



CEOS
Systems Engineering Office (SEO)
Technical Report

Brian Killough
NASA, CEOS SEO
Agenda Item #7





CEOS SEO Functions



- The CEOS **Systems Engineering Office (SEO)** was established in April 2007 (sponsored by NASA) to facilitate the development of CEOS global space plans. **We have supported CEOS for 3.5 years and look forward to the future !**
- The SEO **technical functions** include: requirements definition, gap assessments, systems tools, special projects, and system architecture development.
- The SEO **management functions** include: improving communications through web-based management tools, and developing written and media products for CEOS education and outreach.





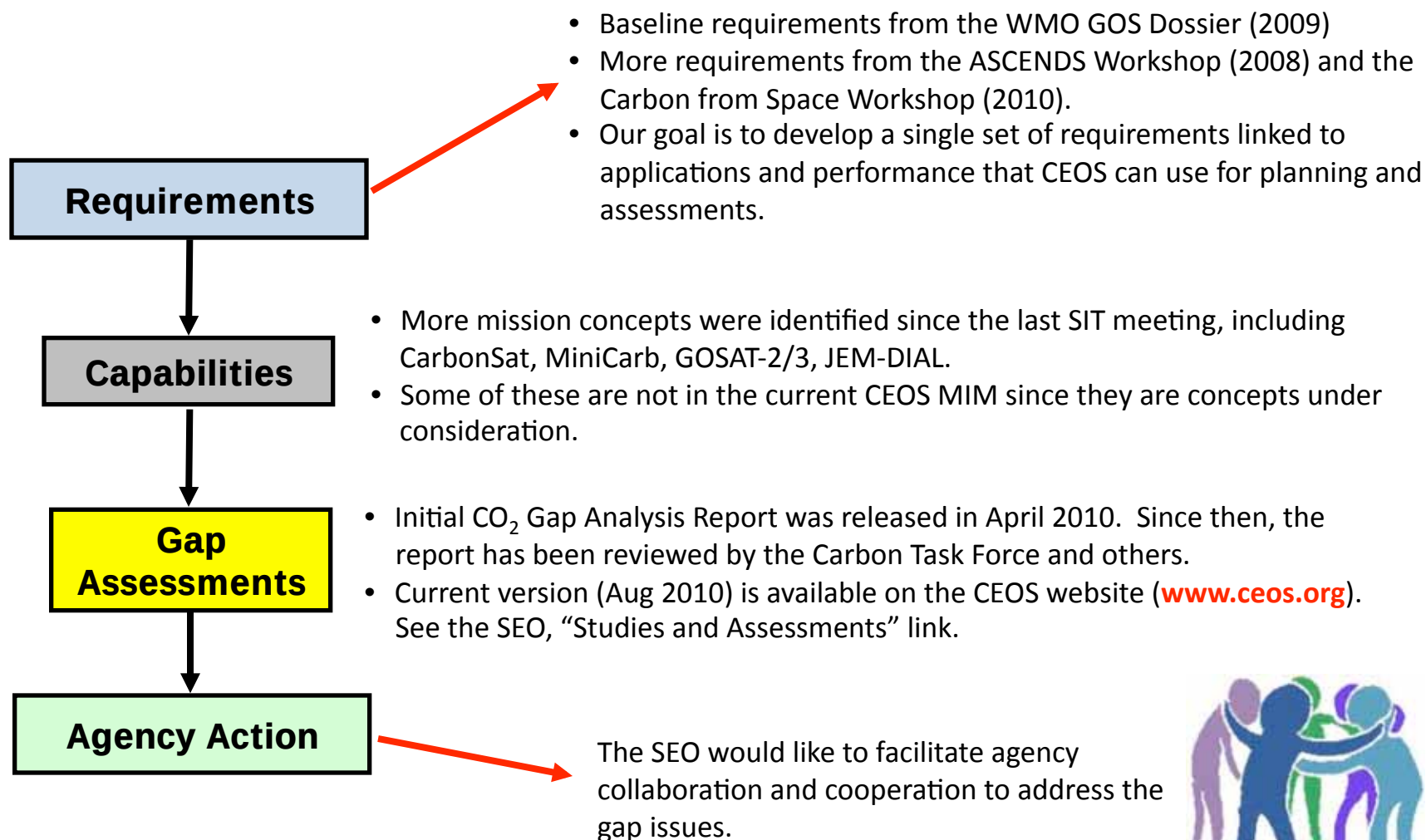
2010 Accomplishments



- Completed an atmospheric Carbon Dioxide (CO₂) gap analysis report. Presented the findings at several ACC meetings and the Carbon from Space Workshop.
- Continued support of the CEOS MIM database. Worked closely with the ESA development team on MIM design and content review. Updated the SEO Systems Database with requirements tables and improved navigation.
- Completed the first full release of the CEOS Visualization Environment (COVE) tool for satellite sensor groundtrack visualization and satellite coincidence calculations.
- Completed the first draft of the Land Surface Imaging (LSI) Mid-resolution Optical Standards Document. **Reported in the LSI presentation ...**
- Improved CEOS agency communications by: maintaining the CEOS website (www.ceos.org) content, maintaining the mailing lists, and developing a new Action Tracking Tool (www.ceos-actions.org). *More details will be covered in Agenda Item #29 (Thursday).*

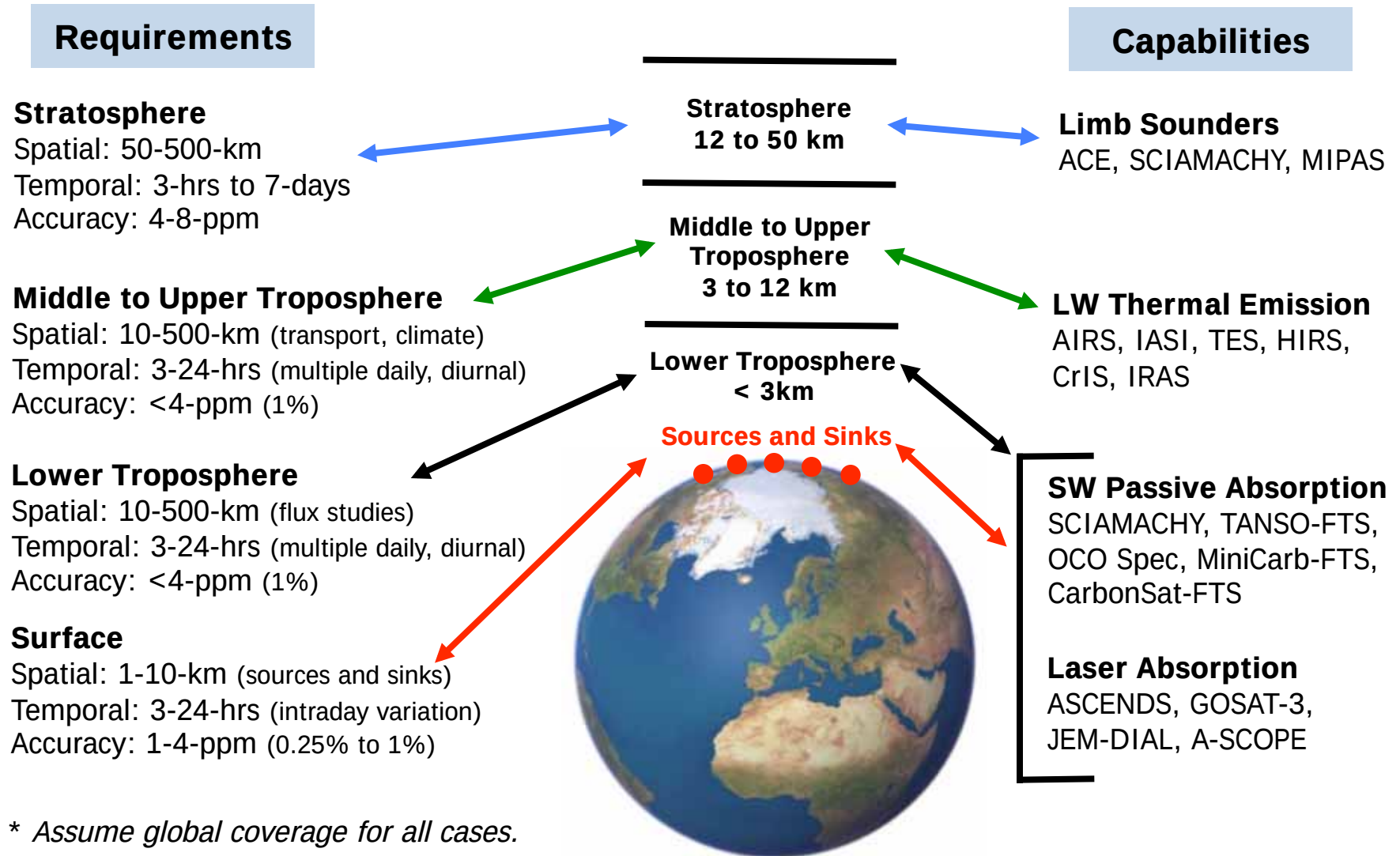


Atmospheric CO₂ Gap Analysis efforts since SIT-25 (April 2010)



Is one set of CO₂ requirements possible ?

The Carbon community thinks it is possible ... but we must link the range of requirements to applications and expected performance.



Mission	Instrument	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Nadir Absorption, weighted to the Lower Troposphere																		
ENVISAT	SCIAMACHY																	
GOSAT	TANSO-FTS																	
OCO-2	OCO Spectrometer																	
Minicarb	FTS																	
GOSAT-2	FTS																	
CarbonSat	Spectrometer																	
ASCENDS	Laser Spectrometer																	
GOSAT-3	Laser Spectrometer																	
Nadir Emission, weighted to the Mid-Troposphere and Upper-Troposphere																		
EOS-AQUA	AIRS / AMSU																	
EOS-AURA	TES																	
METOP and NOAA	HIRS	5	5	5	5	4	4	3	3	2								
Metop (A,B,C)	IASI																	
FY-3 (C,D,E,F,G)	IRAS						2	2	3	2	3	2	3	2	2			
NPOESS (1,3,4)	CrIS										2	2	3	2	2	2	2	2

GAP ???

