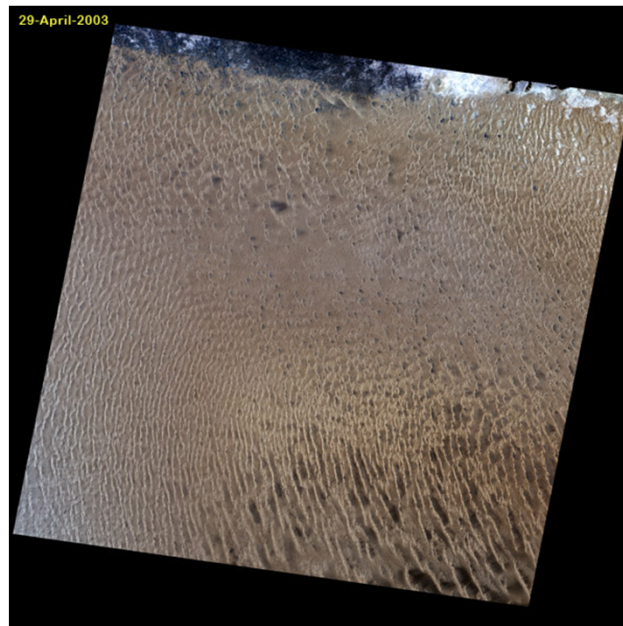


CEOS WGCV IVOS)

MEREMSII review

**Nigel Fox
CEOS IVOS chair**



IVOS: Vision



To facilitate the provision of 'fit for purpose' information through enabling data interoperability and performance assessment through an 'operational' CEOS coordinated & internationally harmonised Cal/Val infrastructure consistent with QA4EO principles.

To Include:

- *Pre-flight characterisation & calibration*
- *Test – sites*
- *Comparisons*
- *Agreed methodologies*
- *Interchangeable/readable formats*
- *Results/metadata - databases*

Need Key Infrastructure to be established and maintained independent of sensor specific projects and/or agencies

IVOS



Post launch vicarious Cal/Val:



Critical for all EO optical missions to facilitate:

- **Interoperability**
- **Bias assessment/removal**
- **Sensor drift monitoring/correction**
- **End to end performance check**

CEOS strategy: evaluate, consolidate & establish ‘best practise’

Test sites / ‘methods’ with documented procedure & uncertainty

- **Different approaches optimum for different purposes**
- **Need to establish ‘degree of equivalence’ between similar &**

different methods & consistent traceability



Test sites

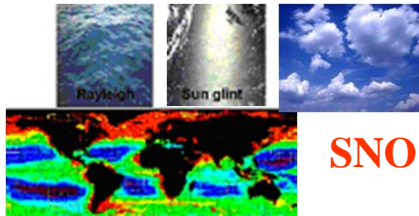
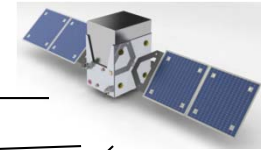
- Aim for relatively few to encourage multi-satellite data collection
 - ~5 -10 autonomous instrumented/ground characterised
 - 6 psuedo-invariant deserts (only observed from sats)
- Need Site characteristics
- atmospheric variability
- multiple acquisitions

Have wide CEOS agency support & recognised as core focus and achievement for Cal/Val

Conceptual operational network



Absolute sensor



SNO

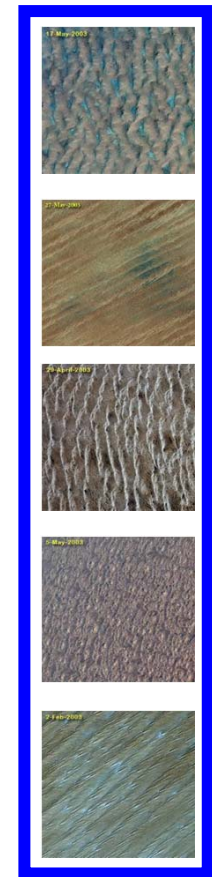
Linked by Satellite
(Reference sensor
/ensemble)

Database / results
- SADE
- Dimitri
- CEOS

Pseudo-Invariant Sites
Long term trends
Stability Monitoring

Instrumented Sites (LANDNET)

IVOS Radiometric Gain



What might an Operational Cal/Val service look like?



