Multisensors remote sensing of cloud properties from POLDER2/Adeos2 and MODIS/Terra

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Multisensors remote sensing of cloud properties from POLDER2/Adeos2 and MODIS/Terra

Context and Rationale

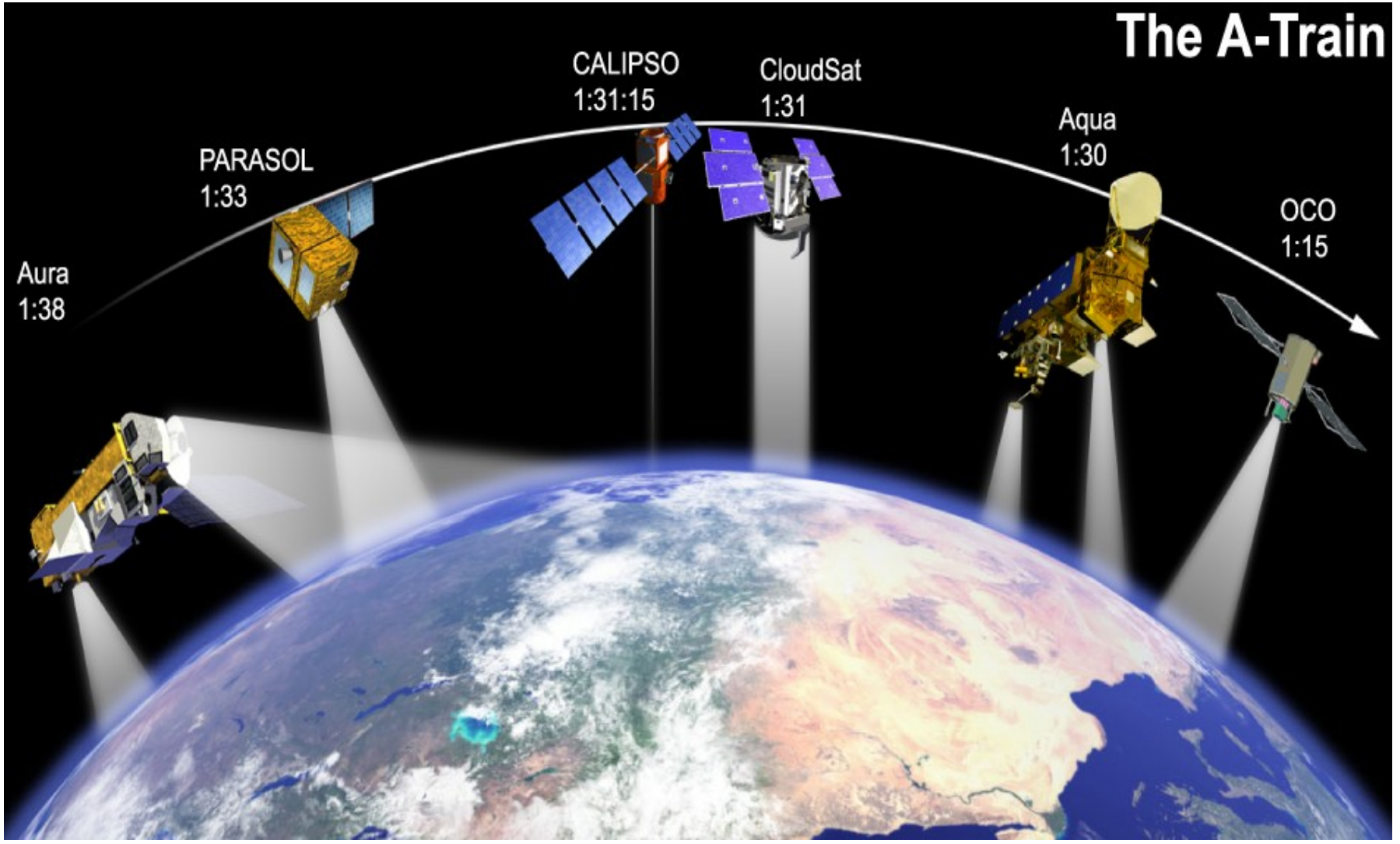
Methodology

Current activities

Potential Synergy

Perspectives

Context and Rationale



Context and Rationale

Objectives :

Define and implement new scientific algorithms based on combination of MODIS and POLDER level 1 data in order to

- (i) improve retrieval of existing parameters
- (ii) allow for retrieval of new parameters

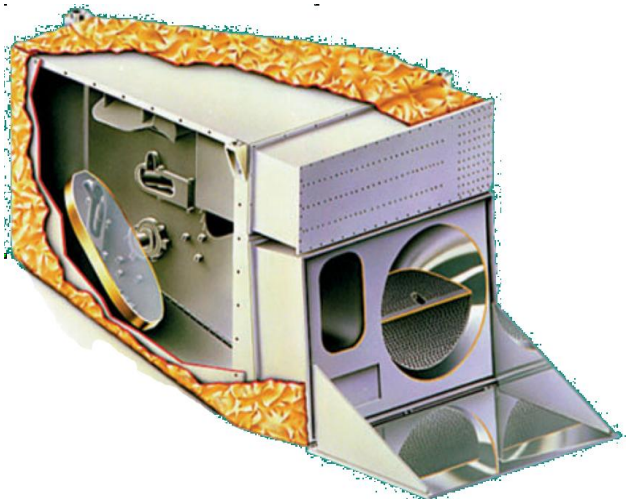
Basic interference considerations tells us that both constructive and destructive interferences are possible

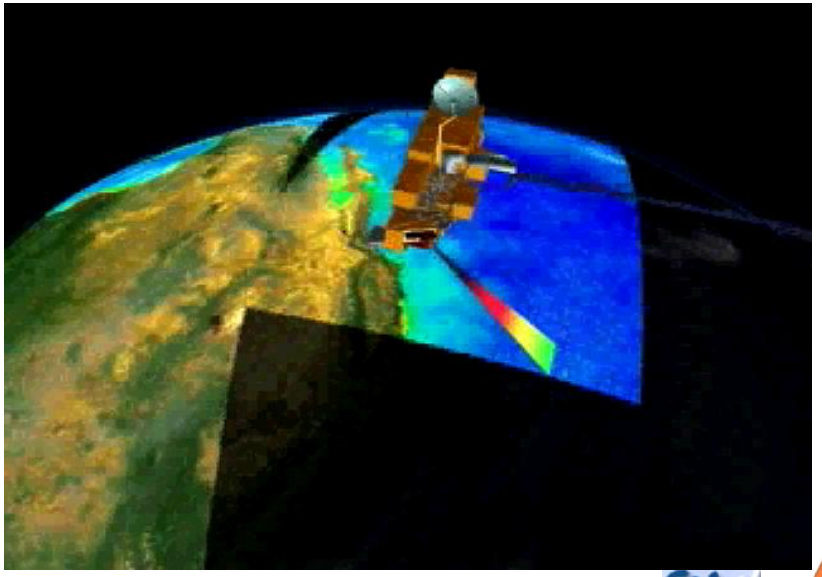
HOW SHOULD WE PROCEED TO MAKE SURE THAT 2 > 1 ?

MODIS/Terra and POLDER/Adeos II in flight between February and October 2003
Terra and AdeosII were in very good coordination every 3 days during one orbit
83 orbit swath available to prepare the A-Train data analysis and test ideas

Instrumental Background : MODIS

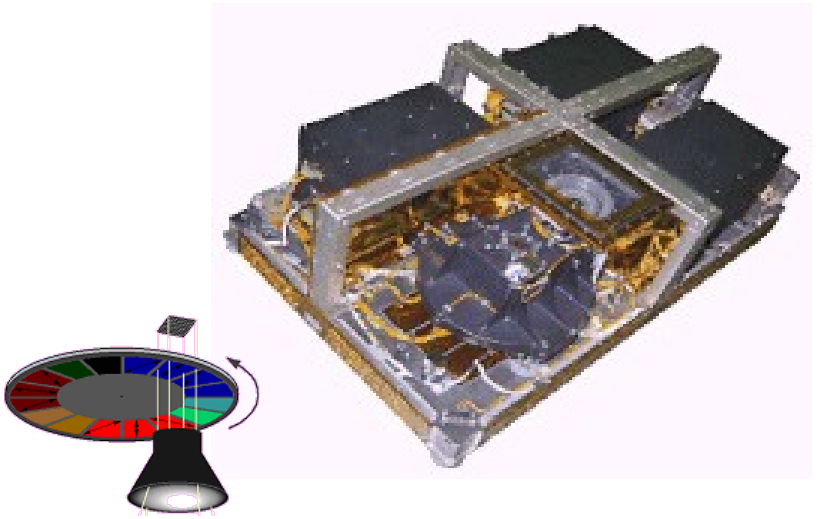
- NASA, Terra & Aqua
  - launched 1999, 2002
  - 705 km polar orbits, descending (10:30 a.m.) & ascending (1:30 p.m.)
- Sensor Characteristics
  - 36 spectral bands ranging from 0.41 to 14.385 µm
  - cross-track scan mirror with 2330 km swath width
  - Spatial resolutions:
    - 250 m (bands 1 - 2)
    - 500 m (bands 3 - 7)
    - 1000 m (bands 8 - 36)
  - 2% reflectance calibration accuracy
  - onboard solar diffuser & solar diffuser stability monitor

