COVE Status Report and Support to SDCG and GFOI

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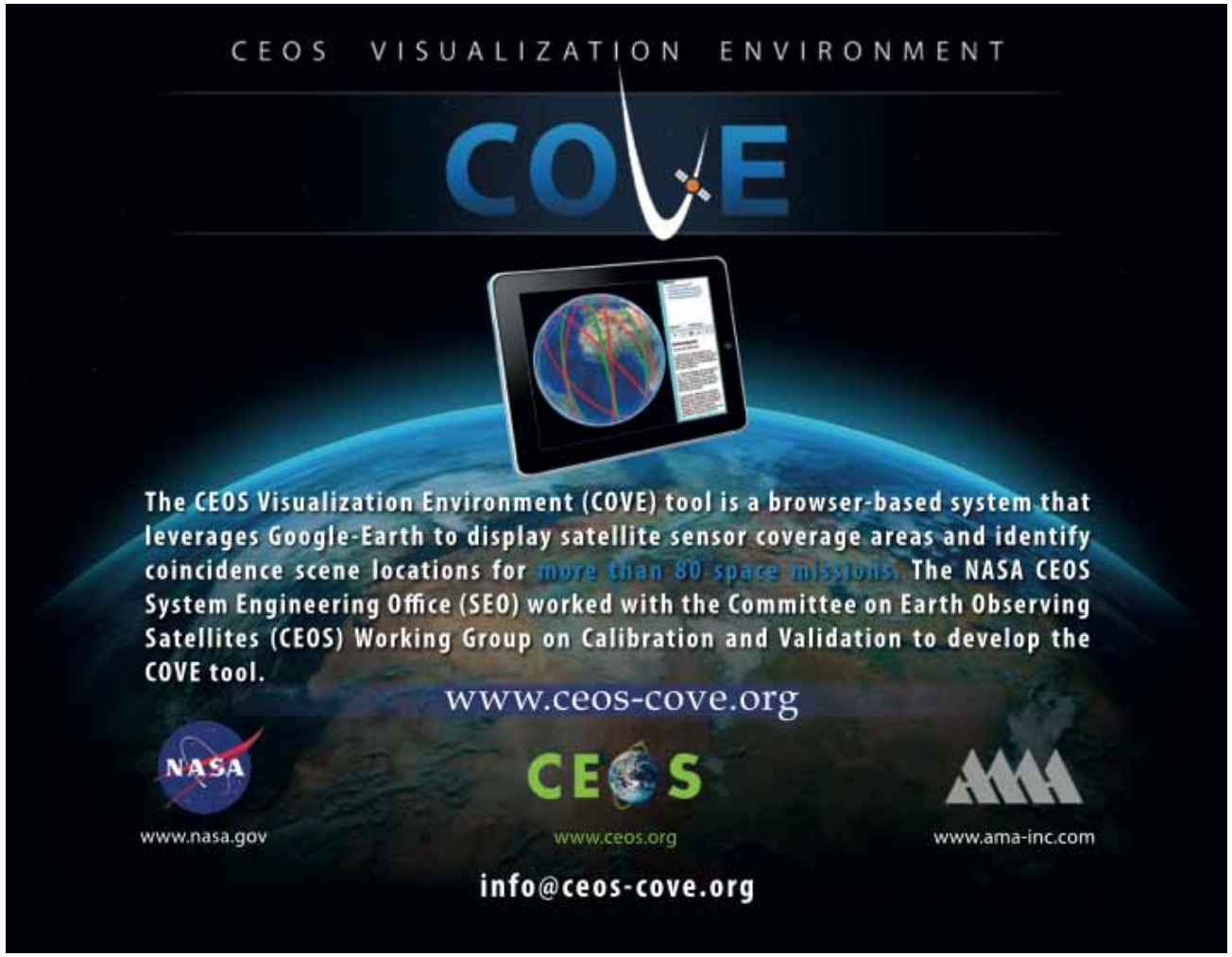
Briefing to SDCG-2
September 14, 2012

CEOS Visualization Environment (COVE)

www.ceos-cove.org



COVE Tool

Satellite sensor coverage areas and coincidence calculations

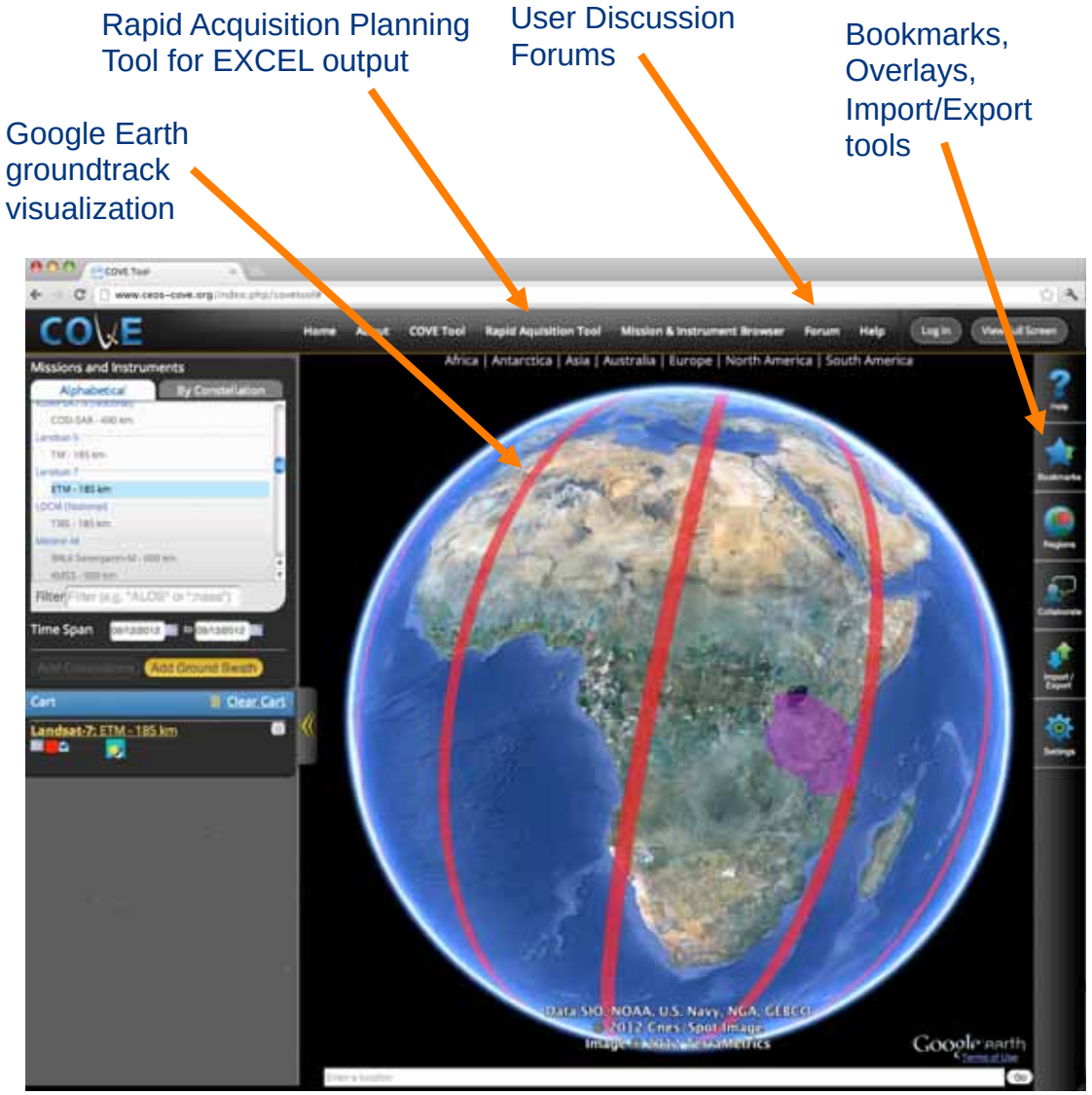
90+ missions

Great capability to support SDCG and GFOI Data Acquisition Planning

COVE is FREE !!!

COVE Features and Details

- Automated daily satellite position data from Analytical Graphics Inc. (AGI) **CelesTrak** database
- Saved bookmarks and states, Google-Earth KML and Shapefile compatibility, collaborative sessions
- **Output**: position, UTC time, viewing angles, solar angles, day/night, and EXCEL tables
- Large mission database: **94** missions, **153** Mission-Instrument combinations
- **NEW** Graphical Interface and website design



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SDCG and GFOI Support

Missions and Instruments

- Most of the GFOI required missions and instruments are currently in COVE and can be used for data acquisition planning. Here is a list ... CORE

  Current Optical: Landsat-7, RapidEye, Pleiades-1, SPOT 4-5; Future Optical: LDCM, CBERS-3, Sentinel-2A, Amazonia-1
  Current SAR: Radarsat-2, TerraSAR-X, TanDEM-X; Future SAR: Sentinel-1A, SAOCOM-1A/1B, ALOS-2, RCM
  ** Plan to add Amazonia-1 (INPE) soon. Pleiades-2 and SPOT 6-7 are not in COVE but can be added.*
  ** Need to add specific SAR modes to represent smaller swaths rather than full FOV capability.*

COVE Data Overlays

- All of the GFOI regions have been added into COVE as overlays. These regions include 47 UN-REDD and Observer sites, 42 REDD+ and Candidate sites, 12 FCT sites and 250+ global countries.
- Cloud overlays are under development. This data will be very important to data acquisition planning of optical missions ... *more to come.*

Data Acquisition Analyses

- SEO will consider developing a GFOI version of COVE. Such a version would include GFOI relevant missions and overlays.
- New analytical tools may be required to support data acquisition planning such as coverage reports, gap assessments, etc.

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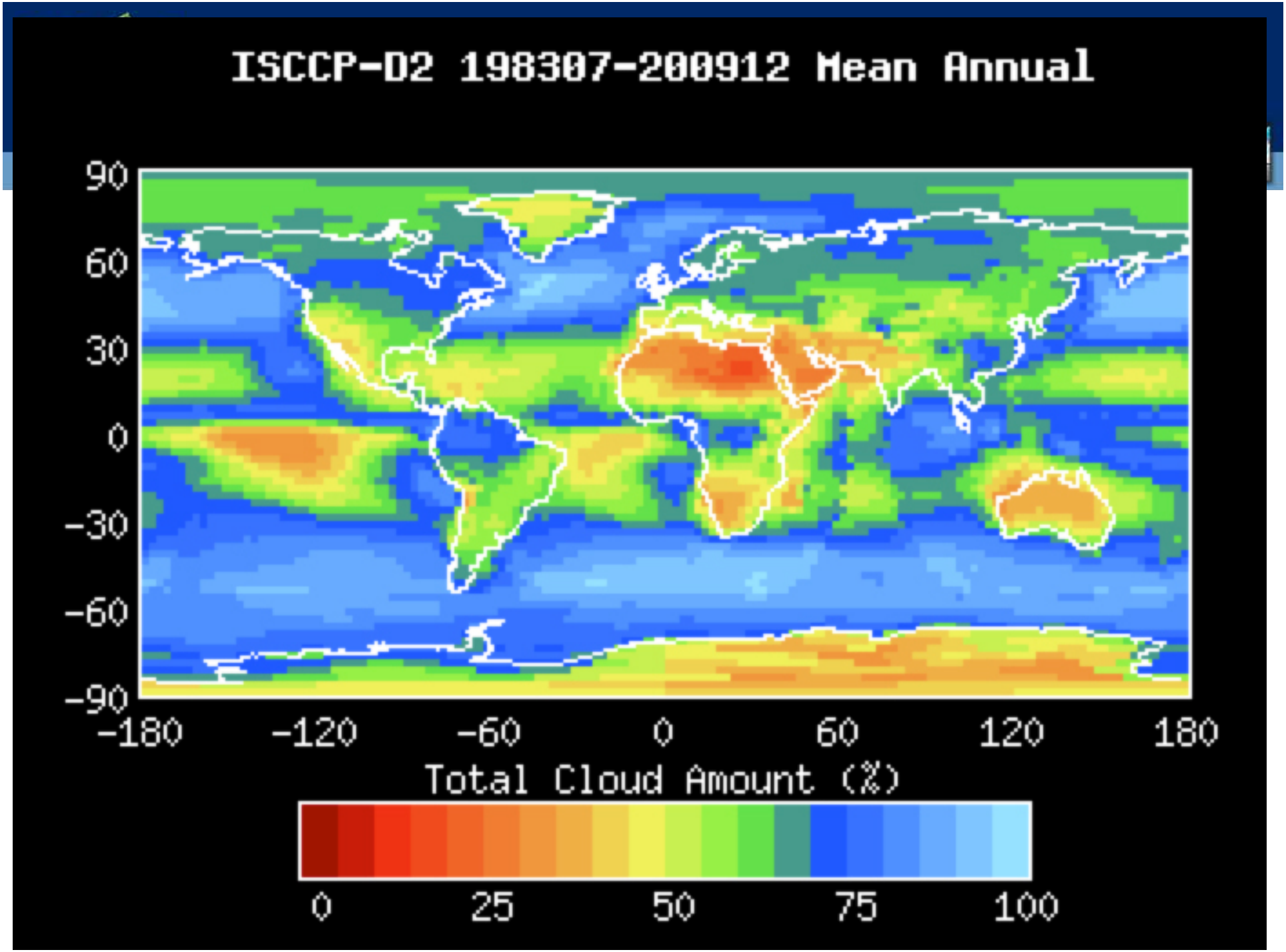
Cloud Modeling in COVE