- Probably Not real time calibration coefficients
 - More a continuously updated set of Sensor to sensor Relative coefficients using standardised conditions: cloud, angles etc
 - Trend to a single site, group of sites, range of methods
 - Difference between a pair of sensors
 - Difference to a ‘Reference sensor’
 - Difference to an agreed baseline
 - Difference to a “community Mean”
- User friendly fully open interface to access results fully archived, with appropriate metadata and re-analysable
- Automatic collection and deposition (accessible) data over CEOS sites
 - Formats/translators
 - CWIC tool
 - Meteorology/Aeronet
- Probably ‘intelligent’ operator managed
- Allow full access to tools for user analysis
- Results based on a combination of tools following analysis of performance
- Could Kick start process with a few methods e.g. WG4 output

IVOS 2010 (JRC) Workshop led to establishment of WGs to consider 'best practise' / relative consistency/applicability of different methodologies
CEOS and WMO-GSICS



WGs on methodology and data format

- **WG1: Use of Deep Convective Cloud**

Lead: D Doelling (NASA)

Participant:

**Call for participants
& leads still open.....**

- **WG2: Rayleigh Scattering**

Lead: P Henry (CNES)

Participant: M Bouvet (ESA)* , L Bourg (ACRI)

- **WG3: Sun Glint**

Lead:

Participant: S Lavender (ARGANS)

- **WG4: Use of fixed ground sites e.g. SADE, DIMITRI, Landnet, invariant desert sites (but not requiring ground measured data)**

Lead: X Briottet

Participant: D Smith (RAL), P Henry (CNES),
M Bouvet (ESA)*, L Bourg (ACRI)

- **WG5: Simultaneous Nadir Observation**

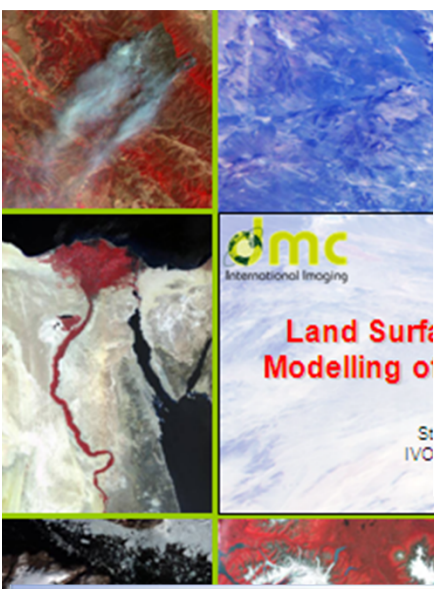
Lead:

Participant: S Kumar (ISRO), S Saunier (Mag)

**WORKING GROUPS NEED INPUT FROM OTHER AGENCIES TO ENSURE
HARMONISATION AND BEST PRACTISE/EXPERTISE**



Sensor to se



Monitoring Stability of VIIRS Radiometric Response

Slawomir Blonski, Changyong Cao, Sirish Uprety, and Xi Shao
NOAA / NESDIS / STAR

Presented at the CEOS IVOS-24 Meeting, Sioux Falls, South Dakota, May 8-10, 2012

Terra ASTER at the CEOS calibration sites



4
in Sioux Falls



O (GSJ),
A (ITRI),
(GSJ)
and Science Technology

Absolute Calibration of Optical Using Pseudo Invariant Calib (PICS) Initial concepts