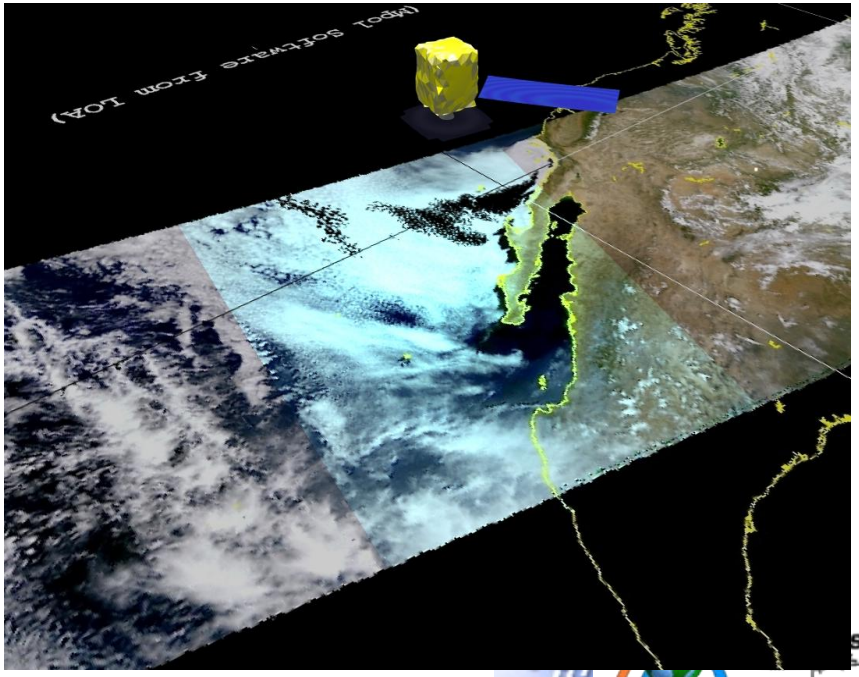




Instrumental Background : POLDER

- CNES/LOA instrument, Adeos I & Adeos II Platform
  - launched 1996, 2003
  - ~ 800 km polar orbits, descending (10:30 a.m.)
- Sensor Characteristics
  - 9 spectral bands ranging from 0.443 to 0.910 µm
  - 3 polarised channels
  - Wide FOV CCD Camera with 2400 km swath width
  - +/- 43 degrees along track
  - +/- 51degrees cross track
  - Multidirectionnal observations (up to 14 directions)
  - Spatial resolution : 6x7 km
  - No onboard calibration system - Inflight vicarious calibration :
    - 2-3% absolute calibration accuracy
    - 1% interband – 0.1% interpixel over clouds





Methodology

Questions :

What are the possible synergies between the different instruments of the Atrain and particularly between POLDER / MODIS ?
How do we combine these measurements to allow combined retrievals ?

Strategy:

Comparison of products retrieved independently by each instrument

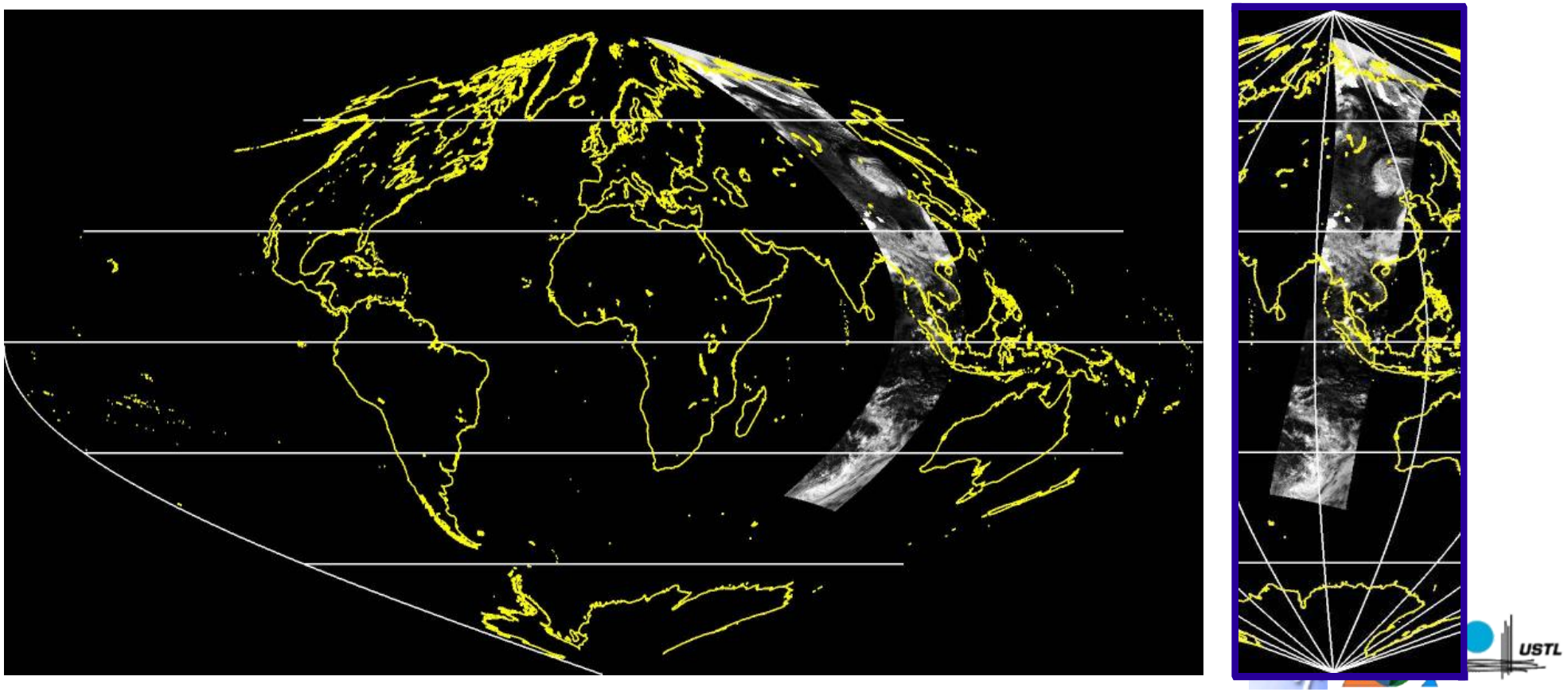
Conducting sensitivity studies based on simulation

Direct analysis of combined level 1 data (ie : look at real world data)
- Processing line development for efficient colocation of all data
- Performing intercalibration of sensors to get compatible reflectances

