



NASA GES DISC support of CO₂ data from OCO-2, ACOS and AIRS

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³Wyle Information Systems



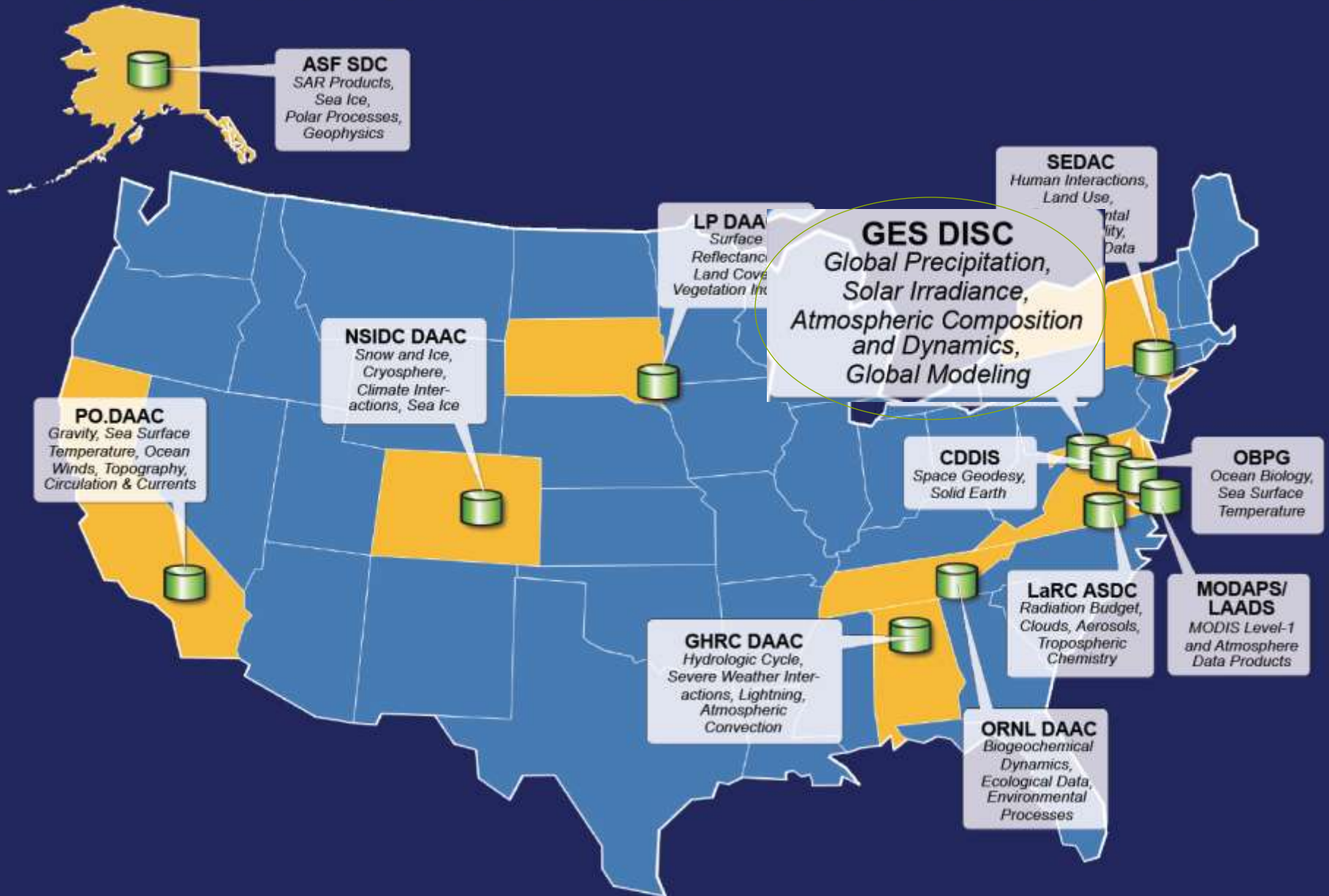
Overview

- **Goddard GES DISC within Earth Observing System Data Information System (EOSDIS)**
 - EOSDIS DAACs – Discipline-Oriented Data Centers
 - Data Files Distributed Metrics in DAACs
- **Activities for exploring Data Access, Usability and Applicability**
 - Documentation – data recipes, ACOS spatial search, KML for ACOS xCO₂ monthly ...etc
 - Interoperability – OPeNDAP, and WMS
 - Data distribution metrics
 - Exploring CO₂ data applicability: assess multi-sensor CO₂ data
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 - OCO₂ Data Table (Products scheduled for archive at GES DISC)
 - DOIs, Landing pages, Data Citation
- **Value-added services (i.e., NASA ROSES)**
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Discipline-oriented Data Centers



GES DISC Data Holdings

Atmospheric Composition

- **Total Ozone Mapping Spectrometer (TOMS)**
- **Upper Atmosphere Research Satellite (UARS)**
- **Aura: Ozone Monitoring Instrument (OMI), High Resolution Dynamics Infrared Sounder (HIRDLS), Microwave Limb Sounder (MLS)**
- **Atmospheric CO2 Observations from Space (ACOS)**
- **Historical datasets from Nimbus, Tiros, SME, others**
- ***Coming: Orbiting Carbon Observatory 2 (OCO-2)***

Modeling

- **Global Modeling Assimilation Office (GMAO)**

Hydrology/Modeling

- **Global Land Data Assimilation System (GLDAS)**
- **North American Land Data Assimilation System (NLDAS)**

Atmospheric Dynamics

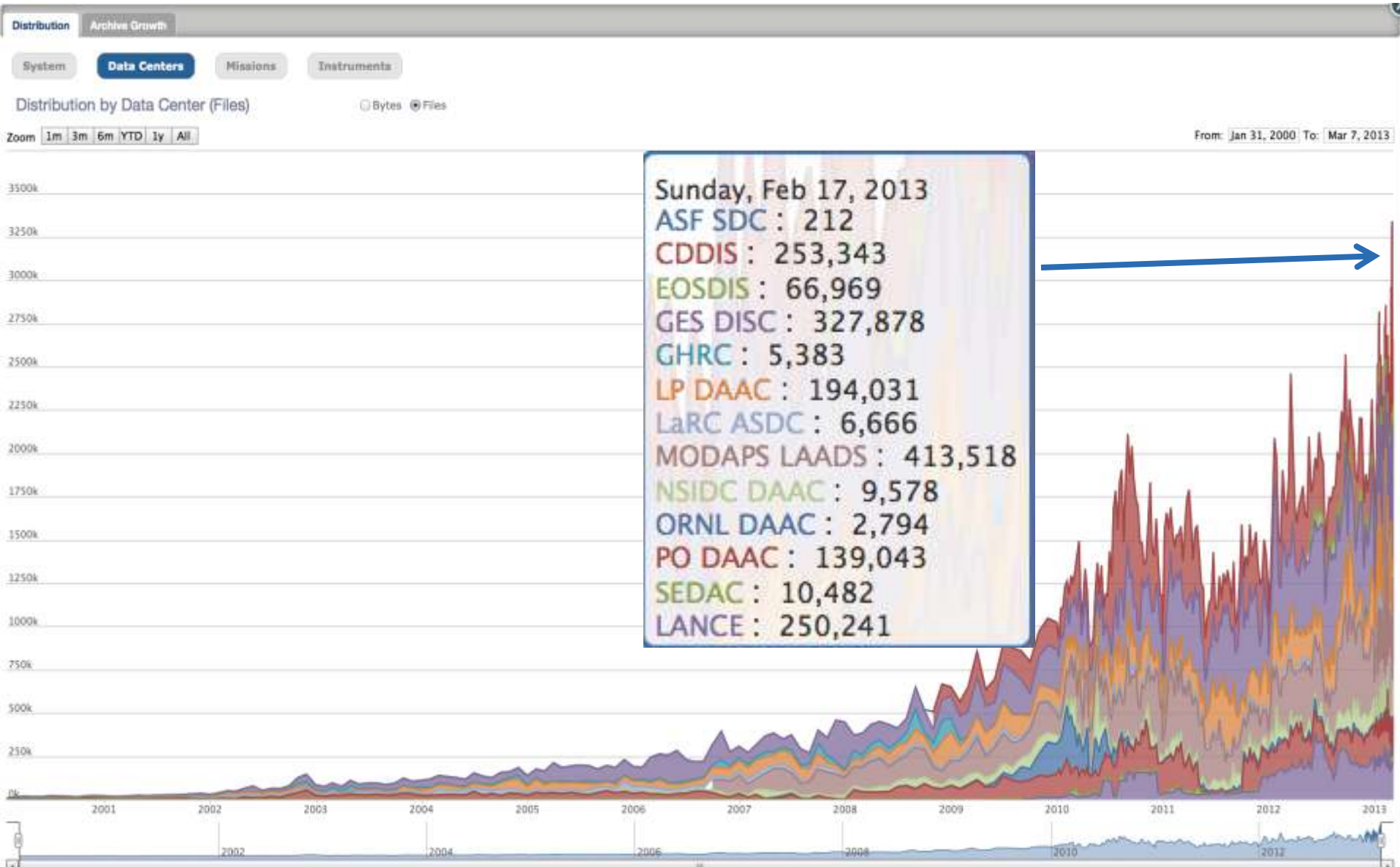
- **TIROS Operational Vertical Sounder (TOVS) Pathfinder**
- **Aqua: Atmospheric Infrared Sounder (AIRS)**
- **Solar Radiation and Climate Experiment (SORCE)**

NASA MEaSUREs Earth System Data Records (ESDRs)

Precipitation

- **Tropical Rainfall Measuring Mission (TRMM)**
- **Hydrology Data Collections**
- ***Coming: Global Precipitation Mission (GPM)***

Data files distributed by DAACs (EOSDIC Metrics)



<http://earthdata.nasa.gov/about-eosdis/performance/eosdis-watch-details>

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- + OVERVIEW
 - + DATA HOLDINGS
 - + DATA SERVICES
 - > DOCUMENTATION
-
- Additional Features**
- + News
 - + Software Tools
 - + Science Focus
 - + Links
 - + FAQ

You are here: [GES DISC Home](#) » [Atmospheric Composition](#) » [ACOS data handling recipes](#)

ACOS data handling recipes

1. [Introduction](#)
2. [IDL](#)
 - A. [Basic reading example](#)
 - B. [Advanced example](#)
3. [Python](#)
 - A. [Basic reading example](#)
 - B. [Advanced example](#)
4. [Matlab](#)
 - A. [Basic reading example](#)
 - B. [Advanced example](#)

Global Attributes:

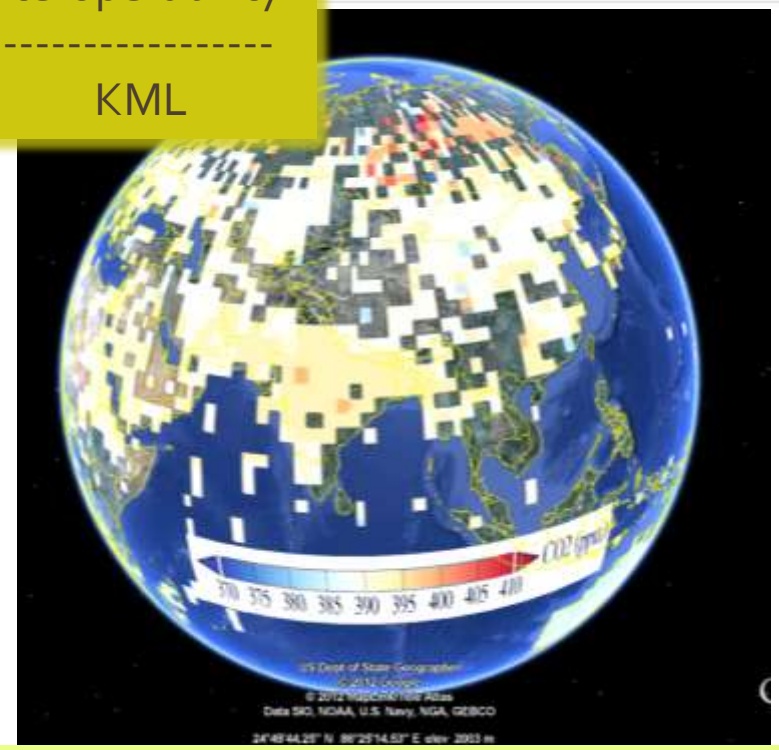
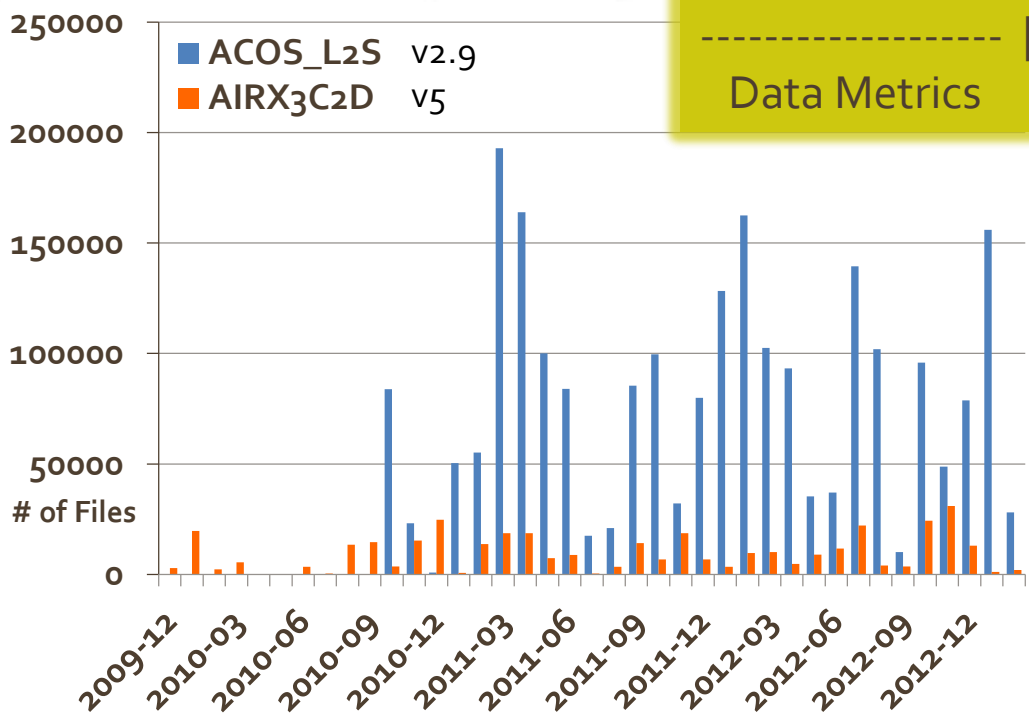
Variables:

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 Units: Meters
 Type: Float32

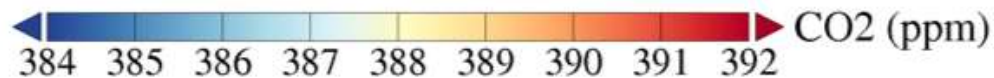
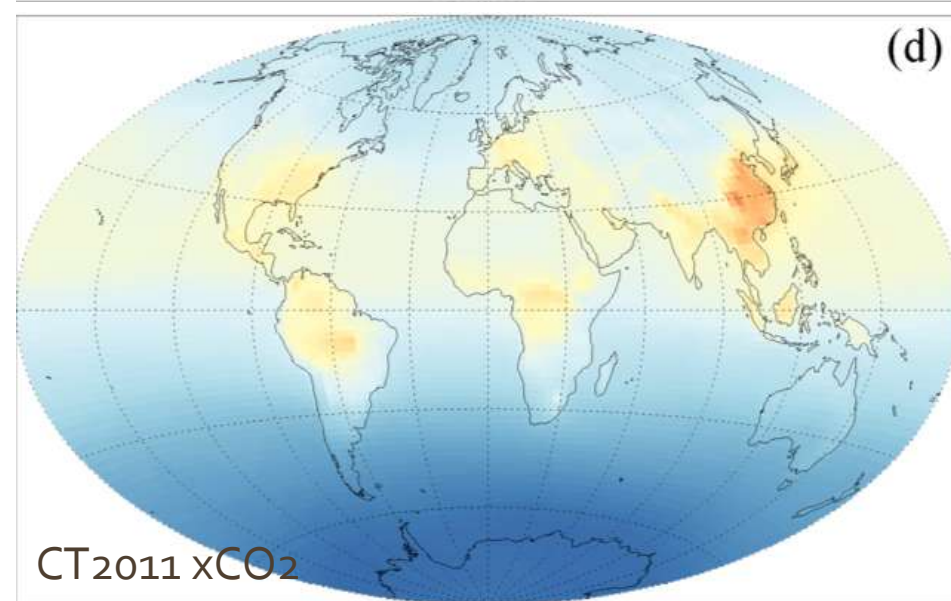
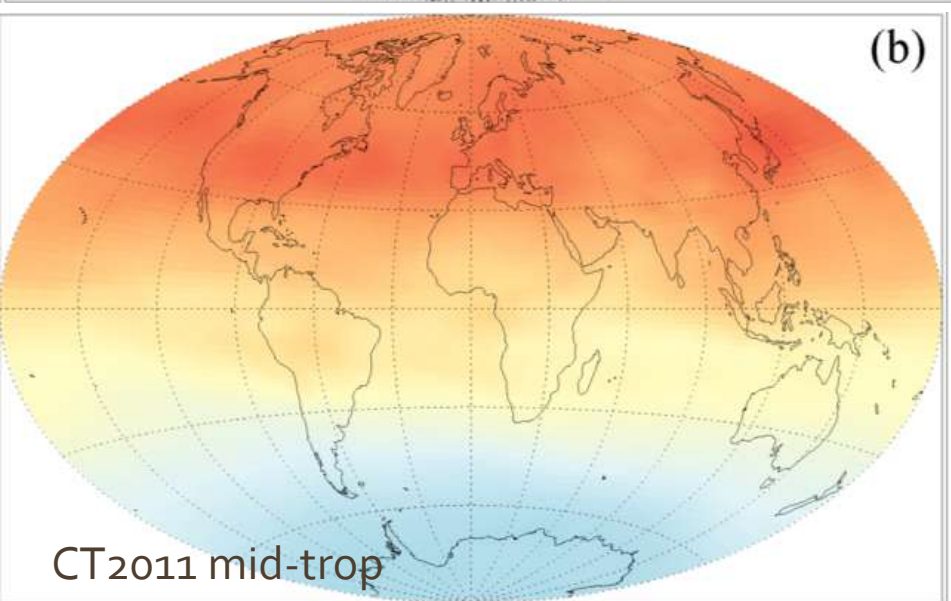
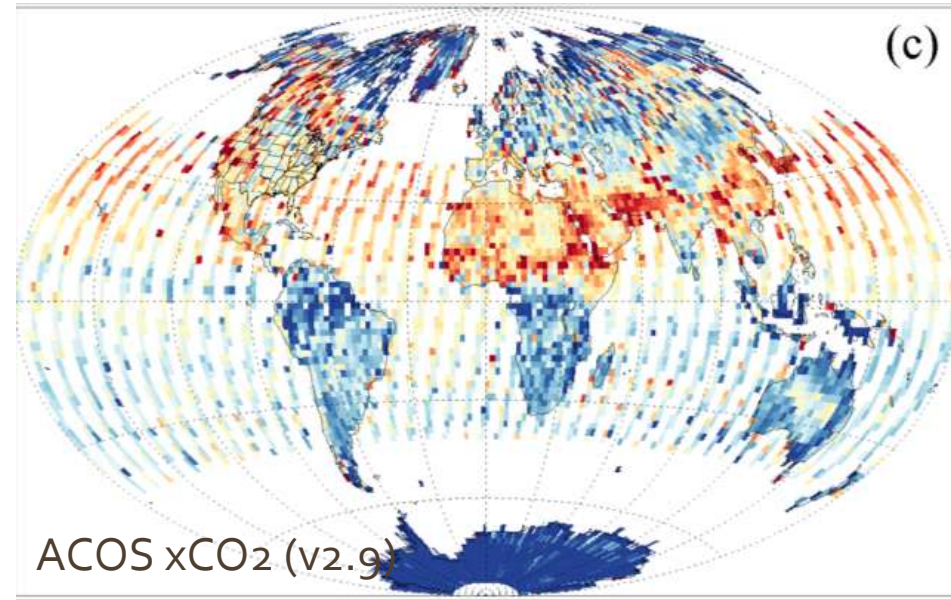
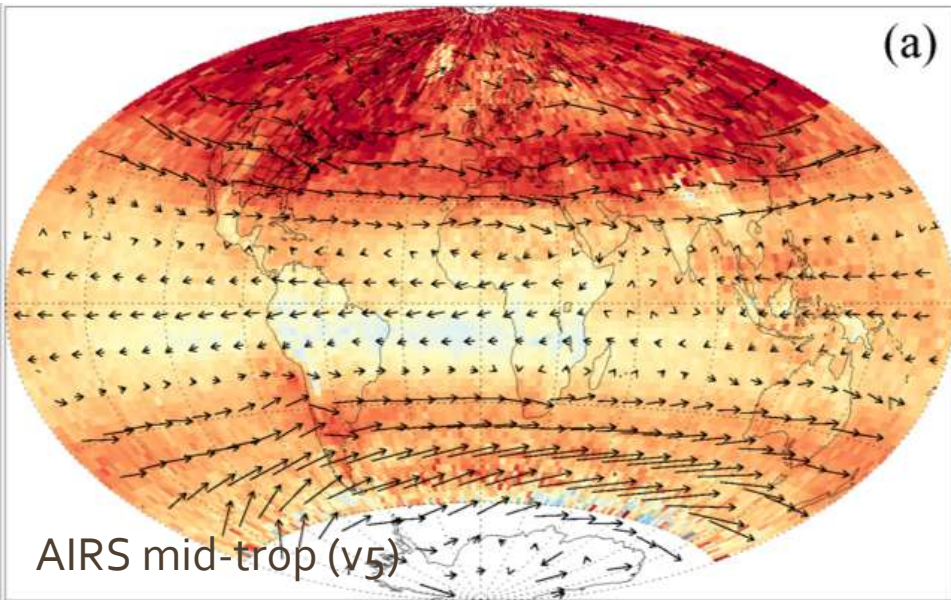
sounding_altitude_max: Array of 32 bit Reals [GeoLocation_dim = 0.136]
 GeoLocation_dim:
 Shape: Retrieval_Array
 Units: Meters
 Type: Float32

Documentation | Interoperability

Data Metrics | KML



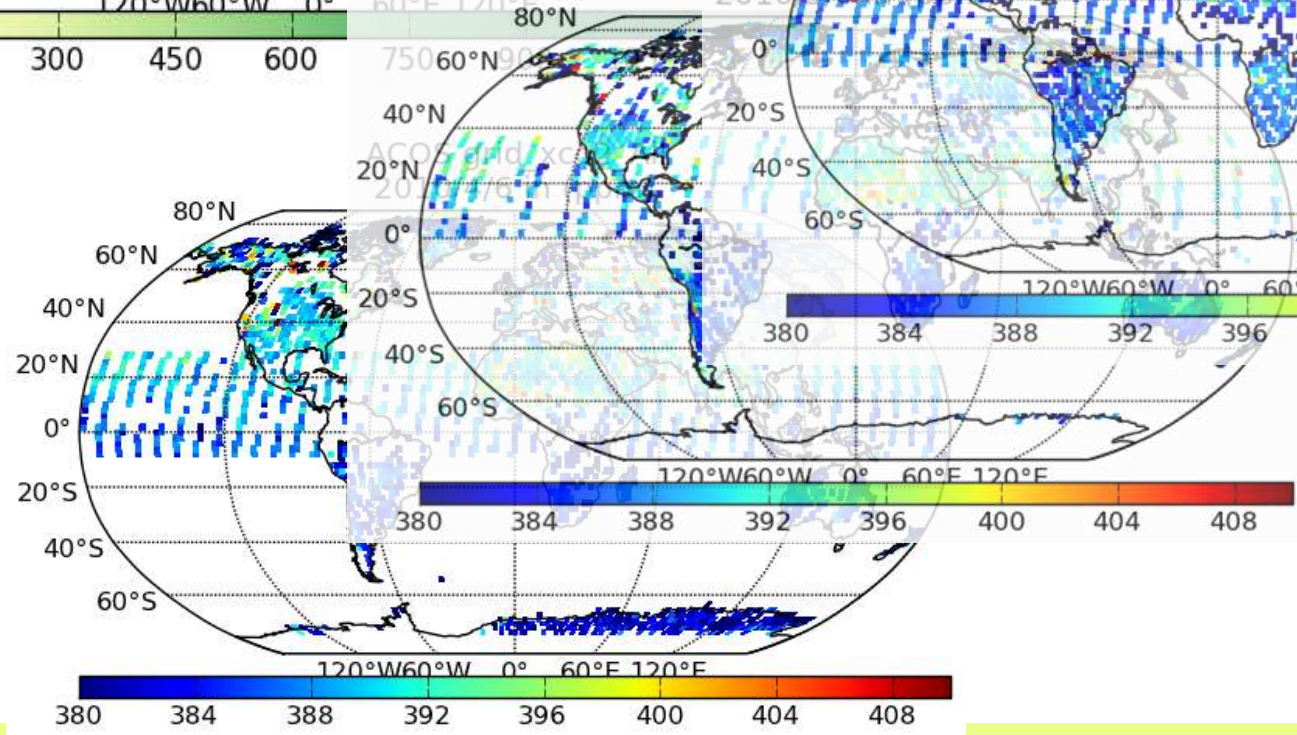
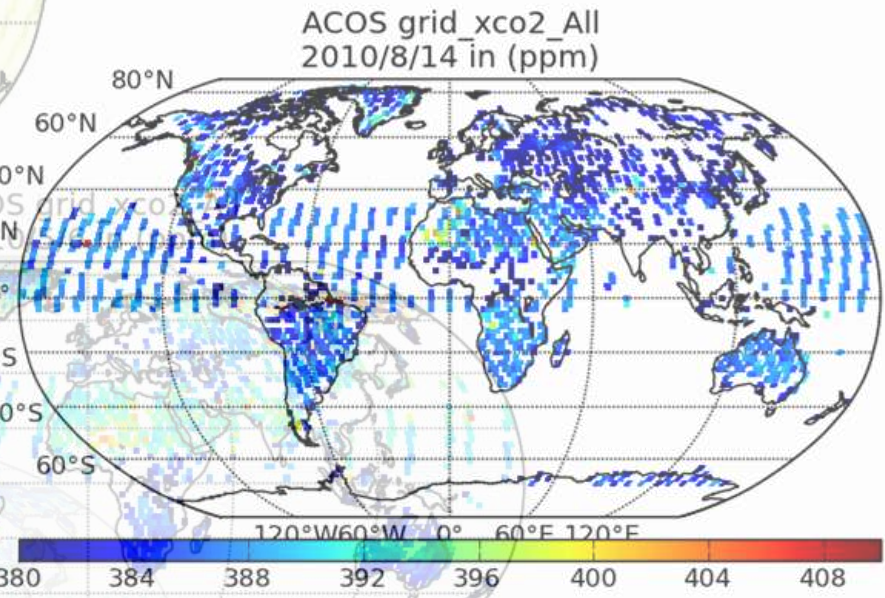
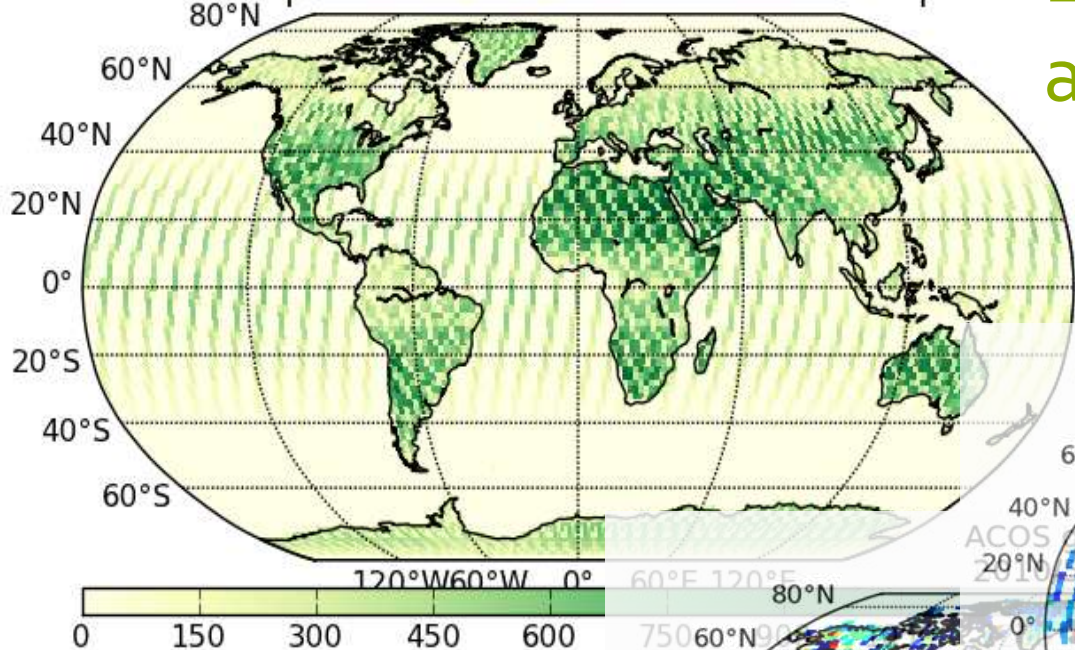
Global CO₂ distribution (yr 2010)



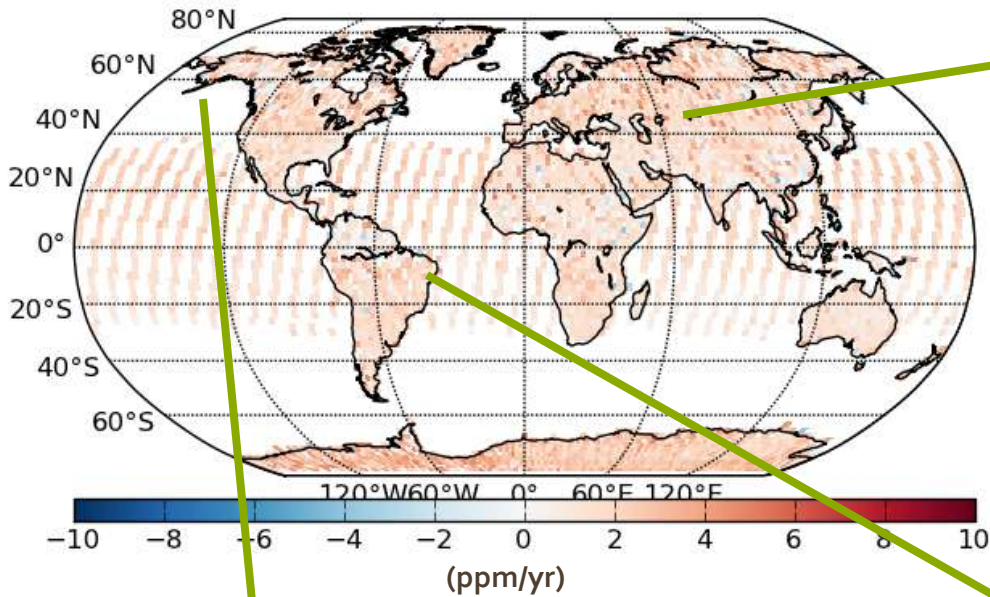
Exploring CO₂ data applicability

Can we see some signal under extreme emission event?

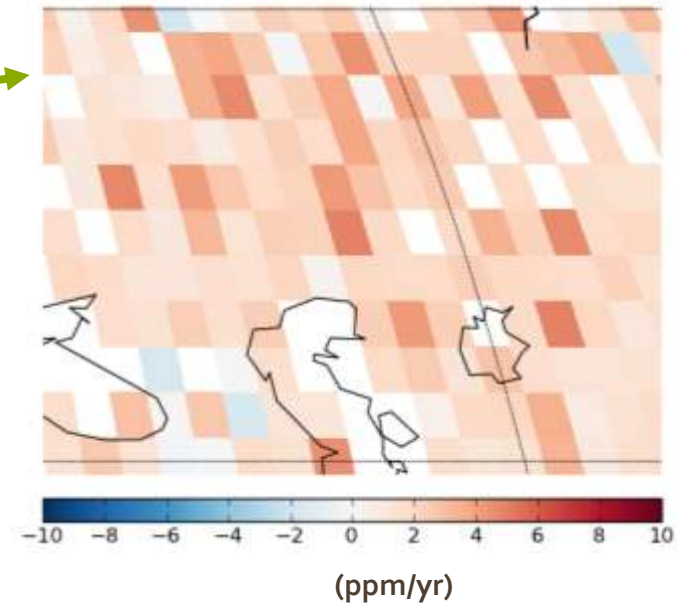
Total Number of Data for each Cell
Max possible for each cell 1272 time steps.



Global Slope Map ($\frac{\Delta(xCO_2)}{\Delta t}$)

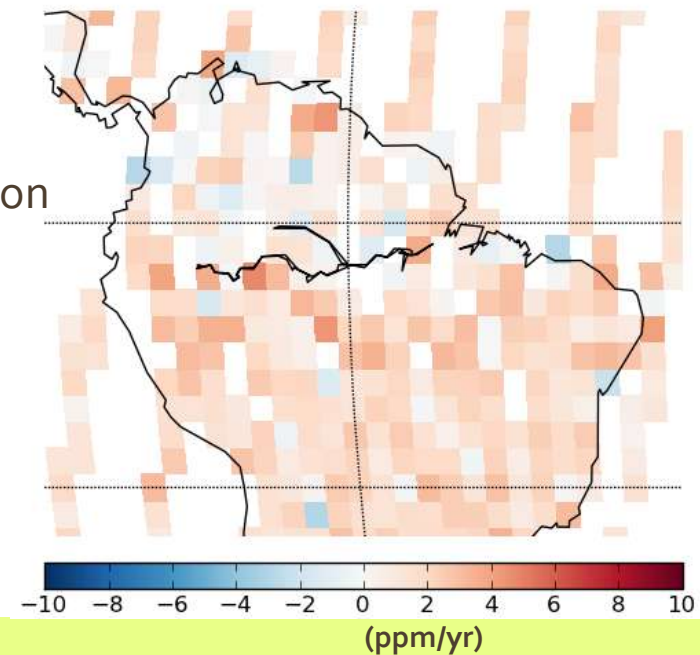


Russia



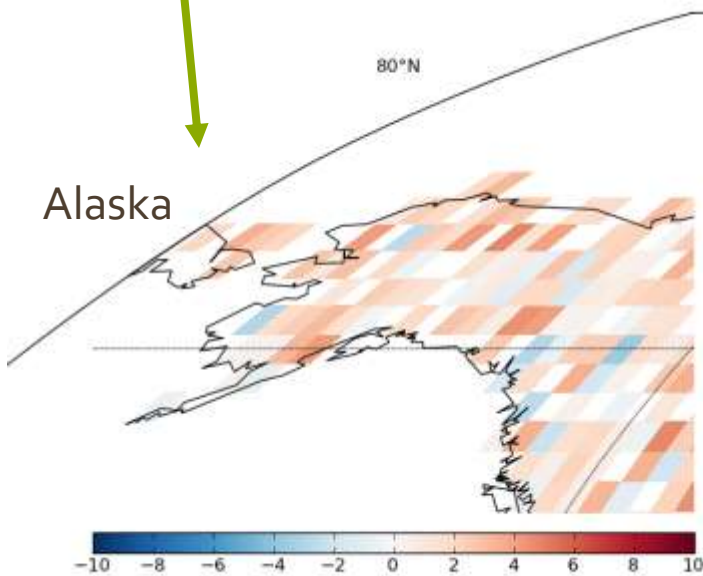
(ppm/yr)

Amazon



(ppm/yr)

Alaska

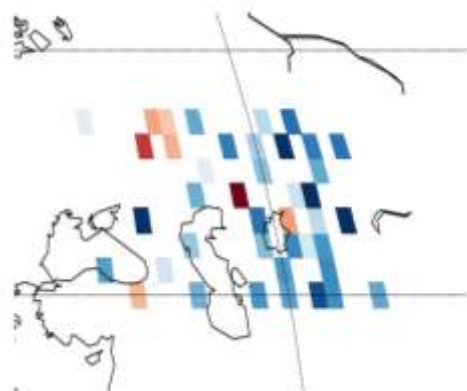


-10 -8 -6 -4 -2 0 2 4 6 8 10

Case: 2010 Russian Wildfire Event

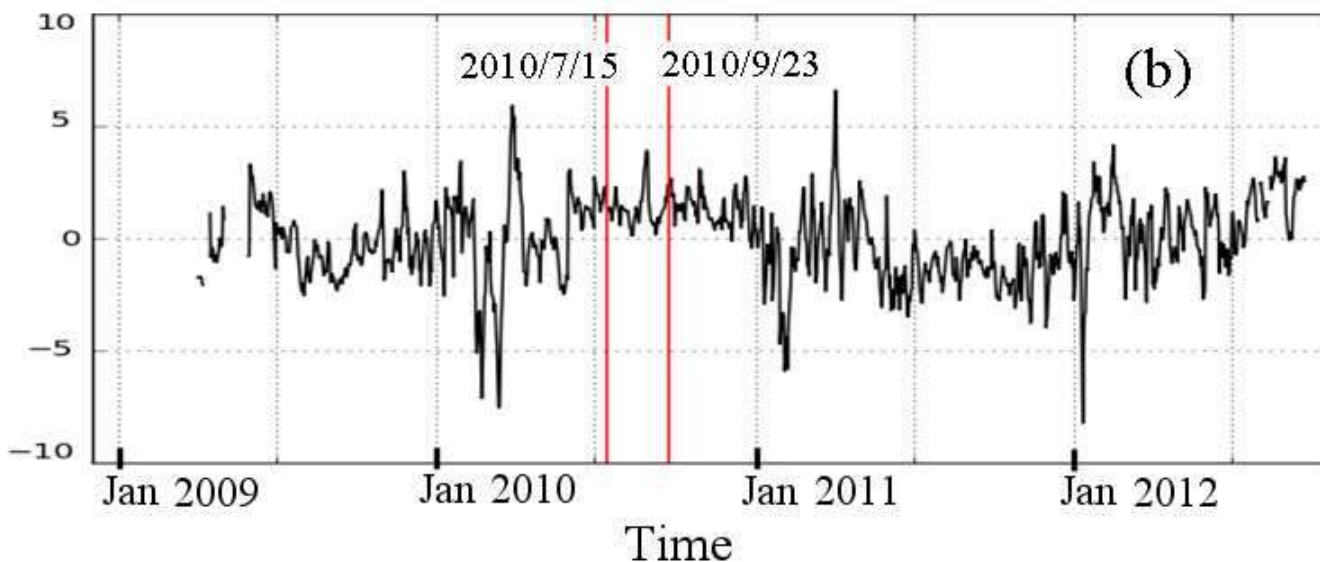
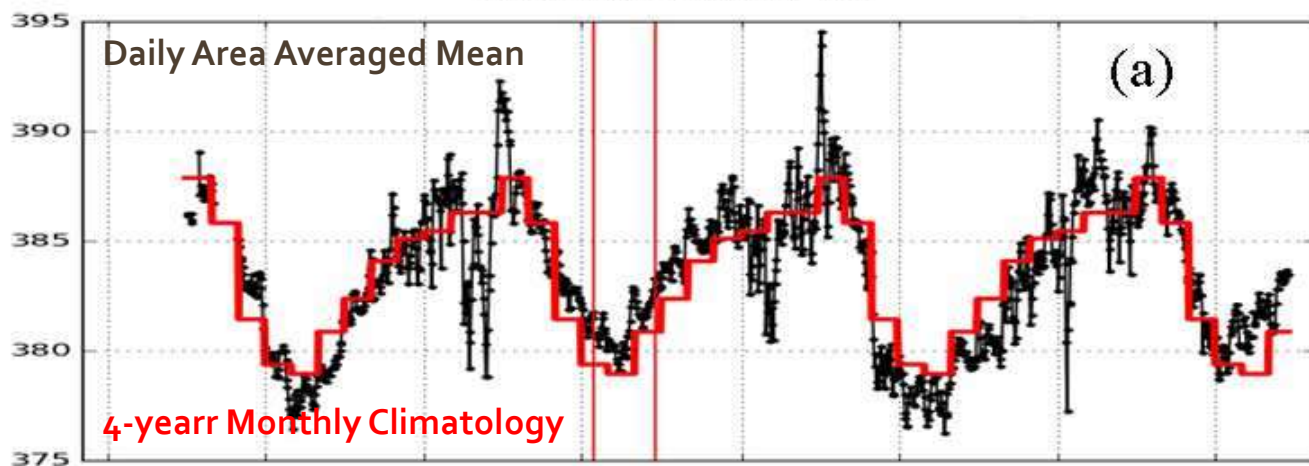


Fire on July 31, 2010



xCO₂ (ppm)

Area: 40N-65N; 35E-70E

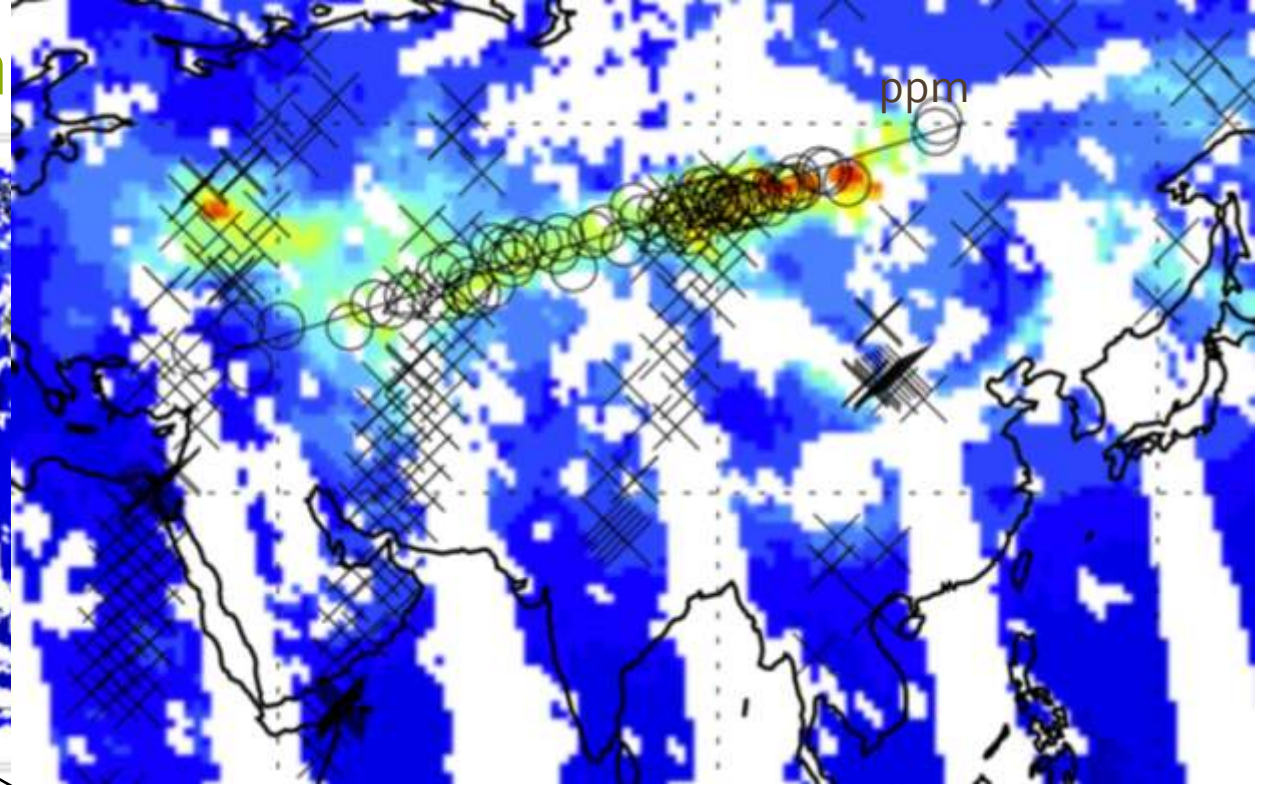


Area-averaged series of:

- (a) Detrended daily xCO₂, and corresponding 4-year monthly climatology
- (b) Daily departures (anomaly) from monthly climatology

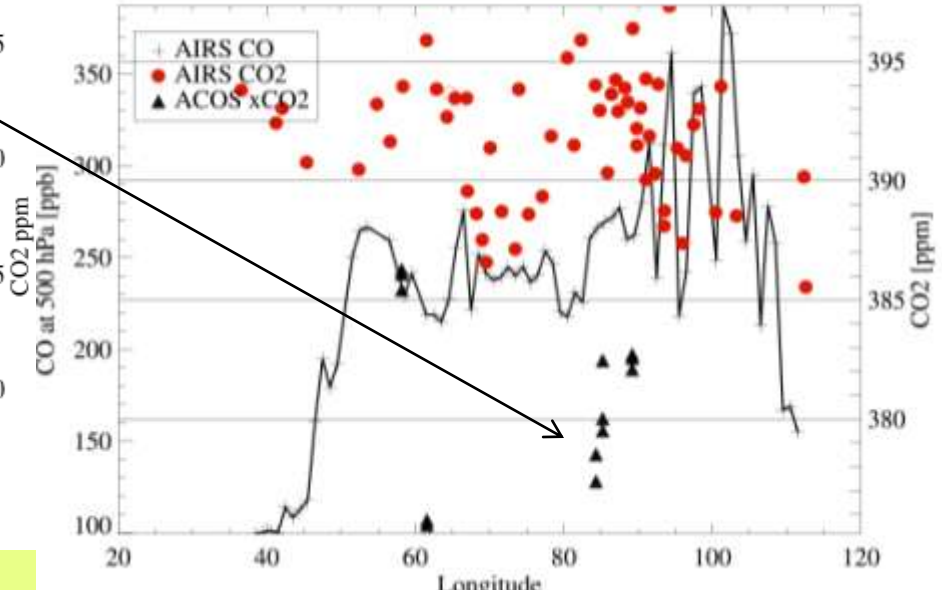
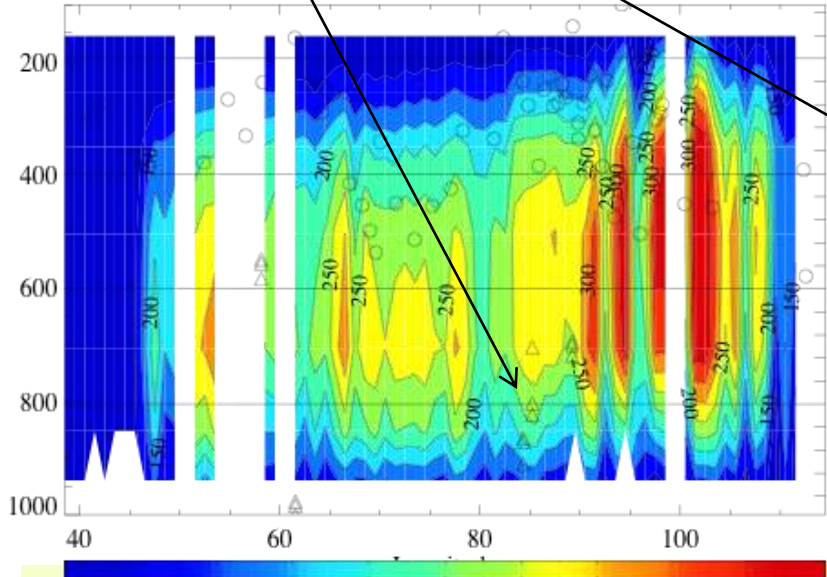
Event Tra

AIRS CO
Distribution
at 500 mb on
Aug. 14, 2010



ACOS

CO_2010.08.14_Lon038to115_Lat040to060_WEtransect



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OCO-2 Data Table

(Products scheduled for archive at GES DISC)

*Total mission volume ~ 20 TB/year

Type	ShortName	#/day	Description	Data Format	Granule Size(GiB)	Yearly volume (GiB)	Public Distribution
Housekeeping Telemetry	OCO2_HK	1	Housekeeping telemetry file generated by EDOS	Binary		21	No
Science Telemetry	OCO2_Lo	3	Science telemetry file generated by EDOS	CCSDS packets		4,100	No
Node Time File	?	1/week	Predicted nodal crossing times generated by OCO-2 MOC	ASCII		Very small	No
Predicted Ephemeris File	?	1/week	Spacecraft ephemerides predicted by OCO-2 MOC	ASCII		Very small	No
Attitude Files	OCO2_ATT	14-15	OCO-2 spacecraft attitude data for one specific orbit	HDF5	.00038	2.0	Public
Ephem Files	OCO2_EPH	14-15	OCO-2 spacecraft ephemerides for one specific orbit	HDF5	.00047	2.5	Public
L1aIn Product	OCO2_L1ALN	180-193	Collated, parsed, OCO-2 Science Data for one specific orbit and one specific viewing mode	HDF5	0.71	4,100	Public
L1bSc Product	OCO2_L1BSC	18-19	Calibrated, geolocated OCO-2 science spectra for one specific orbit and one specific viewing mode	HDF5	1.4	7,300	Public
L1bCl Product	OCO2_L1BCL	30-35	Calibrated, geolocated OCO-2 calibration spectra for one specific orbit and one specific viewing mode	HDF5	0.22	0.24	Public
L2Dia Product	OCO2_L2DIA	14-15	GeolocatedXCO2 retrieval results for selected soundings for one specific orbit and one specific viewing mode, plus algorithm diagnostic information	HDF5	<0.82	<4,400	Public
L2Std Product	OCO2_L2STD	14-15	GeolocatedXCO2 retrieval results for selected soundings for one specific orbit and one specific viewing mode	HDF5	<0.037	<200	Public

DOIs for EOSDIS Data

- **Background**

- unique and lasting data identifiers for publication
- more frequent and consistent citation of EOSDIS datasets

- **A DOI will be assigned for each EOSDIS standard data product**

- A major new version would be assigned a new DOI.
- DOIs of old versions that are no longer available would have updated locators that point to new version (with explanation)

- **DOIs registered via subscription provider (EZID) with Registry Agent (DataCite)**

- **Consists of two part alphanumeric string doi:[prefix]/[suffix]**

- E.g., **10.5067**/123; Prefix 10 is the DOI registry identifier; 5067 is the Registrant (EOSDIS)
- Suffix alphanumeric string identifies the data item as decided by the Registrant
 - doi: 10.5067/Aura/HIRDLS/data1234
 - doi: 10.5067/Aqua/AIRS/data1234
 - doi: 10.5067/MEASURES/GSSTF/data1234

- **Additional Product Metadata**

- 2 file attributes embedded in data files

- **Identifier_product_doi**

- **Identifier_product_doi_authority**

- **A DOI resolves to a landing page**

Insert DOI attributes in each file

```
identifier_product_doi : 10.5067/AQUA/AIRS/DATA201
identifier_product_doi_authority : http://dx.doi.org/
```

Resolve DOI

The screenshot shows the 'The DOI System' logo and a search form titled 'Resolve A DOI Name'. The input field contains 'doi: 10.5067/AQUA/AIRS/DATA201' and there is a 'Go' button below it.