- Recently met with NASA Atmospheric Scientists focused on cloud modeling and products. They suggested several past and future cloud datasets.
- **Past datasets** ... Plan to utilize a new NASA-developed CERES SSF dataset (12 year) ready in Jan 2013. Data will include near-global (60S to 60N latitude), hourly, 8-km spacing, cloud products up to 9 months from present. A similar "Flash Flux" product can be used for time periods from NRT to last 9 months. If needed, an AVHRR product (4-km spacing) is available back to 1978.
- **Future forecasts** ... Global average cloud cover can be forecasted from the NASA International Satellite Cloud Climatology Project (ISCCP) dataset (D2 product, 25 years, 280-km, 3-hour sampling, monthly averages). We may also consider additional forecasted cloud statistics such as histograms.

Sample ISCCP overlay in COVE showing the 280-km spacing of cloud cover data


ISCCP-D2 198307-200912 Mean Annual
90
60
30
0
-30
-60
-90
-180
-120
-60
0
60
120
180
Total Cloud Amount (%)
0
25
50
75
100

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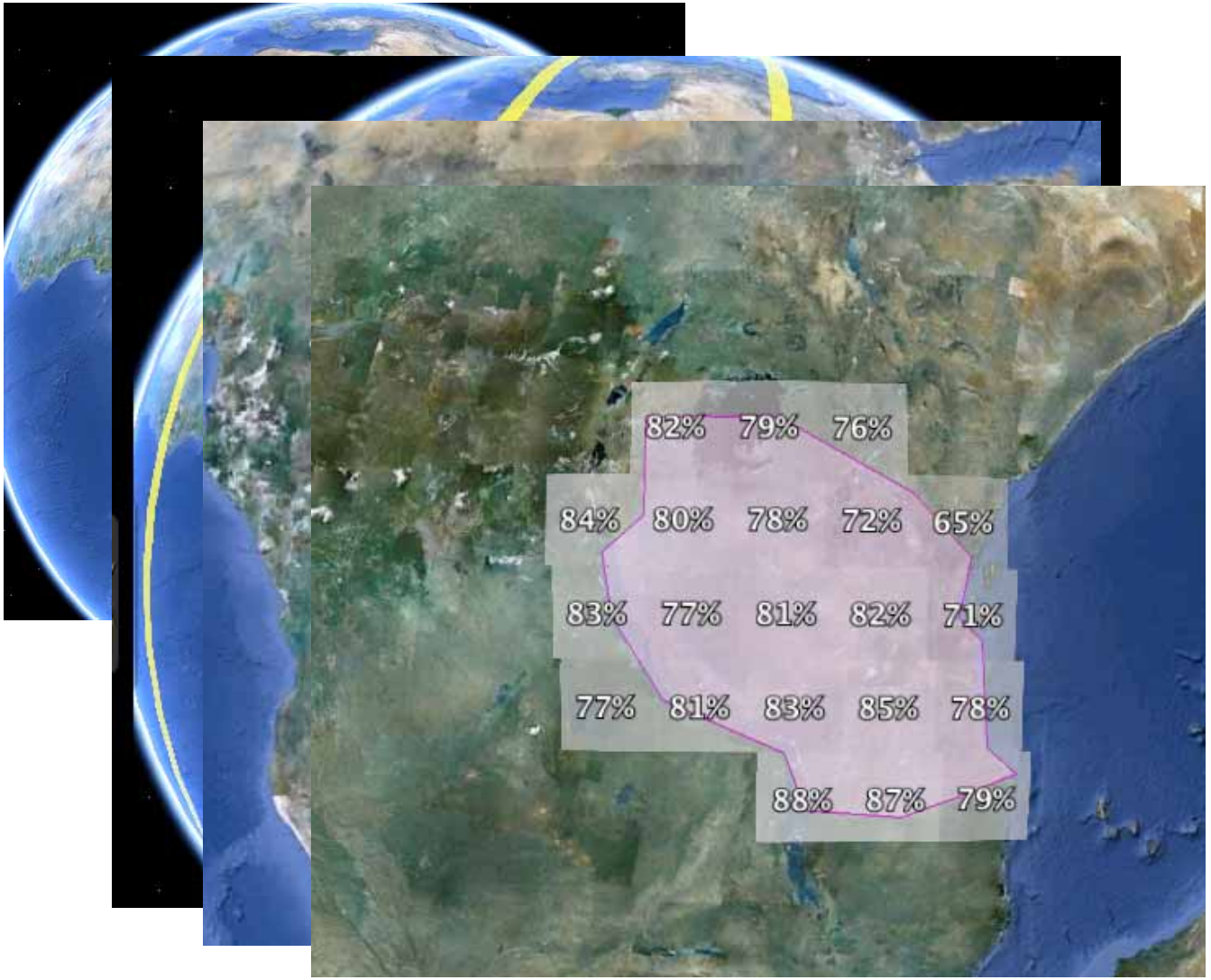
Tanzania Example - Optical

Optical: Landsat-7
ETM+, Standard Mode
185-km swath
16-day repeat
10:30am crossing

(1) Tanzania region
(2) **1-day** Landsat-7 coverage
(3) **14 days** to cover Tanzania (wall to wall)
(4) Average cloudiness 65% to 88%

Assuming 82% cloudiness, it will take an average of **78 days** (5 times per year) to cover Tanzania with clear scenes.

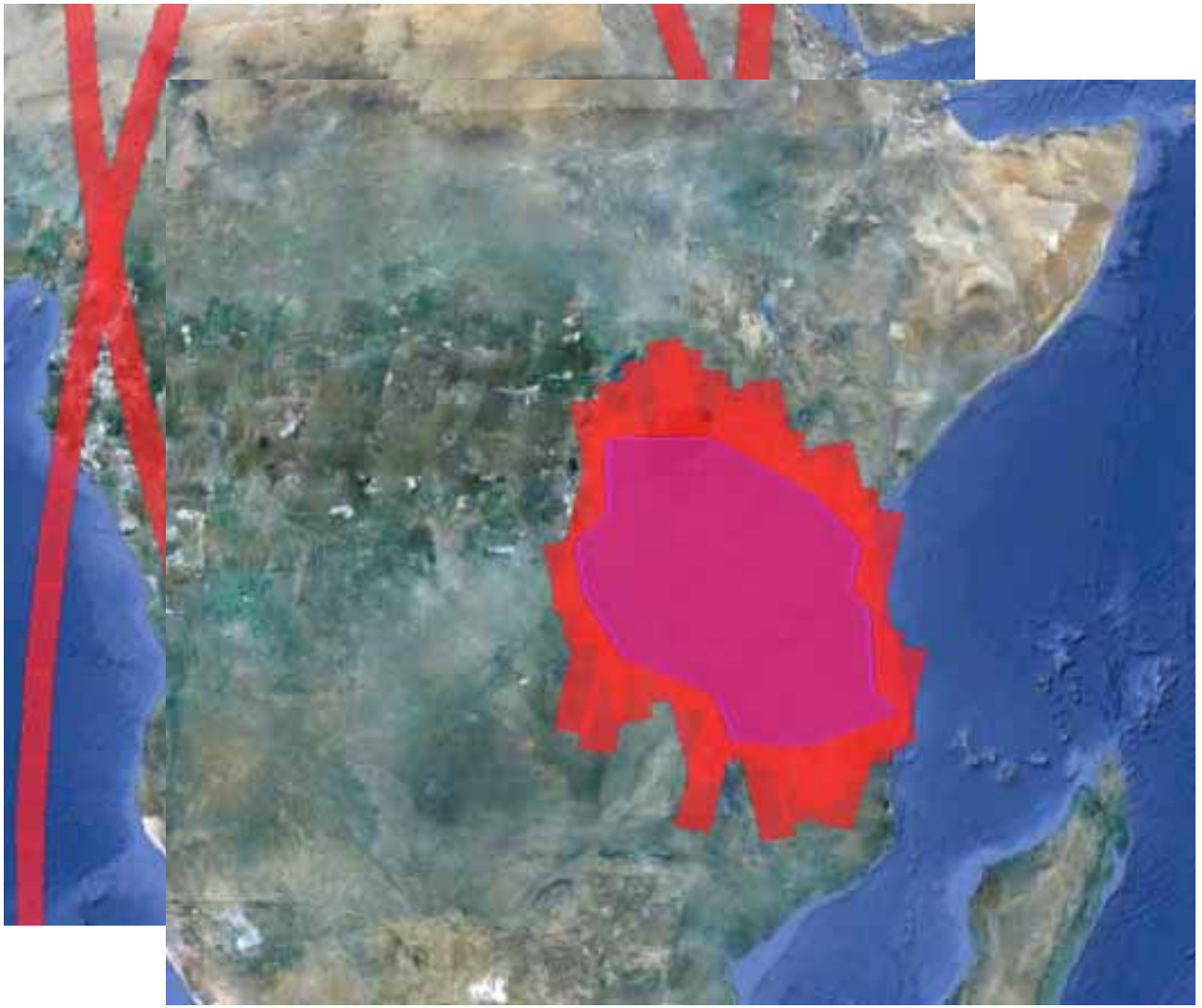


Tanzania Example – SAR Imaging

SAR: Radarsat-2
SAR, Wide-3 Mode
38.7-48.3 deg off-nadir
150-km swath
24-day repeat

24 days to cover Tanzania (wall to wall)

Radarsat has 28% duty cycle, so limited imaging is available. It is possible that all GFOI required acquisitions cannot be accommodated. Missing a single day may add another 24 days to the plan.



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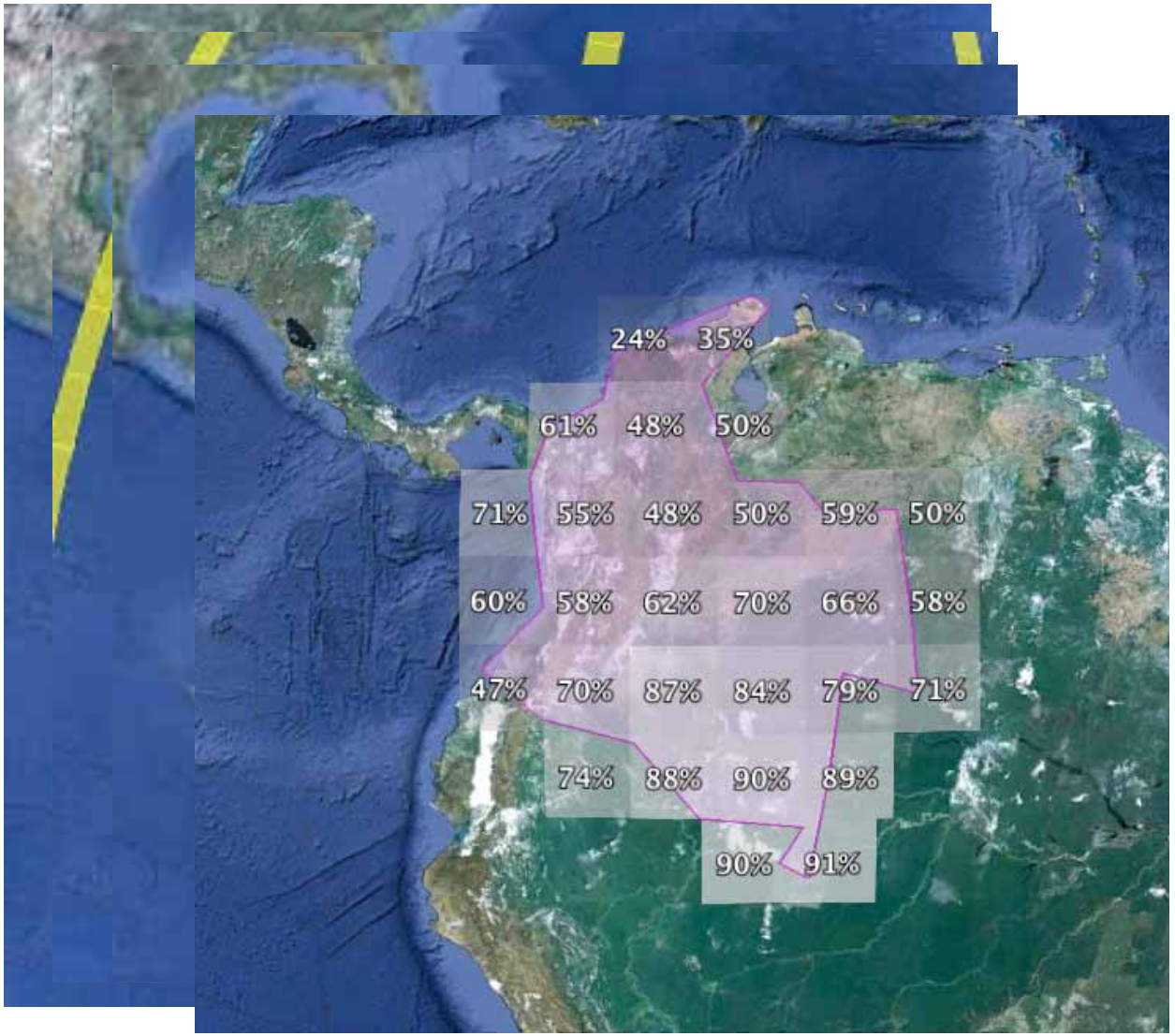
Columbia Example - Optical

Optical: Landsat-7
ETM+, Standard Mode
185-km swath
16-day repeat
10:30am crossing

(1) Columbia region
(2) **1-day** Landsat-7 coverage
(3) **14 days** to cover Columbia (wall to wall)
(4) Average cloudiness 24% to 91% (huge range)

Assuming 90% cloudiness in southern region, it will take an average of **140 days** (2.5 times per year) to cover Columbia with clear scenes.