Current Activities : Processing environment

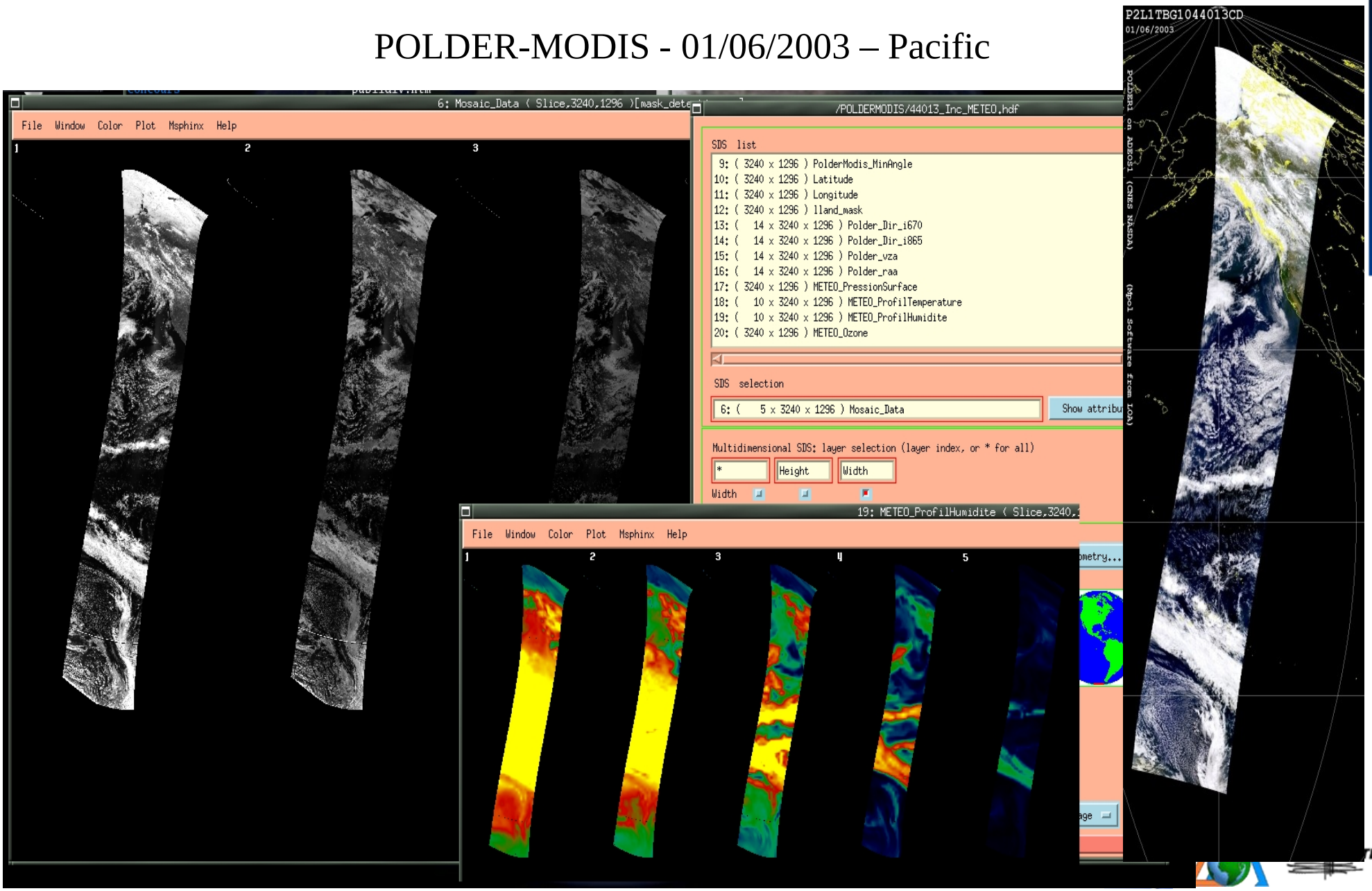
Provide users with an hyper-pixel structure containing both multispectral, multispatial and multidirectionnal observation together with all necessary ancilary data.