- Lower Troposphere missions beyond OCO-2 (2016) are uncertain. All of the missions are in concept development and may not be flown, as shown. **A timeline gap may exist.**
- It is unlikely that ENVISAT and GOSAT will last beyond 2015 due to mission fuel constraints. OCO-2 has fuel for 8-years (till 2020).
- OCO-2 could be the only CO₂ mission measuring the lower troposphere beyond 2015 with limited repeat cycle (16 days) and spatial coverage (swath width 10-km). **More wide-swath CO₂ missions are needed.**

- The SEO will work with the Carbon Task Force (CTF) to develop requirements linked to applications and potential performance.
- The SEO will continue to gather new mission options, assess gaps and develop constellation options.
- The SEO will conduct future assessments of other GHG, including CH₄ and N₂O.

A possible CO₂ constellation for the future

SW Absorption (near surface, lower troposphere)

>5 satellites, >500-km swath, 2-km spatial sampling

<1-day combined revisit, <4-ppm (1%) accuracy

Laser Absorption (vertical profiling, day+night)

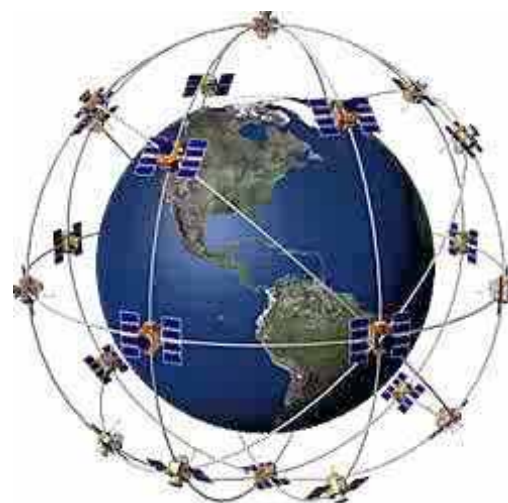
>1 satellite, <10-km spatial sampling,

<1-ppm (0.25%) accuracy

LW Emission (middle to upper troposphere)

