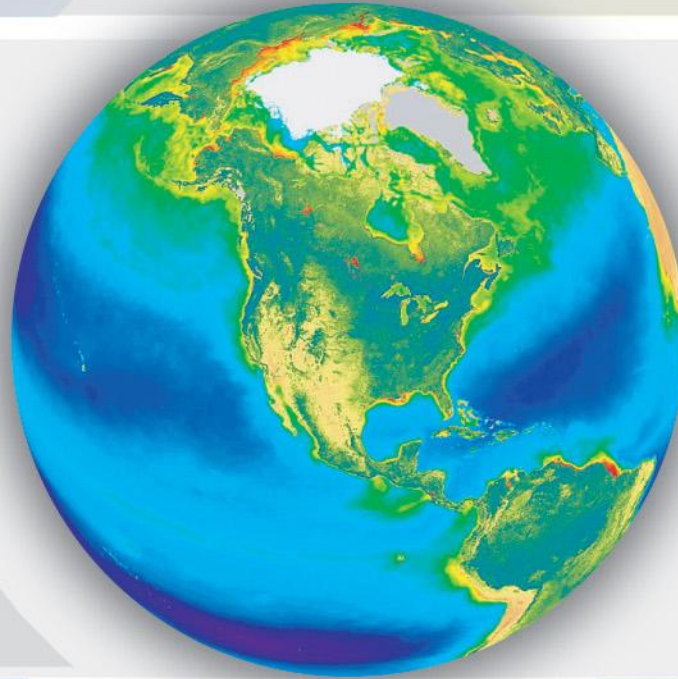


# State of the Program: NASA Ocean Biology & Biogeochemistry



**Paula Bontempi**  
**NASA Headquarters**

**IOCS – NASA Ocean Color Research Team Meeting Splinter**  
**6 May 2013**





# Announcements



- **Speakers** – talks will be posted on the ocean color web or the IOCS web site, so please submit a copy. Please remember to remove any material you do not want posted.
- **Dr. Kathy Tedesco** joined the NASA Ocean Biology and Biogeochemistry program in December 2012 – you can reach her at [kathy.a.tedesco@nasa.gov](mailto:kathy.a.tedesco@nasa.gov) or by calling 202.358.4578

**Hours still 0630-1500 but Kathy works the late shift.**





# Agenda



- **NASA Headquarters Update (Q&A)**
- **NASA Ocean Biology Processing Group Update/Time Series**
- **NASA Suomi-NPP VIIRS Ocean Color Products**
- **Pre-Aerosol, Cloud, ocean Ecosystem (PACE) Science**
- **Controls on Open Ocean Productivity and Export eXperiment (COOPEX)**
- **Agency data sharing discussion (with “Multi-Agency Data Sharing” splinter session)**
  - **focus on interagency data sharing and exchange principles**



# Science Budget Request Summary – PresBud FY14

	FY2012	* FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
<b>Science Total</b>	<b>5073.7</b>	<b>5115.9</b>	<b>5017.8</b>	<b>5017.8</b>	<b>5017.8</b>	<b>5017.8</b>	<b>5017.8</b>
<b><u>Earth Science</u></b>	<b><u>1760.5</u></b>		<b><u>1846.1</u></b>	<b><u>1854.6</u></b>	<b><u>1848.9</u></b>	<b><u>1836.9</u></b>	<b><u>1838.1</u></b>
Earth Science Research	441.1		443.3	483.1	483.4	485.1	476.5
Earth Systematic Missions	879.9		787.5	811.2	861.9	839.1	833.3
Earth System Science Pathfinder	183.3		353.6	293.1	232.2	237.4	250.0
Earth Science Multi-Mission Operations	168.6		171.7	174.3	177.9	179.0	182.0
Earth Science Technology	51.2		55.1	56.2	55.1	56.1	56.1
Applied Sciences	36.4		35.0	36.7	38.4	40.1	40.1