Provide an easy to access, visualize and process data structure

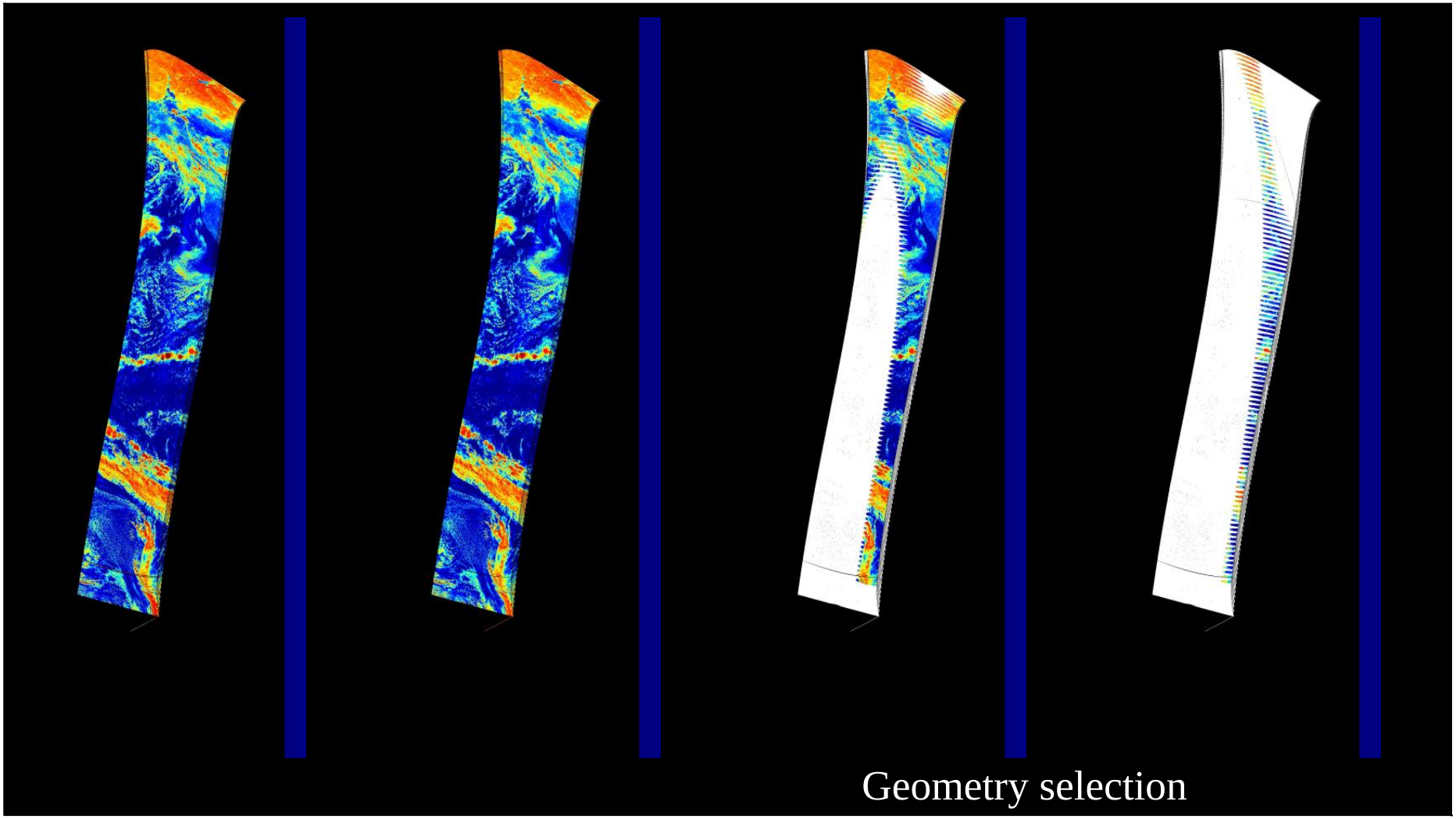


Current Activities : Processing environment

POLDER-MODIS - 01/06/2003 – Pacific

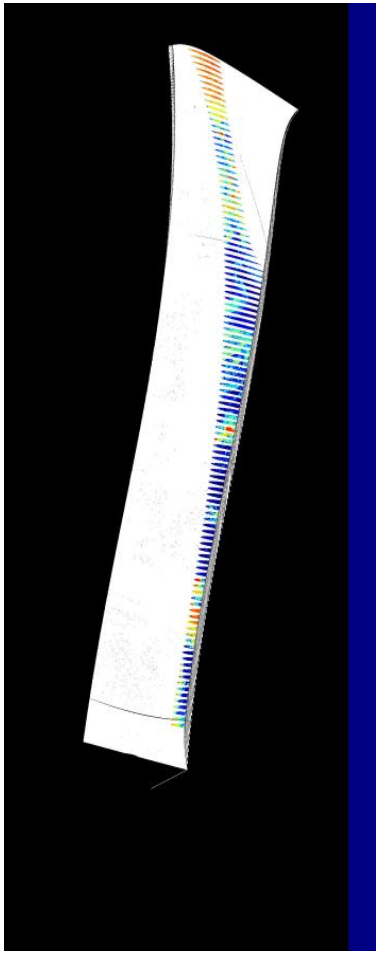


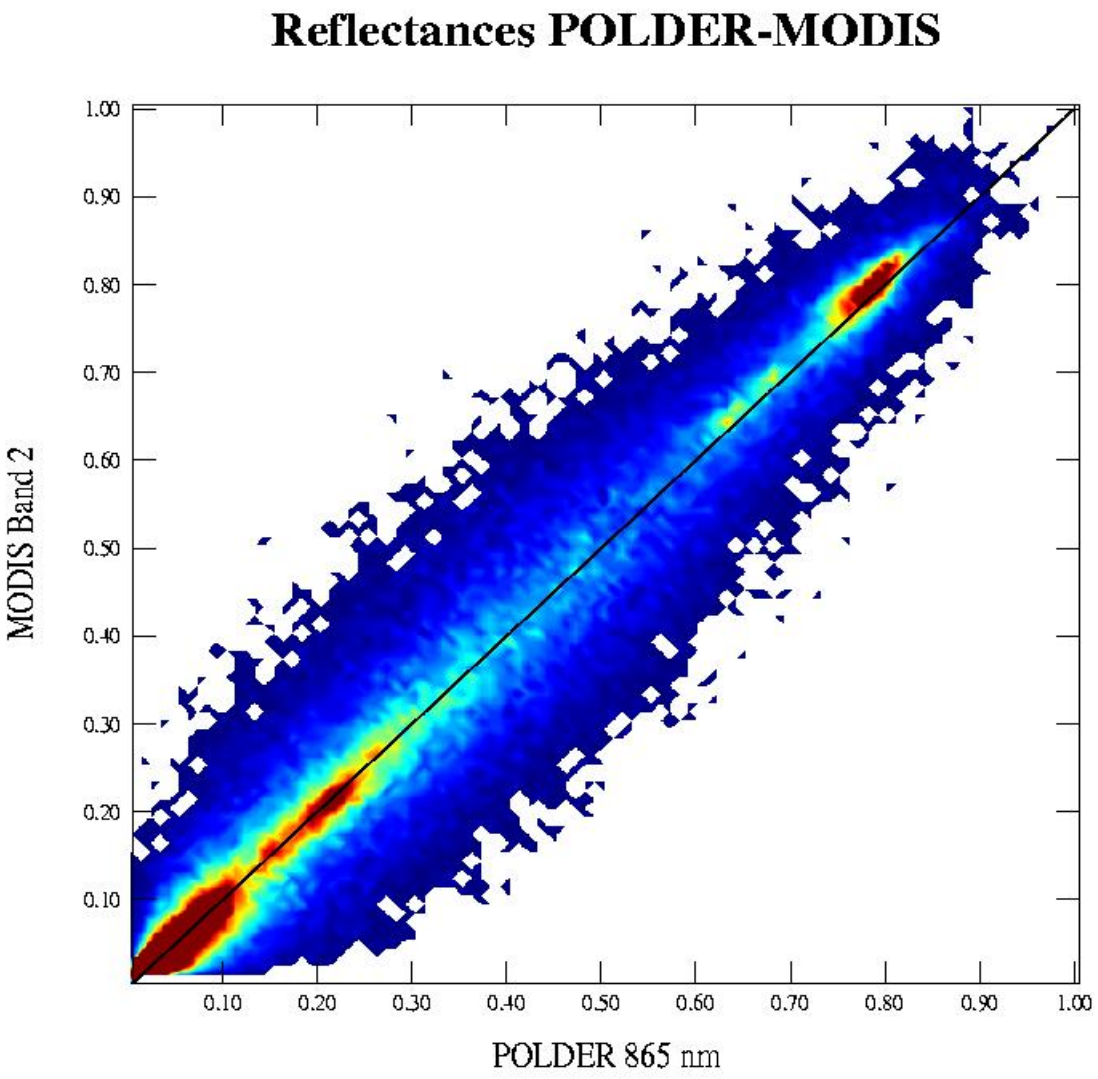
Current Activities : Intercalibration



Modis Band 2 Polder 865 nm 5 degrees diff. 2 degrees diff.

Current Activities : Intercalibration





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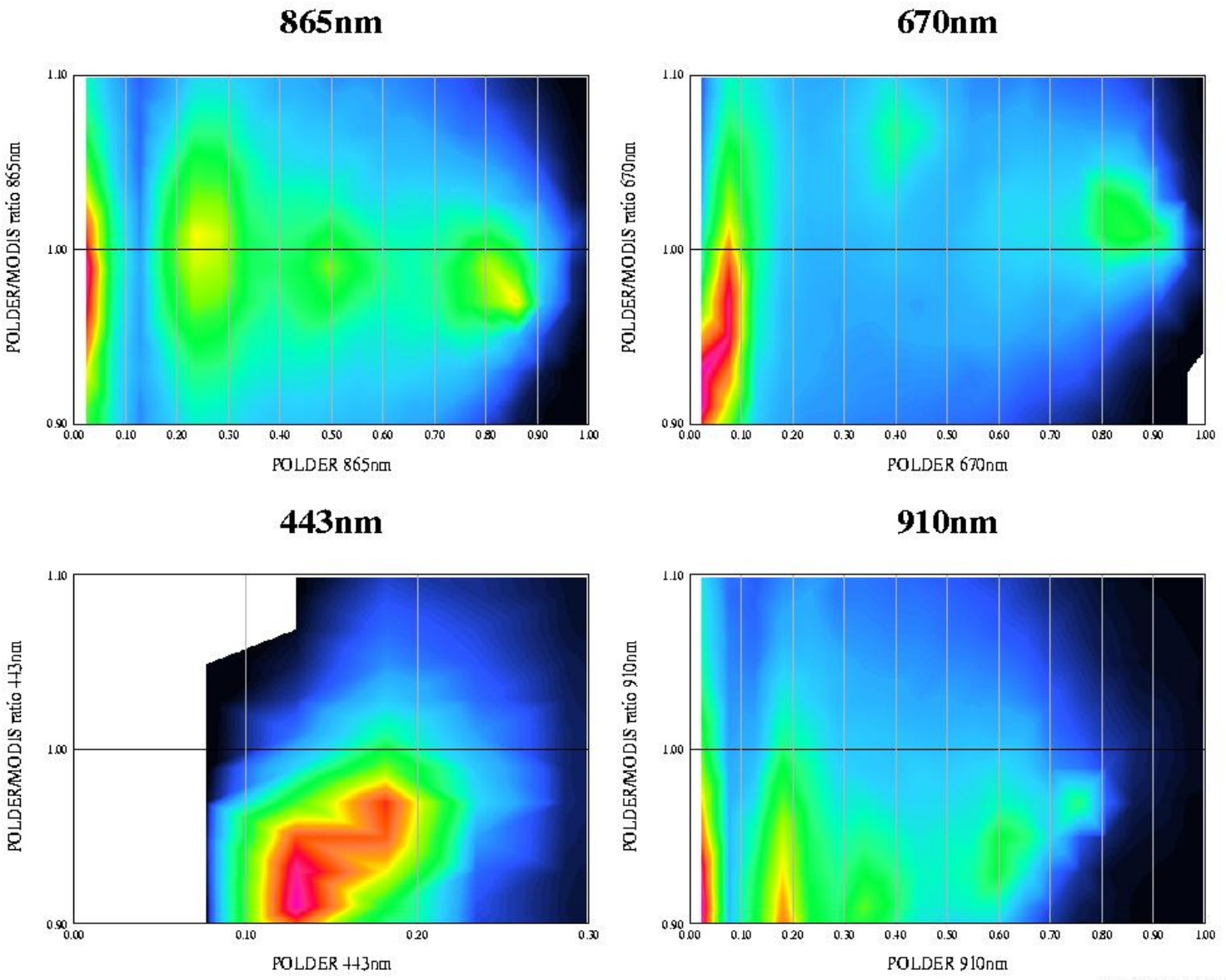
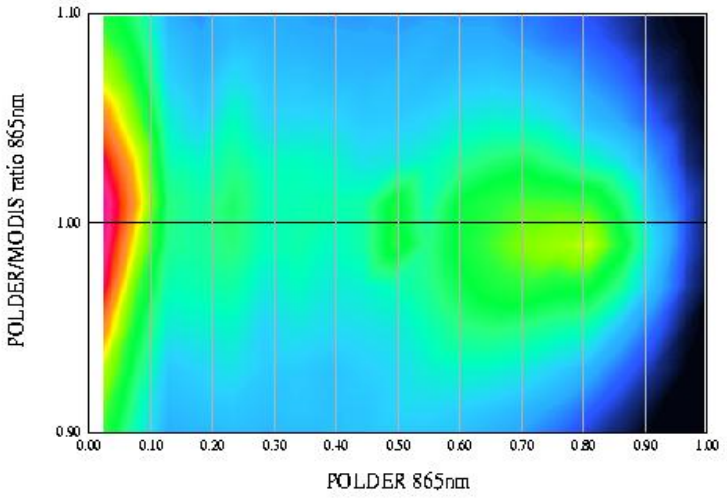
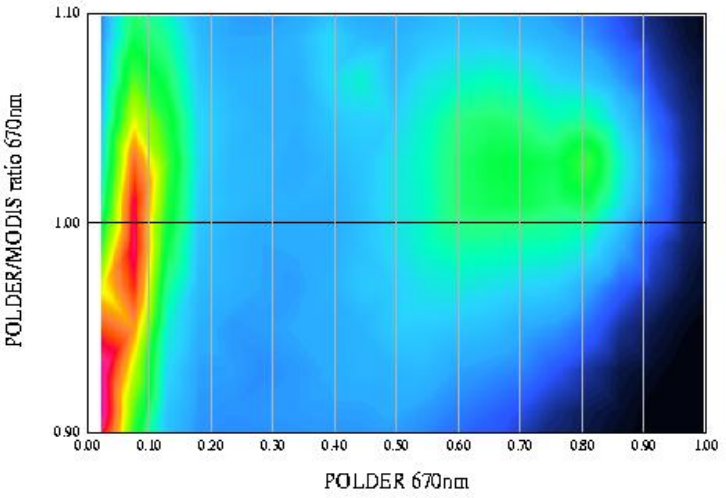


Current Activities : Intercalibration

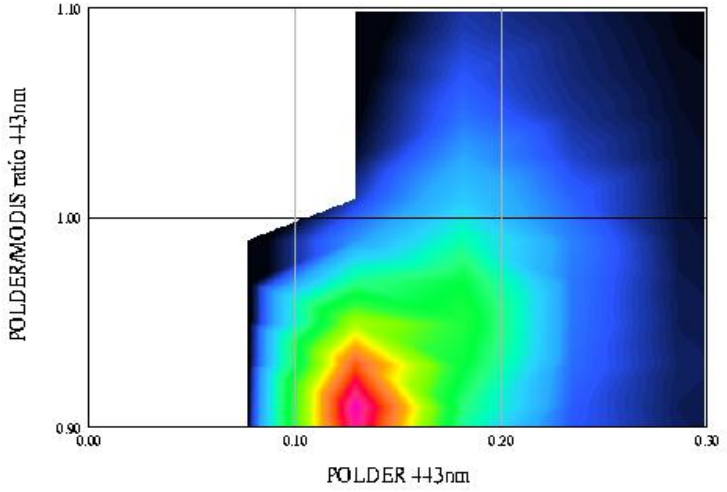
865nm



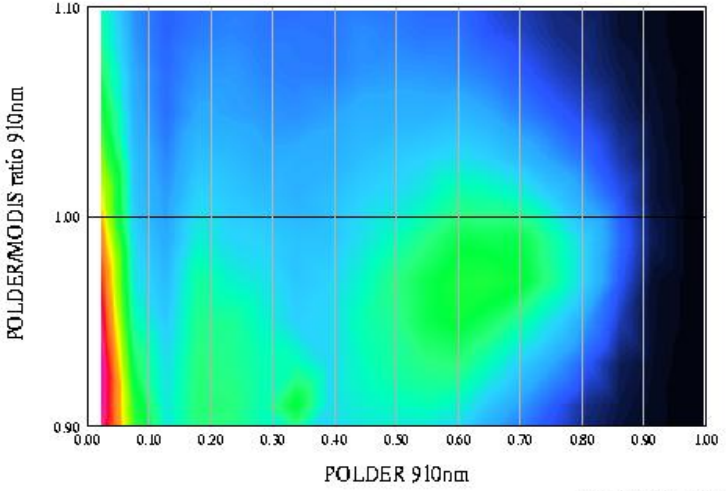
670nm



443nm



910nm



Wed Jun 30 05:44:30 2004 Picard Science Team

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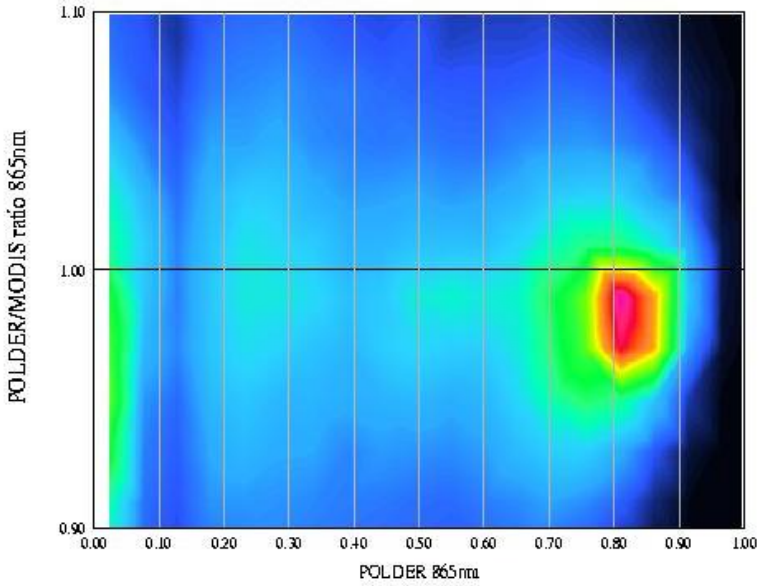
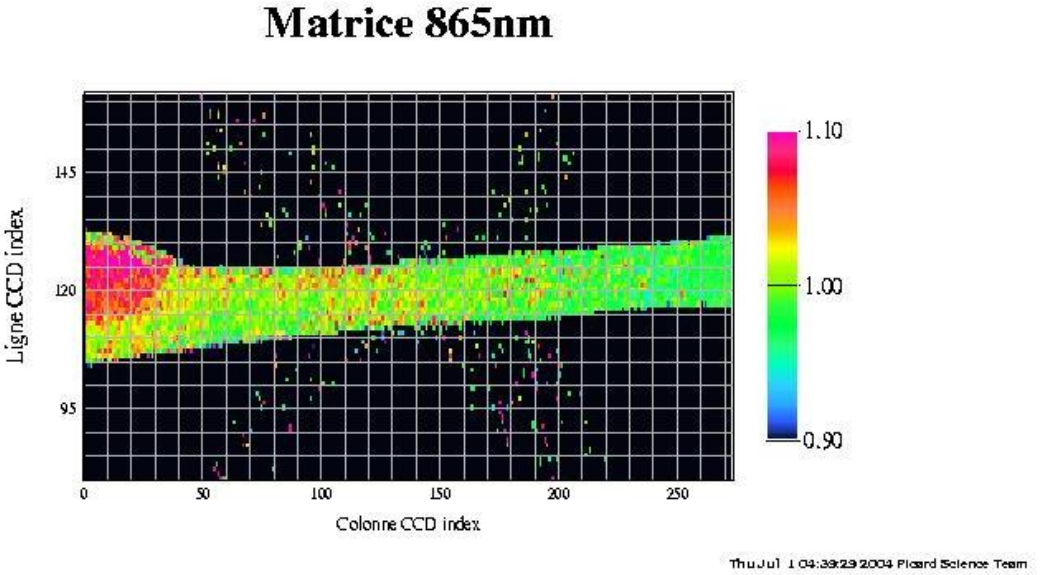
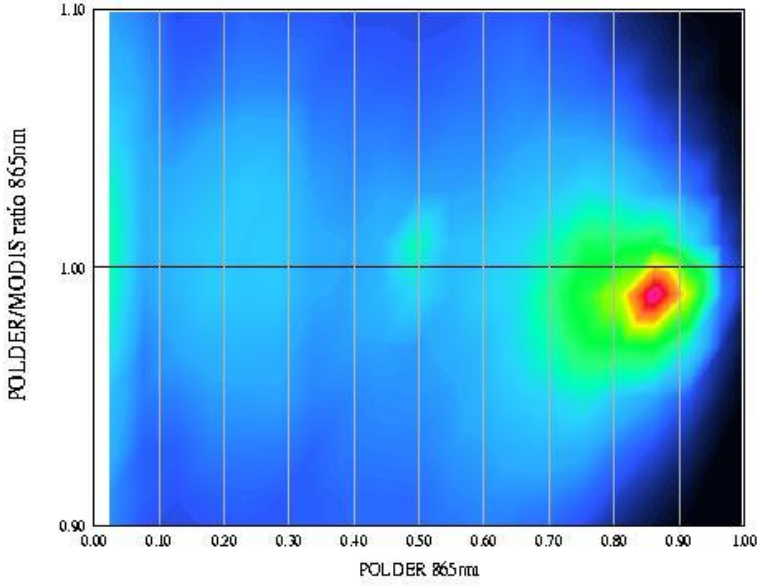
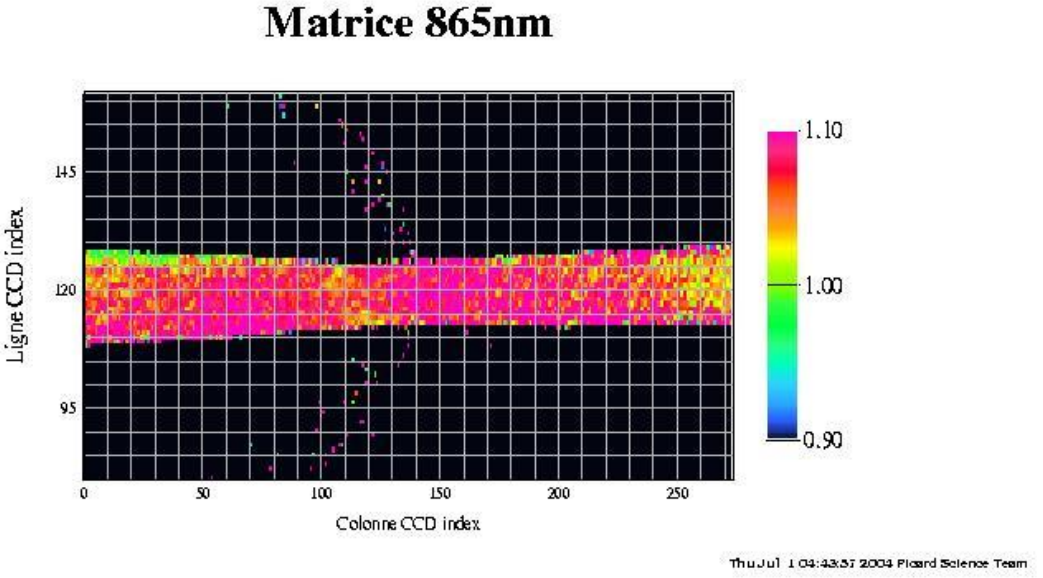
Current Activities : Intercalibration