Dennis Helder
Nischal Mishra
Sandip Shrestha
Image Processing Laboratory
SDSU



IVOS

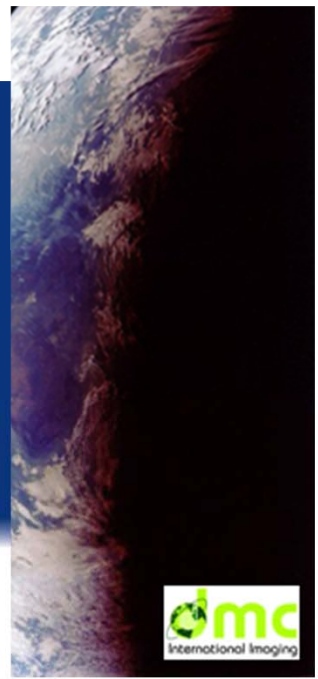
Toulouse, France
April 13 – 15, 2011

Gyanesh Chander (SGT/USGS EROS)
Email: gchander@usgs.gov



ETM+ vs Terra/MODIS Cross Calibration over Desertic Sites & Accuracy Assessment using Hyperion Data

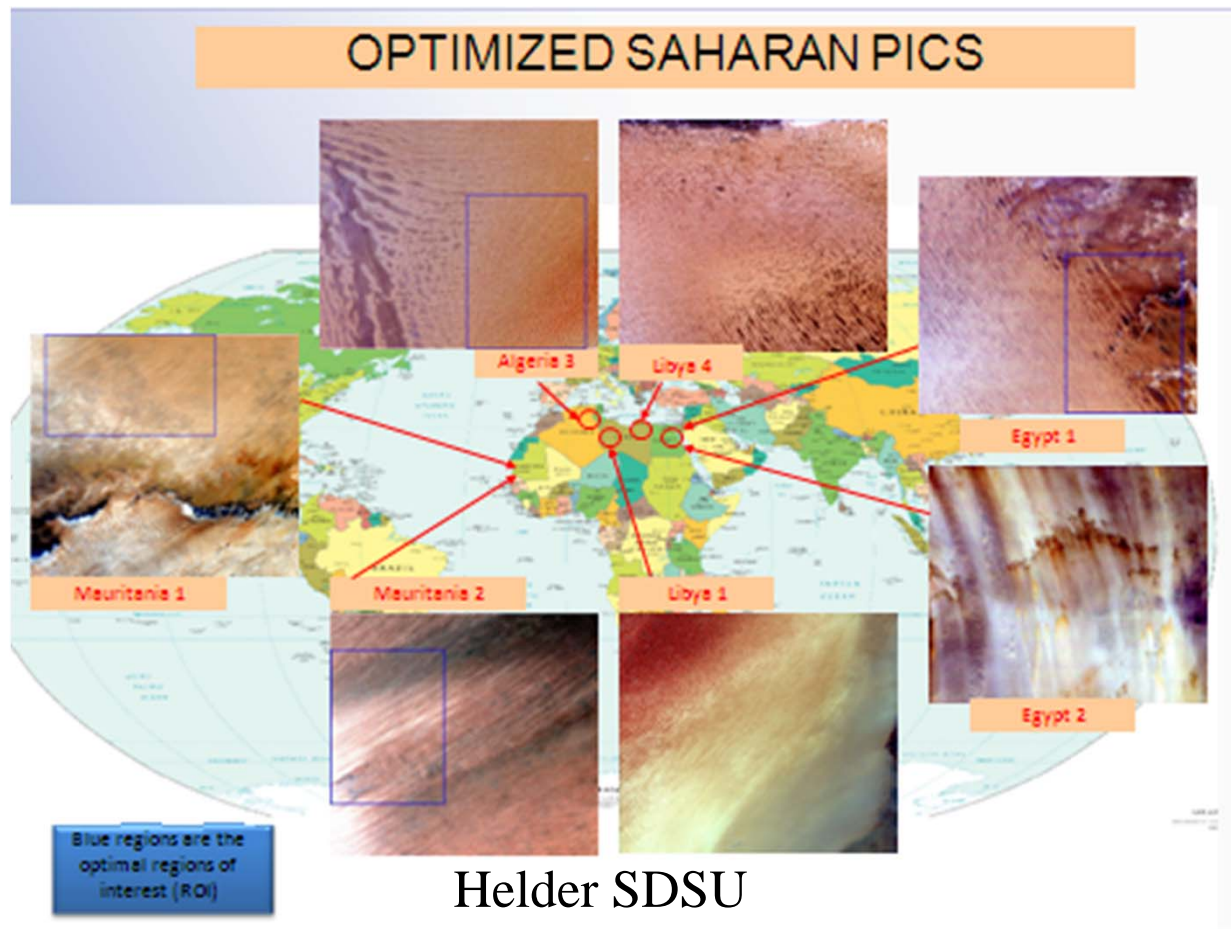
Patrice Henry, Bertrand Fougne, Sophie Lacherade,
Philippe Gamet, Denis Blumstein - CNES
Thomas Colin - CS
Gyanesh Chander - USGS