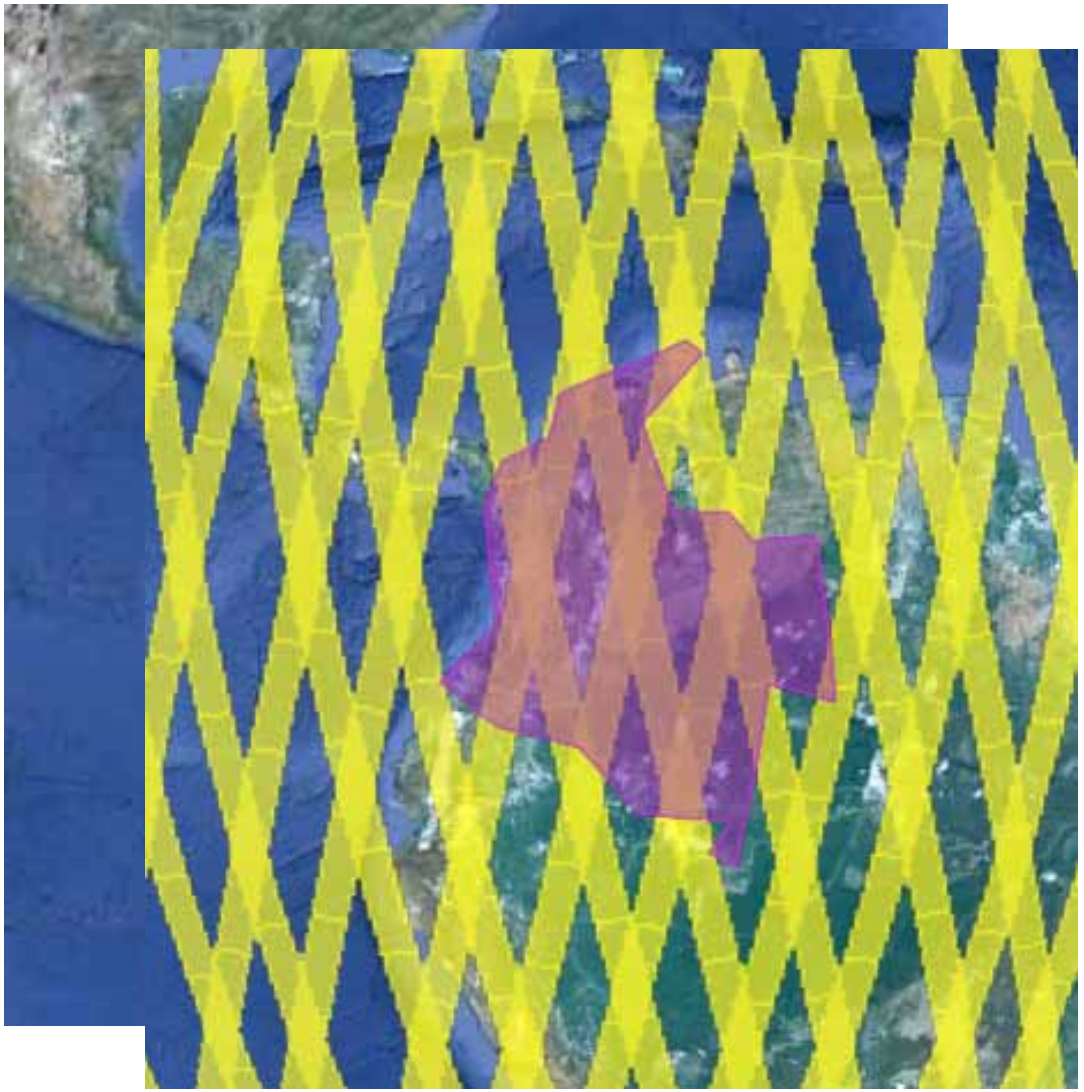
Columbia Example – SAR Imaging

SAR: Radarsat-2
SAR, Wide-3 Mode
38.7-48.3 deg off-nadir
150-km swath
24-day repeat

24 days to cover Columbia (wall to wall)

Yellow lines represent 7 days of coverage

Radarsat has 28% duty cycle, so limited imaging is available.



Work Plan

- Work with **SDCG** to develop a near-term set of requirements for figures and analyses needed to support the GFOI Strategy report (early 2013).
- Work with **WGISS** to develop a long-term set of requirements for actual data acquisition assessments. WGISS would facilitate the development of KML files that represent actual data footprints for GFOI products. The **SEO** would receive these KML files for visualization in COVE.

- Explore options for creating a GFOI version of the COVE tool. Work with **SDCG** to develop a set of required features and objectives for the tool.
- Implement cloud data overlays into COVE for past and future assessments.
- Perform quantitative assessments of coverage over all GFOI regions for single and multiple mission combinations and compare with requirements.

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Questions / Actions from SEO

- **Action for SDCG** ... Provide SEO with KML/Shapefiles for sub-region "hot spots" to allow focused SAR imaging.
- **Question** ... CBERS-3 is modeled the full field capability (i.e., 1190-km) for instruments. Should we add one typical swath (i.e. MUXCAM, 120-km swath) at the nadir position for acquisition planning? Same is true for RapidEye: 685-km full capability and 77-km single swath.
- **Question** ... COVE models optical instruments as daytime only viewing. Are there any optical missions that acquire data on the "dark side"?
- **Analysis needs** ... what are the specific missions (Core only?), specific regions (42 REDD+ and Candidate sites), and dry periods? Acquisition plans will be compared to requirements (by product).
- **Analysis Tool idea** ... Pick region, Pick Missions/Instruments, Pick time period, with or without clouds. Results could be displayed using colors or numbers (for total acquisitions). Also consider an approach to compare with requirements (green, yellow, red). Cloud probability may also be considered.