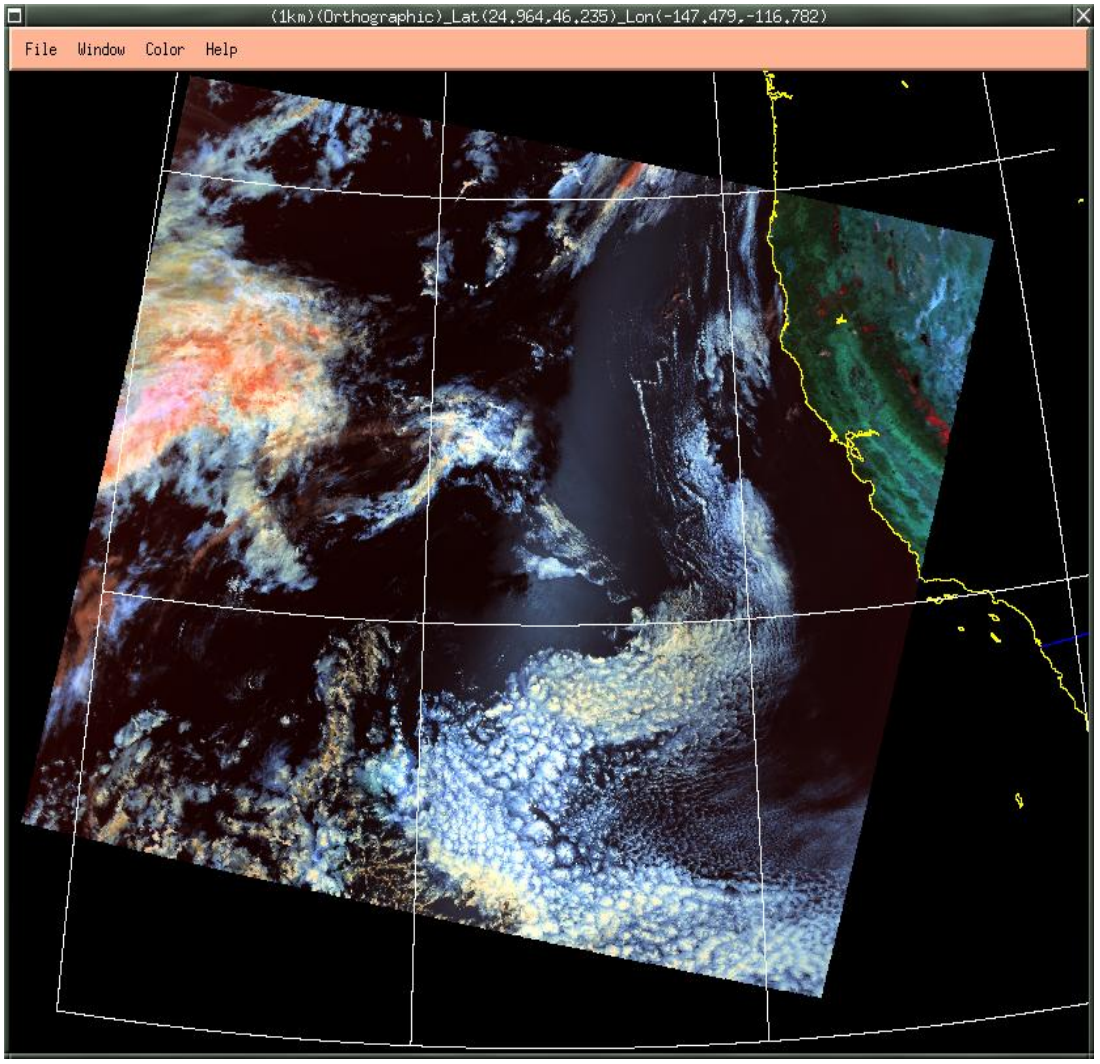






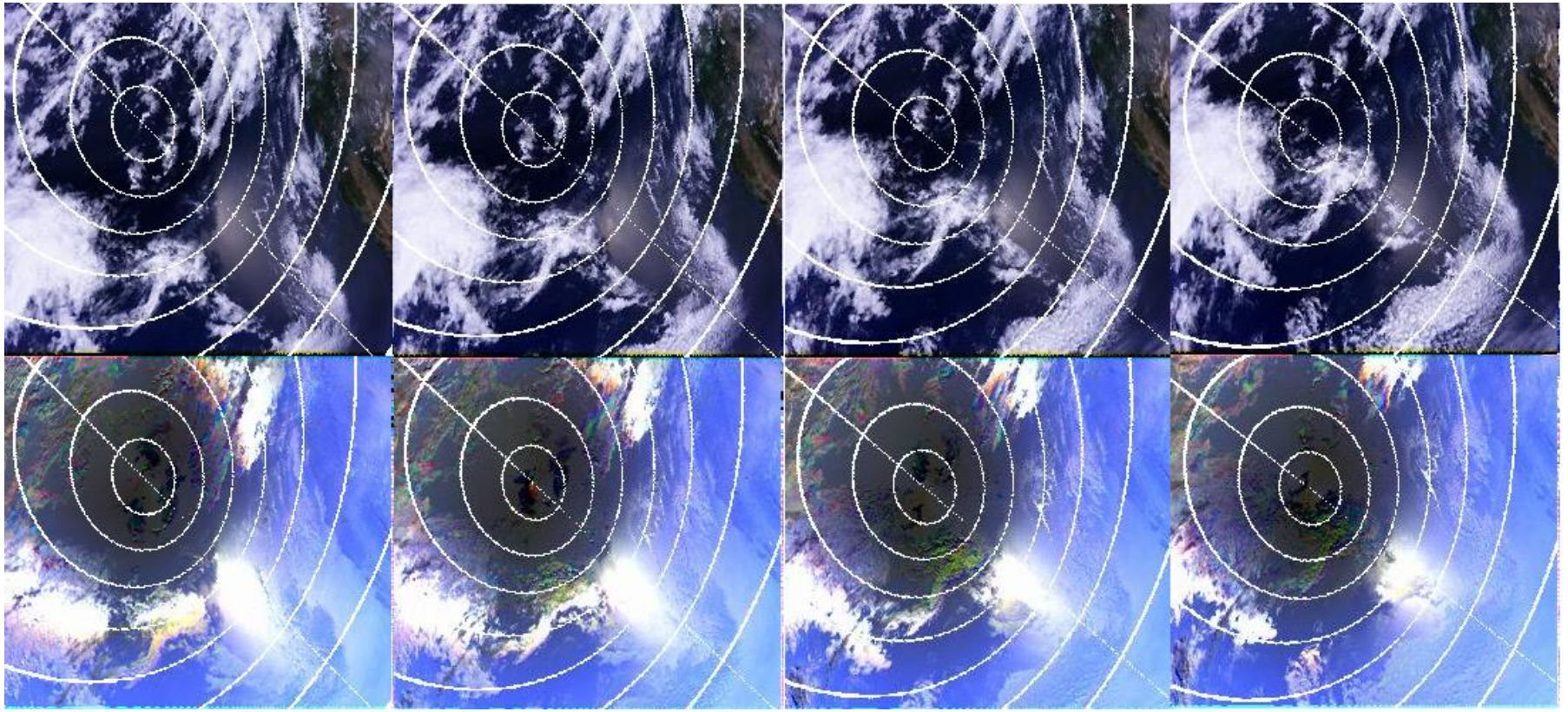


Potential Synergy : Cloud phase



MODIS VIS/SWIR composite (band 2, 6 and 7)
Higher absorption by ice in SWIR bands produces red colors in composite

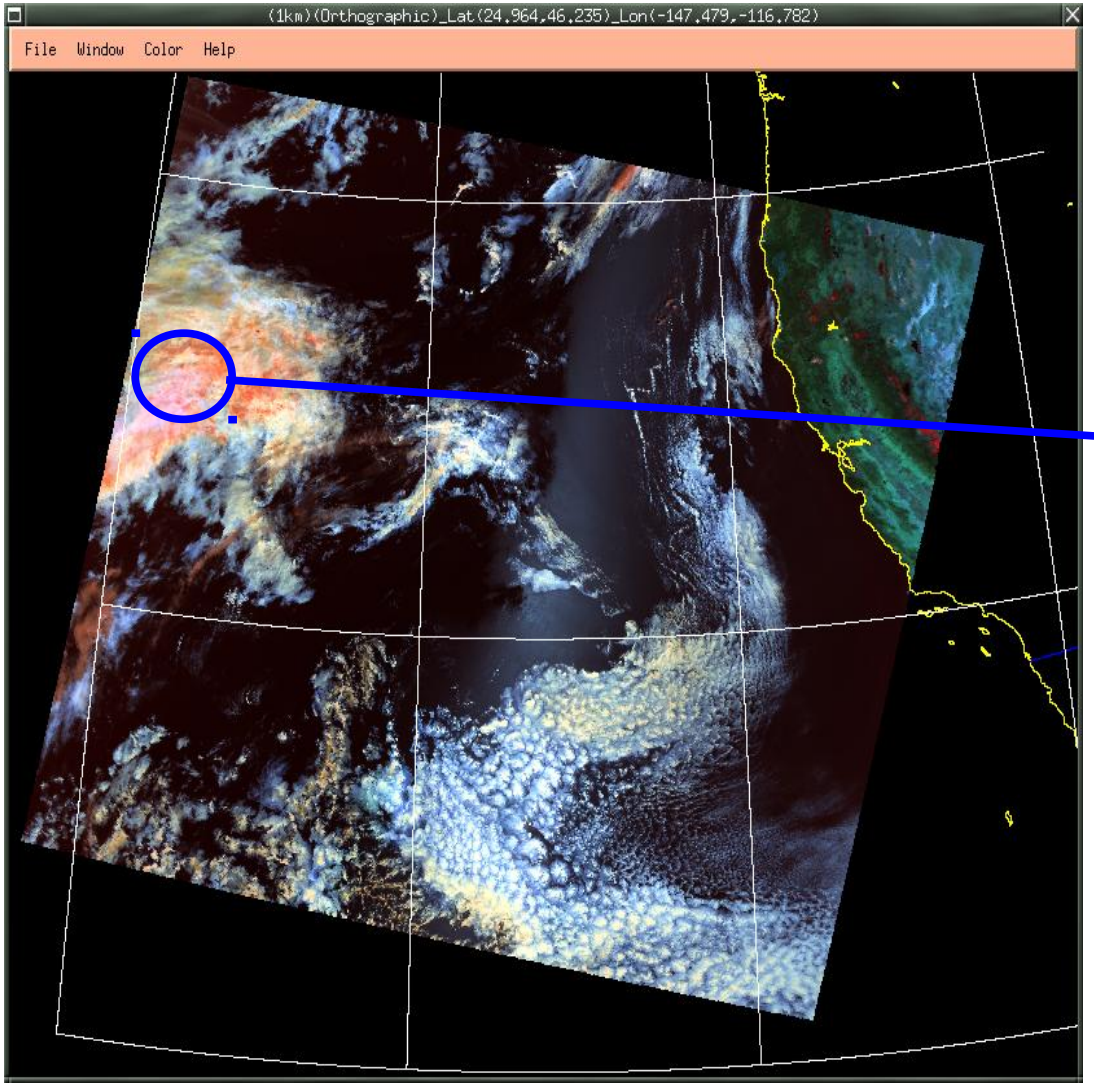
Potential Synergy : Cloud phase

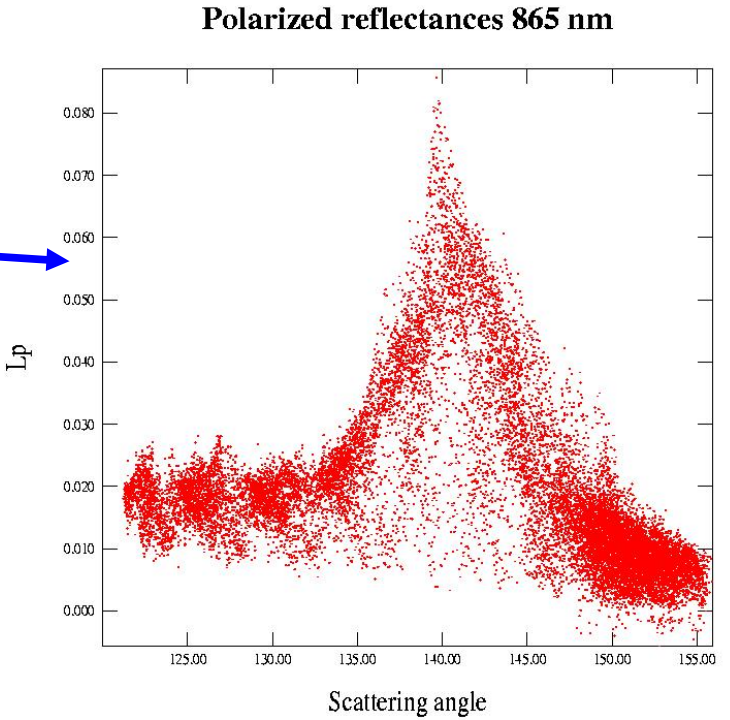


POLDER True color (total radiances / Top) and False color (polarized radiances / Bottom)