FY 2015-FY 2018  
estimates  
are notional

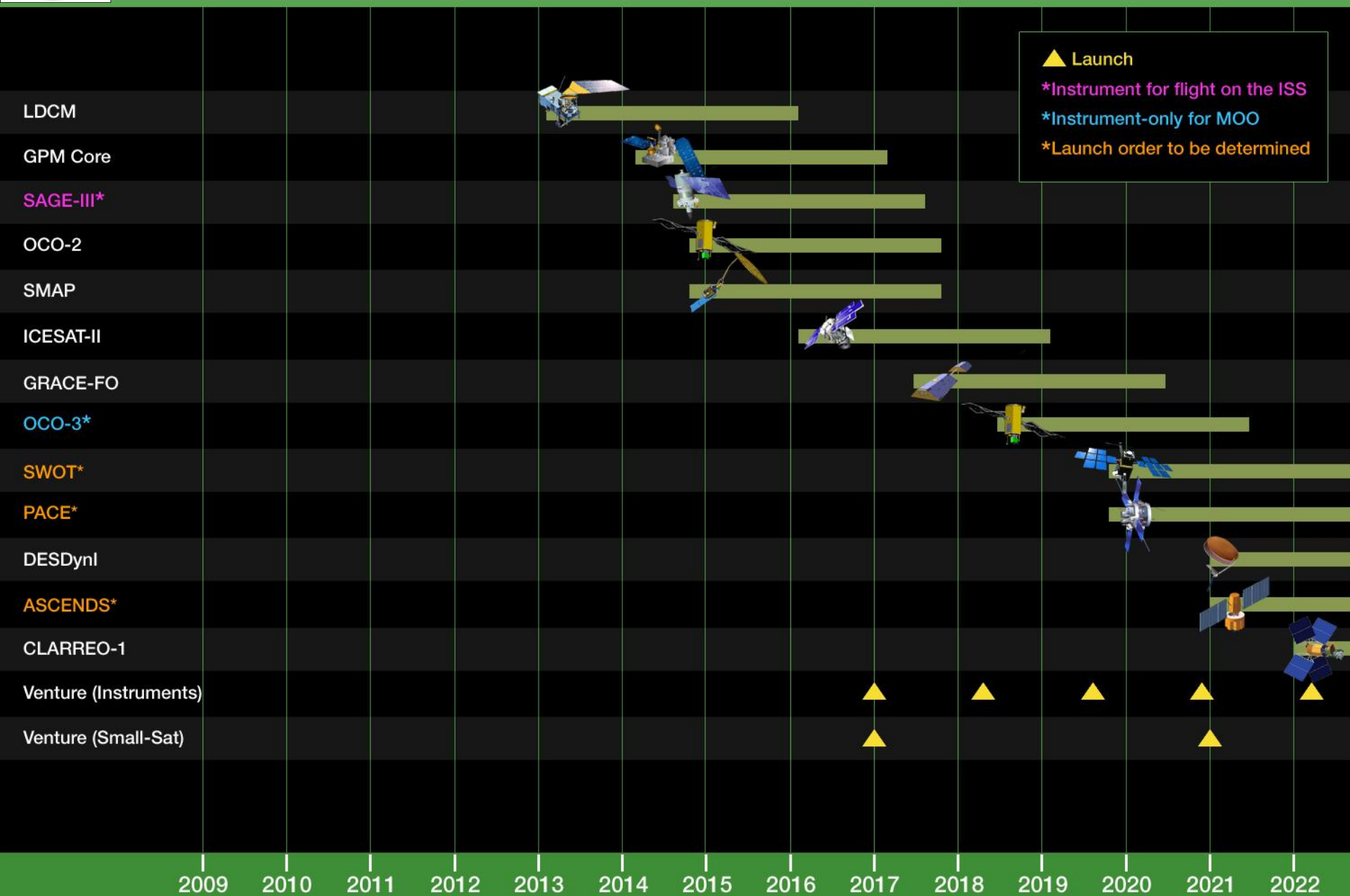
FY13 numbers are  
not shown, and not  
fully determined at  
this time

# Earth Science Budget Features – PresBud FY14

- Initiates new Land Imaging project for development of a national sustained Land Imaging Satellite System (with United States Geological Survey)
- Expands Venture-Class competitive flight program
- Initiates **development of a program** for TSIS, OMPS-Limb, and “CERES” measurements starting in the JPSS-2 time frame – former-NOAA climate sensors
- Completes integration of DSCOVR Earth observing instruments (EPIC and NISTAR) and initiates ground data system development in preparation for 2014 launch
- Ops funding for QSCAT, Jason-1, CloudSat, GRACE, SORCE in FY14 – ends all by FY18
- Advances development of SMAP, SAGE III/ISS, GRACE-FO, SWOT, CYGNSS, OCO-3, TEMPO, and ICESat-2 for launch before 2021
- Pre-formulation studies will continue for PACE, L-band SAR, and other Decadal survey-recommended and climate architecture missions
- Funds Carbon Monitoring System at \$10M/year
- E/PO funding removed – GLOBE “protected”
- Space Geodesy acceleration for station final development/test



# Future Orbital Flight Missions 2011-2022







# Pre-Aerosol, Cloud, ocean Ecosystem (PACE) mission

- 2010 - Report - Responding to the Challenge of Climate and Environmental Change: NASA's Plan for a Climate-Centric Architecture for Earth Observations and Applications from Space  
(<http://science.nasa.gov/earth-science/>)
- The PACE mission will make global ocean color measurements to provide extended data records on ocean ecology and global biogeochemistry (e.g., carbon cycle) along with polarimetry measurements to provide extended data records on clouds and aerosols. Understanding of impacts and feedbacks of the Earth system to climate are of critical importance.
- The PACE mission will extend key global climate data records based on SeaWiFS, MODIS heritage for ocean color, and begun by PARASOL, MODIS, and MISR for aerosols and clouds.
  - The 2007 IPCC identified the largest uncertainty in our understanding of physical climate as that due to aerosols and clouds.
  - New and continuing global observations of ocean ecology, biology, and chemistry are required to quantify aquatic carbon storage and ecosystem function in response to human activities and natural events. A key goal is improvement of climate-carbon and climate-ecology model prediction. The blend of atmospheric and oceanic requirements is critical as ocean biology is affected by deposition of aerosols onto the ocean, which in turn, produce aerosol precursors that influence climate.
  - **CARLOS DEL CASTILLO LEAD THE SDT – TALK TODAY**





# ESD Mission Development Path Forward



- