MISR Terra (re-introducing)
- POLDER Parasol (in testing)
- MERIS Envisat (prototype)
- GOCART (in preparation)

Also, CALIPSO feature mask for curtains
AOT for June 2006

Terra MODIS

Parasol POLDER

Aqua MODIS

Envisat MERIS

1/11/2008
AOT Differences for June 2006

Terra MODIS – Aqua MODIS

Aqua MODIS - POLDER

Terra MODIS – MERIS

MERIS – POLDER
Scatter plots

Scatter Plot
Time: Aug 2007  Area: (60S–60N, 180W–180E)

$R^2 = 0.7834$

Scatter Plot
Time: Jun 2006  Area: (30N–30S, 90W–90E)

$R^2 = 0.5529$

Scatter Plot
Time: Aug 2007  Area: (0N–30N, 90W–0E)

$R^2 = 0.8507$

Scatter Plot

$R^2 = 0.2178$

# of points: N=26020

# of points: N=2000

# of points: N=1504

# of points: N=2000

1/11/2008
Time series

Area-Averaged Time Series
(Region: 180W-90E, 90S-90N  Level: None)

- AOT_550nm (MER_T550.004) (Unitless)
- Aerosol Optical Depth at 550 nm (MYD08_M3.005) (unitless)
- Aerosol Optical Depth at 550 nm (MOD08_M3.005) (unitless)
- AOT at 550 nm (PARASOL_M3.001) (unitless)

1/11/2008

- Terra MODIS - POLDER
- Aqua MODIS - POLDER
- Terra MODIS – Aqua MODIS
- MERIS – POLDER
- Terra MODIS – MERIS
- Aqua MODIS – MERIS
The regional patterns of positive or negative correlation

Less pronounced regional patterns of correlation
Data Fusion
Increased spatial coverage: better feature tracking

Terra + Aqua
Dust event, May 23, 2007
Next step: Adding MISR

![Map showing data distribution with labeled areas a, b, c, and d.]
Trace gases
OMI NO2 measurements

OMI Vertical Column NO2

OMI Tropospheric NO2
The A-Train Data Depot Purpose and Goals

Purpose
To be a focal point for researchers interested in learning about and using A-Train constellation data, by providing an integrated set of tools that facilitate/enhance the use of this data

Goals
- Co-locate data from A-Train sensors operationally
- Archive co-located data
- Provide quick exploration vis. Tool - Giovanni
- Provide convenient access to A-Train data...
- Facilitate A-Train data comparison (+ model data)....

So A-Train researchers can concentrate on science!
CloudSat, and coregistered MODIS/Aqua, AIRS/Aqua, CALIPSO lidar, and OMI/Aura Atmospheric Measurements
Plots of vertical profiles of clouds, temperature, humidity, cloud and aerosol classification; Horizontal swaths of cloud characteristics and total column aerosols, collocated with CloudSat track. Line over-plots of cloud pressures.

Select Constraints:

Spatial

Temporal

Orbit Date  Year  Month  Day

Parameters

Curves

Clouds

Strips

Select Visualization:

Generate Visualization  Reset  Alert: A new window will be opened when "Generate Visualization" is selected.
Tropical Storm Barry, May 30, 2007, forming in the Gulf of Mexico
Cloud/Aerosol Classification and Ice/Water Phase Discrimination. (Calipso – Lidar)

02/24/07 11:06:13–11:08:12 CMT
Prototyping PM25 data in Giovanni

PM2.5 (EPA → DataFed → Giovanni)

Deep Blue MODIS Aerosol Optical Depth

The standard MODIS AOT

GOCART AOT (Goddard → DataFed → Giovanni)
Google Earth
**Future plans related to AEROCOM**

- Identify and agree on compatibility between model and observational data
- Add GOCART model data
- Create an AEROCOM Giovanni instance
- Add AEROCOM climatology data
- Initiate interoperability between model and RS archives
- Add Taylor diagram to the suite of statistical analysis capabilities
- Add ISCCP data
- Add maps of ground-based observations
Conclusions

• Giovanni is a very convenient online tool for remote sensing data exploration, visualization and analysis
• Giovanni can be very useful for providing easy access to model data along with various statistical intercomparison options
• Giovanni can provide convenient avenue for comparing models with observations
• Recent progress in Data Fusion allows to complement measurements by various sensors and increase spatial coverage
• Giovanni integration with Google Earth provides a convenient way to overlay maps of various parameters along with convenient visualization of vertical structures

http://giovanni.gsfc.nasa.gov