Spherical (liquid) particles produce high polarisation around 140 degree

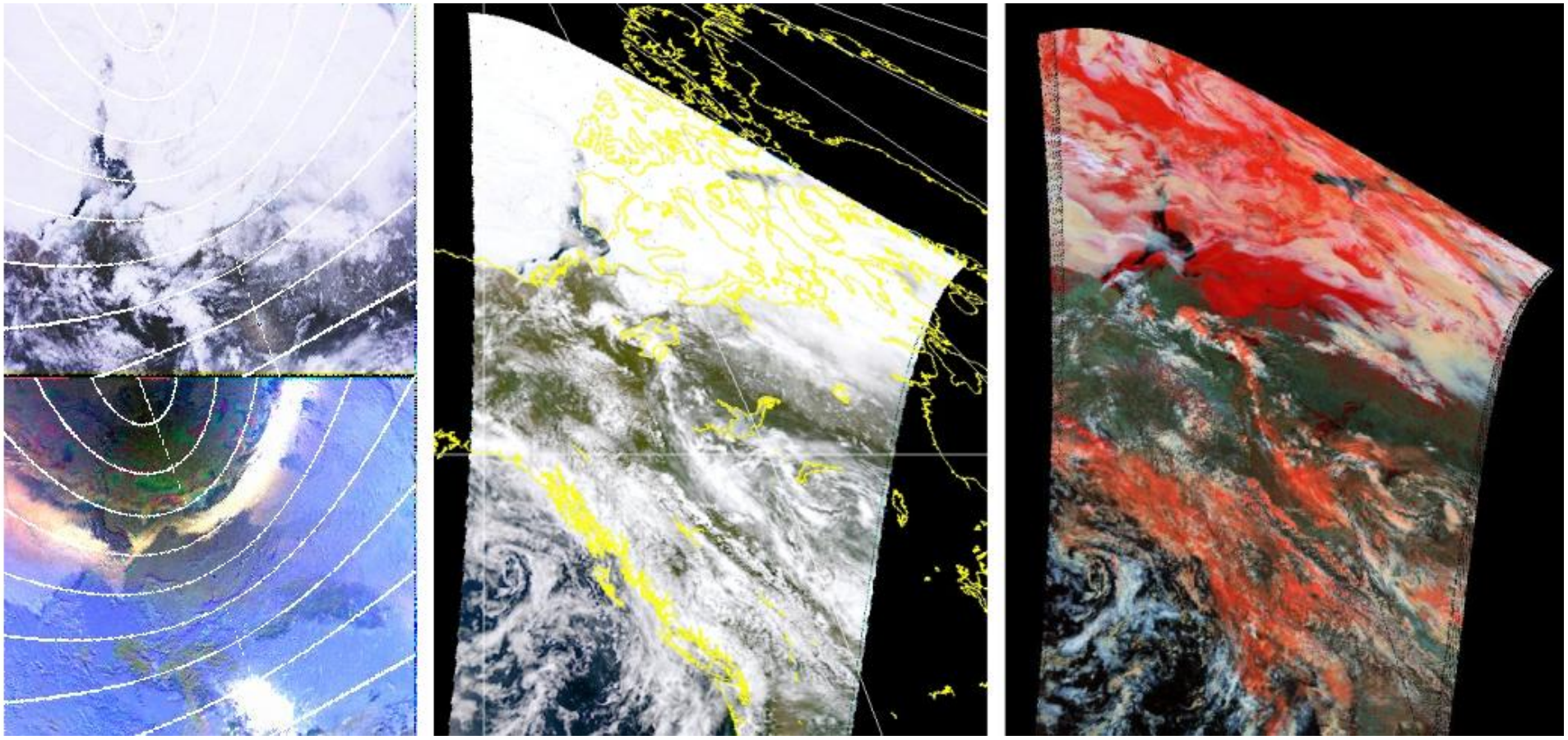
Potential Synergy : Cloud phase





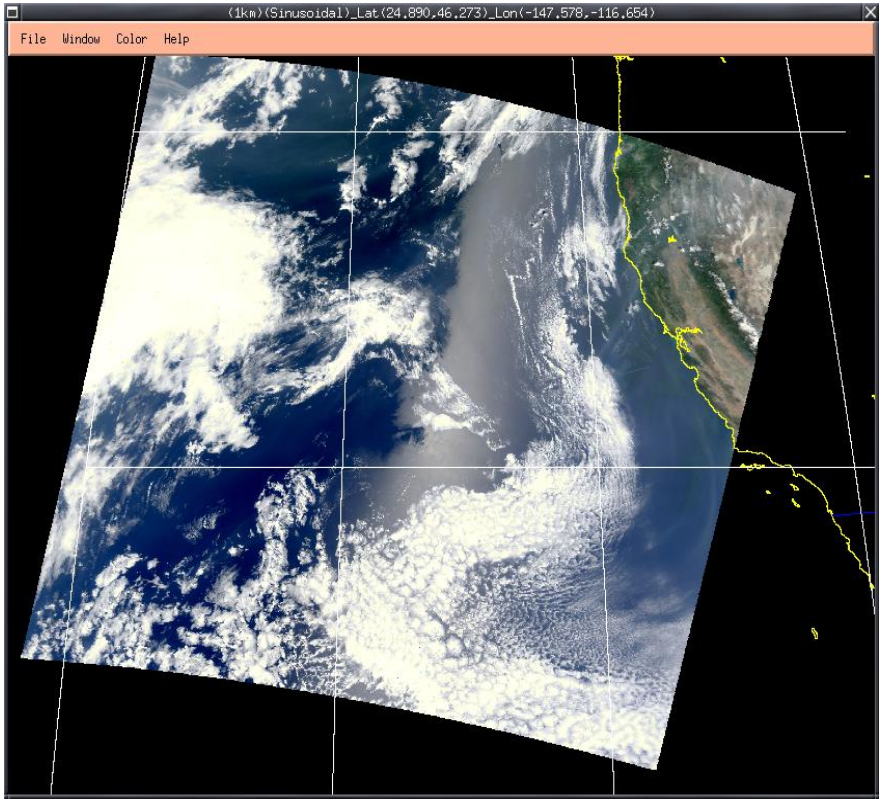
Spherical (liquid) particles produce high polarisation around 140 degrees

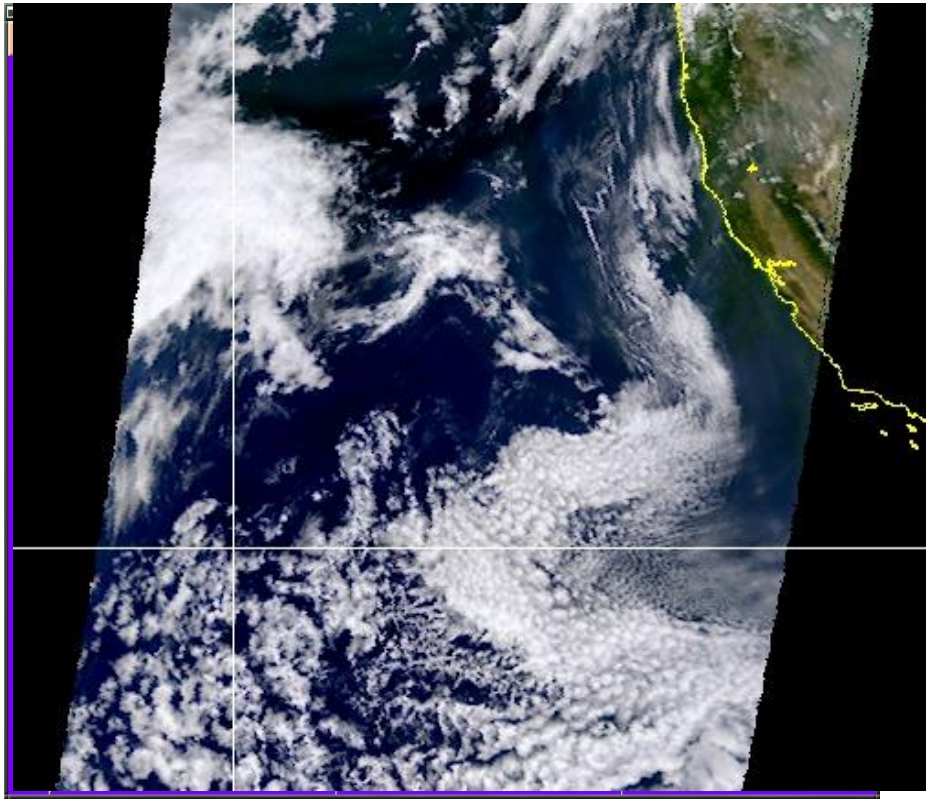
Potential Synergy : Cloud detection over snow/ice



Combination of polarisation and SWIR measurements enable better discrimination of clouds against snow/ice surface

Potential Synergy : Cloud detection in glint region





Multiangle observations enable straightforward cloud detection under glint conditions

Potential Synergy

Cloud layers height

Deriving multiple cloud top pressure (O2, Rayleigh, CO2 slicing, H20) to detect multilayer clouds and better describe vertical structure

Improved cloud retrievals

Using Size retrieval from MODIS to improve multidirectionnal OT retrievals from POLDER

Cloud Heterogeneities

Using MODIS 250m information to understand angular behavior in POLDER measurements and separate 3D effect from subpixel heterogeneities

Summary

An efficient module for merging MODIS and POLDER data has been created

Intercalibration of the sensors is greatly simplified and detectors evolution can be monitored

Improved knowledge of the POLDER sensor is also possible

Various potential synergy for cloud remote sensing are clearly identified

Future work

Implement new algorithms for joint analysis

Provide users with POLDER/MODIS joint dataset and new products

Parasol-Modis/Aqua soon available ...

Next Generation POLDER to follow.