>2 satellites, >2000-km wide swath, 10-km spatial sampling

<6 hours combined revisit, <4-ppm (1%) accuracy



CEOS Mission Databases



<http://database.eohandbook.com>



<http://www.ceos-sysdb.org>



CEOS MIM Database (ESA-developed)

- Online database of CEOS agency Missions, Instruments and Measurements (MIM).
- Filter and Search capabilities.
- Measurement timeline tables, export to EXCEL.
- Plans to update agency data annually.
- Future plans to consider EO Portal data, and Measurement Quality.
- Offered to CGMS for their use.

CEOS Systems Database (NASA SEO-developed)

- Includes MIM data from ESA.
- Links MIM data to CEOS Constellations, GEO Societal Benefit Areas (SBA), GCOS Essential Climate Variables (ECV).
- Summary of accuracy, spatial resolution, temporal resolution and sampling requirements by measurement type to support gap analyses.
- Future plans for statistical analyses and improved integration with the MIM database.



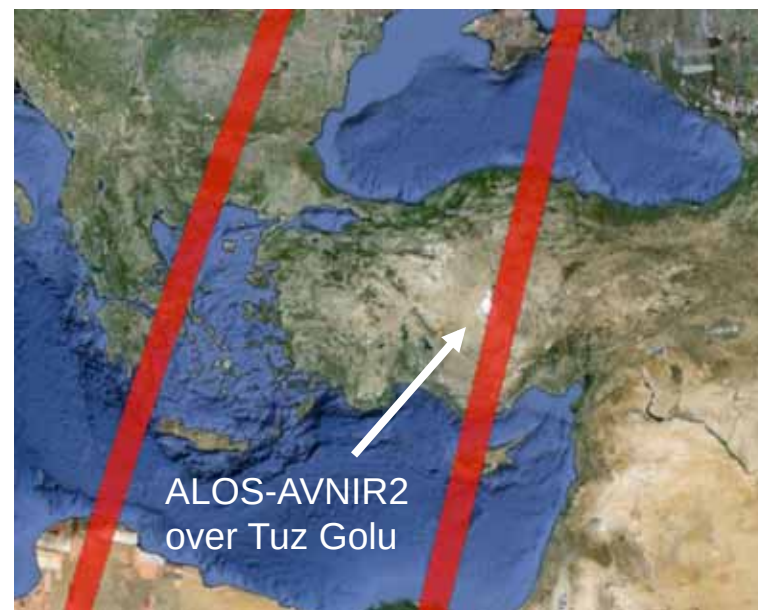
24th CEOS Plenary – Rio de Janeiro, Brazil, 12-15 October, 2010

Background

- COVE (www.ceos-cove.org) has two major objectives
 - (1) Satellite sensor groundtrack visualization
 - (2) Multi-satellite coincidence calculations
- First release includes 26 missions, automated hourly TLE orbit updates (Celestrak and N2YO), solar zenith / azimuth angles, improved GUI layout, and point and polygon coincidence areas.
- Recent used for the Tuz Golu, Turkey Campaign (Aug 17-25) to identify cal-val overpasses for the region and visualize sensor coverage tracks for 13 missions.

Future Enhancements

- Tool Validation and Verification – user reports of findings in the areas of accuracy or functionality.
- Expand Mission Database – add more missions for land imaging and to support oceans.
- Create a COVE Online Community - Utilize the Joomla environment to support COVE access, general information, videos, sample cases, applications, and user feedback.
- Add New Features - Single satellite coincidences, solar zenith constraints, and other applications.



- Complete requirements definition, assessments and architecture studies of atmospheric CO₂. Complete initial gap assessments of CH₄, N₂O, and the Disasters SBA.
- Improve coordination of the SEO Systems Database with the CEOS MIM database. Add capabilities for statistical analysis.
- Continue work on the COVE tool by adding more mission and instrument sets, developing an improved user website, and identifying applications.
- Complete the LSI Constellation Mid-resolution Optical Standards Document.
- Work with the new CEOS Climate Working Group to develop a “systems” plan to coordinate ECV efforts and conduct gap assessments.
- Host the CEOS-GEO Actions Meeting in January 2011 and the host the WGEdu Meeting in May 2011.



CEOS

Systems Engineering Office (SEO)

Management Report

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2010 Accomplishments



- **Education Outreach**

- Led a WGEdu team to develop the first **EduFlow** product. The final publication is available at this Plenary meeting and will be translated to Spanish for distribution in South America in a few months.
- Led a Disasters SBA team to develop a **video** product for the GEO-7 meeting. Copies of the DVD are available at this Plenary meeting.
- Developed new CEOS **outreach products** to support internal (CEOS) and external (GEO and COP) meetings. These include a CEOS roll-up banner, lenticular cards, Constellation posters, glossy one-page “CEOS Rio Statement”.

- **Communications**

- Continued maintenance of the CEOS **website** (www.ceos.org) content.
- Continued maintenance of the CEOS **mailing lists**.

- **Management Tools**

- Completed a CEOS **Action Tracking Tool** (www.ceos-actions.org) to support online management of the CEOS-GEO annual actions.

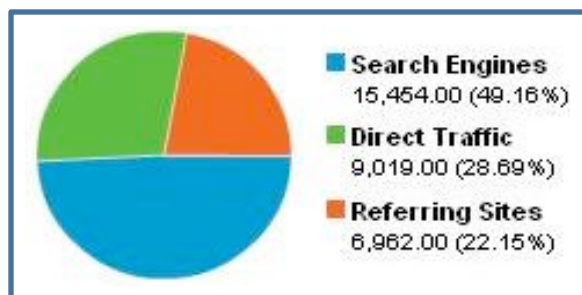


Visitors Overview

Sep 1, 2009 – Sep 1, 2010



In the last year, the CEOS website has had **31,435 visits** by **19,544 unique visitors** from **159 countries/territories** on all 6 continents.



Please visit: www.ceos.org

Contact Kim Keith, with questions or comments:

Kim.E.Keith@nasa.gov



Thanks
Kim !!!



One lonely
visitor on Feb.7





CEOS Action Tracking Tool

www.ceos-actions.org



View CEOS-GEO Actions Editors Administrators CEOS.ORG	
Search Category Show All	
CEOS-GEO Action Number	AR-09-02a_15
GEO Task Reference	AR-09-02a: Interoperable Systems for GEOSS: Virtual Constellations
Action Status	OPEN
CEOS Action Category	1
Action Description	Maintain continuity with one higher accuracy, lower inclination Jason-type and at least two lower accuracy, higher inclination altimeters. test edit
Due Date (DD-MMM-YYYY)	31-Dec-2010
Primary POC	Stan Wilson (stan.wilson@noaa.gov) Francois Pariset (francois.parisot@eumetsat.int)
Lead Agency	EUMETSAT, NOAA
Other Agency and Organization Participation	CNES, EC, ESA, ISRO & SOA/CNSA
CEOS Working Group and Constellation Participation	OST
Planned Deliverables & Milestones	Ongoing: Invite SOA/CNSA participation in CEOS.
	Feb 10: EUMETSAT secure funding for its half of Jason-3, its joint mission with NOAA.
	Apr 10: ESA & EUMETSAT include NOAA when initiating conceptual definition study of Jason-4 (Jason-CS).
	Dec 10: Develop and demonstrate a 'portal' to facilitate timely access to subsets of the global significant wave height field from multiple satellites for use in operational marine forecasting.
On 1 February 2010, EUMETSAT Member States approved the European part of the EUMETSAT	

- The tool is ready to be used for 2011 to support tracking CEOS-GEO actions online ... no more EXCEL tables ... sorry Ivan ☺



- The tool mirrors the appearance of the GEO website task system with direct links to GEO tasks.
- Key features include: online editing, search and query capability, EXCEL output, and a future link to archives of old actions.
- Administration features allow user management, version control, and error recovery.



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