CEOS IVOS workshop on: Libya 4 (Oct 4-5 2012 CNES Paris)



CEOS 'non-instrumented' Test sites for Stability and sensor to sensor cross-comparison

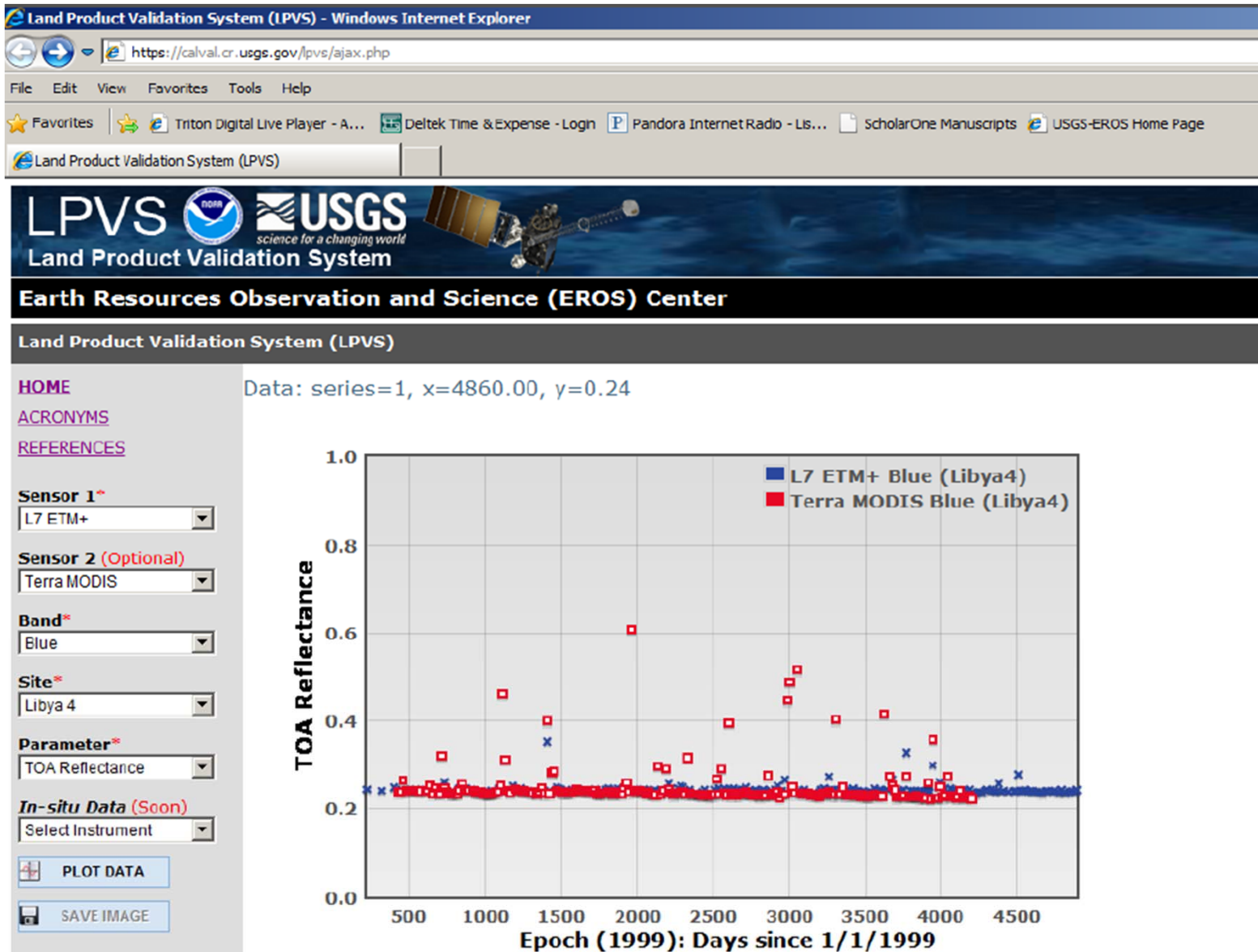


- ~25 attendees
- Working meeting
- Focus on one site
- Share ideas
- Different sensors
- Cal/comparison methods
- Site characteristics – observed/modelled
- High and medium res
- **What can & might be achievable?**

Conclusions: Next steps

- Compare results from different BRDF models
 - Develop/agree a CEOS BRDF (site specific)
 - Look at Sensor derived Pleiades, MISR, CHRIS, POLDER
- Compare (and assess uncertainty) of methods of spectral response convolutions with standardised site reflectance
- Extend comparisons to include higher resolution sensors
- Assess variances in atmospheric corrections (part of K Thome task group)
- Evaluate hyperspectral measurements of test sites (Schiamachy, hyperion etc)

Other Tools



Future tools/infrastructure



- **CEOS / GSICS access to SADE database of CNES - long time base multi-sensor acquisition data over key test sites**
- **DIMITRI data-base and comparison tool - open access via Cal/Val portal**
- **‘Test data set and protocol’ - open access via Cal/Val portal**
- **CEOS COVE - Acquisition/comparison planning and past opportunities tool**

CEOS WGCV plenary 35 ISRO Sep 23-28 2012

- **USGS Sensor cross-comparison tool and acquisitions data base**
- **WGISS CWIC tool – IDN linked search/find and order tool for multi-sensor data granules – temporally & spatially defined**
 - **User interface for CEOS test sites now under development**



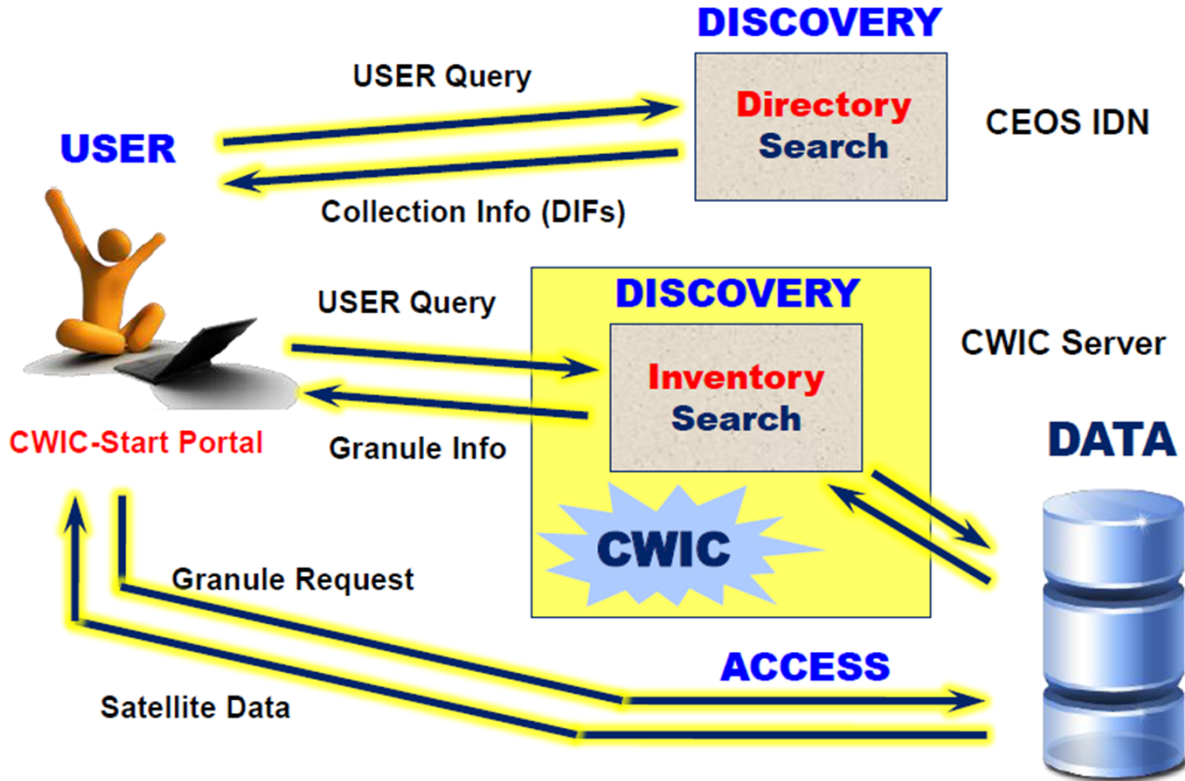
CNES: SADE & Muscle



A screenshot of a Windows Internet Explorer browser window. The address bar shows the URL 'http://smc.cnes.fr/CALIBRATION/A_desert_sites.htm'. The browser's menu bar includes 'File', 'Edit', 'View', 'Favorites', 'Tools', and 'Help'. Below the menu bar, there are 'Favorites' and 'Get more Add-ons' buttons. The browser tabs show 'http://www.ceos.org/ima...', 'http://www.ceos.org/ima...', and 'Desert Sites'. The main content area displays the CNES website header with the text 'RADIOMETRIC CALIBRATION'. Below the header is a navigation menu with links for 'HOME', 'PRACTICAL INFORMATION', 'LEGAL INFORMATION', 'WEBMASTER', 'HELP', 'SITE MAP', 'OTHER LINKS', and 'GLOSSARY'. A dropdown menu for 'Space Missions' is visible. The main content area is titled 'The cross-calibration over desert sites' and contains a paragraph of text explaining the selection and use of 20 desert sites for radiometric calibration. Below the text, there is a map of the desert regions in North and West Africa, with red squares indicating the locations of the 20 sites. The map is labeled with country names and site numbers, such as 'ALGERIA 1-4', 'LIBYA 1-4', 'EGYPT 1-3', 'SUDAN 1', 'NIGER 1-3', 'MAURITANIA 1-2', and 'ARABIA 1-3'. A small satellite image of a desert landscape is visible in the bottom right corner of the map area.



CEOS WGISS Integrated Catalogue (CWIC)