Landing Page (Permanent Identifier)

- Data Citation
- Data Access
- Summary
- Documentation
- Variables

The screenshot shows the landing page for 'AIRX2RET: Aqua AIRS Level 2 Standard Physical Retrieval (AIRS+AMSU)'. It features a navigation bar with tabs for 'Description', 'Data Access', 'Summary', 'Documentation', and 'Variables'. The 'Data Citation' section provides citation information for the data, and the 'Product Description' section details the instrument and data characteristics.

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Data Quality Screening Service (DQSS)

Initial settings are based on Science Team recommendation.
(Note: "Good" retains retrievals that are Good or better).
You can choose settings for all parameters at once...

Apply To All Parameters:
(Select Good to screen all parameters following Science Team criteria)

Best * Good ** NoScreening

* For data assimilation, use of Best quality data only is recommended.
** Using only Good quality (or better) data is recommended for most uses.

...or variable by variable

Temperature_Parameters

TSurfStd Visualize	<input type="radio"/> Best <input checked="" type="radio"/> Good <input type="radio"/> NoScreening
TAirStd Visualize	<input type="radio"/> Best <input checked="" type="radio"/> Good <input type="radio"/> NoScreening
TAirMWOnlyStd Visualize	<input checked="" type="radio"/> Best <input type="radio"/> Good <input type="radio"/> NoScreening
TSurfAir Visualize	<input type="radio"/> Best <input checked="" type="radio"/> Good <input type="radio"/> NoScreening

- DQSS can encode the **science team recommendations** on quality screening
- Output file has the same format and structure as the input file

Simple Subset Wizard (SSW)



EOSDIS Home

SIMPLE SUBSET WIZARD (SSW) [V1.07 RELEASE NOTES](#)

1. Search for Data Sets
2. Select Subset Criteria
3. View Results

Enter values for the Date Range and (optionally) the Spatial Bounding Box to search for data sets; those criteria will also be used when data sets are subsetted by Date Range and Spatial Region.

Data Set Keyword(s)

Date Range to

Spatial Bounding Box

[Report a Problem with the Simple Subset Wizard](#)

Available Data Sets

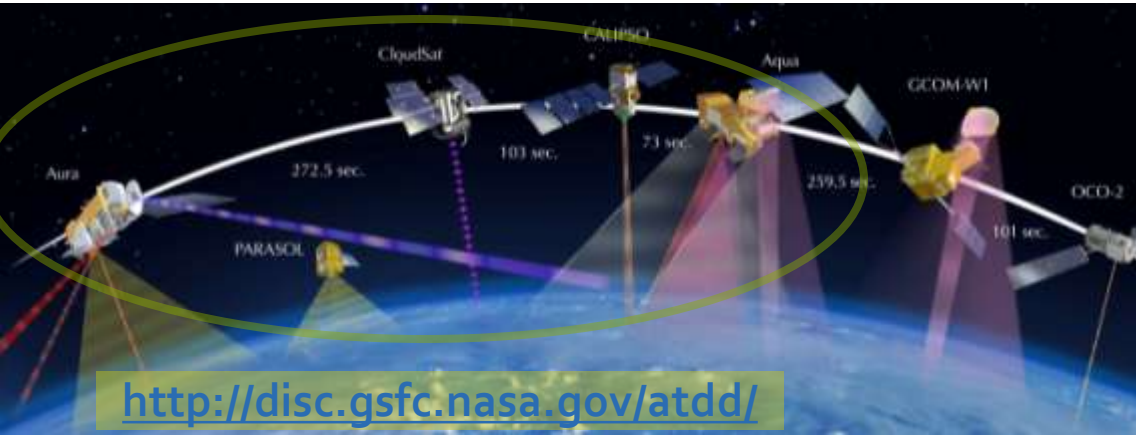
Data sets are sorted by the data archive center and project/mission.

- Alaska Satellite Facility Synthetic Aperture Radar Data Center
- Global Hydrology Resource Center
- Goddard Earth Sciences Data and Information Services Center
- MODIS Level 1 and Atmosphere Archive and Distribution System
- Langley Atmospheric Science Data Center
- Land Processes DAAC
- NSIDCV0
- Oak Ridge National Laboratory DAAC for Biogeochemical Dynamics
- Physical Oceanography DAAC
- Socioeconomic Data and Applications Center

Cross DAACs Access (10)

Data need to be OPeNDAP compatible

A-Train Data Depot (ATDD) – CloudSat Collocated Dataset



- A-Train Data Depot (ATDD) was supported by NASA ACCESS (Advancing Collaborative Connections in Earth System Science) program and now is on sustaining mode.
- Started with CloudSat mission support with MODIS-CloudSat collocated subsets. Building upon the expertise, OMI, POLDER, and AIRS subsets were subsequently added in production, and distributed by ATDD.
- The collocated subsets include MODIS/Aqua L1B and L2 atmospheric products, OMI/Aura L2 products, and Polder/Parasol L2 products (Table shows detail)

Archived On-line A-Train Subsets

- **Mirador:** <http://mirador.gsfc.nasa.gov/>
- **FTP:** <ftp://atrain.sci.gsfc.nasa.gov/s4pa>

MODIS/Aqua, Level 1B, radiances

- **MAC021S***: 1-km radiances
- **MAC02QS***: 250-m radiances

MODIS/Aqua, Level 2, atmospheric products

- **MAC04S***: Aerosol Optical Depth Land and Ocean, Aerosol Type over Land, Angstrom Exponent, Mass Concentration, Fine Mode Fraction
- **MAC05S***: Water Vapor IR and near IR retrievals
- **MAC06S***: Cloud Top Parameters: Pressure, Temperature, Effective Emissivity, Spectral Forcing, Cloud Phase; Cloud Optical Parameters: Cloud Optical Thickness, Effective Particle Radius; Cirrus Detection: Cirrus Reflectance.
- **MAC07S***: Temperature and Moisture (dew point temperature) profiles.
- **MAC35S***: Cloud Mask: IR, NIR, and CO2 tests; Visible test at 250-m.

OMI/Aura, Level 2, Cloud Pressure, Ozone, and UV index

- **OMCLDO2_CPR**: Cloud effective pressure based on O2-O2 absorption
- **OMCLDRR_CPR**: Cloud effective pressure based on Raman scattering
- **OMTO3_CPR**: Column amount O3, UV Aerosol Index, UV reflectivity.
- **OMAERUV_CPR**: UV Aerosol Index, Aerosol Absorption Optical Depth, Surface Albedo, UV Reflectivity.

POLDER/Parasol, Level 2, Radiation Budget processing

- **PARASOLRB_CPR**: Column Water Vapor, Cloud Pressure from O2 lines, Cloud Optical Thickness, Cloud Phase, Cloud Albedo, Clear Albedo.

*Available in 200- and 10-km swath widths; The rest are 200-km-wide, (+/-100 km) only.



Questions?

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