GUI focussed on applications



The screenshot displays the CEOS Land Surface Imaging Explorer interface. It is divided into several sections:

- Search Criteria:** Includes a search bar for address/place, a coordinate selection tool (currently showing "No coordinates selected"), and a date range selector (set from 01/01/2012 to 09/19/2012).
- Map:** A satellite view of South Asia, showing India, Pakistan, and Bangladesh. The search area is centered over India.
- Data Sets:** A list of satellite data sets with checkboxes for selection. Selected items include:
 - USGS: Enhanced Thematic Mapper Plus (Landsat 7), Landsat Multispectral Scanner (MSS) Imagery, Landsat Thematic Mapper Imagery.
 - INPE: CCD - High Resolution CCD Camera (CBERS 2) Imagery, IRMSS - Infrared Multi-spectral Scanner (CBERS 2) Imagery, WFI - Wide Field Imager (CBERS 2) Imagery, CCD - High Resolution CCD Camera (CBERS 2B), WFI - Wide Field Imager (CBERS 2B) Imagery, HRC - High Resolution Camera (CBERS 2B) Imagery.
- Search Results:** A list of search results with details for each entry, including Entity ID, Start Date, End Date, and Summary Data. The first four results are displayed.

- Finds data sets,
- Links to catalogues to allow ordering
- Also provides meta-data
- Currently extending to provide one for CEOS test sites
- Potential linkage with COVE
- JAXA has version for Oceans (but also includes Aeronet sites and data)

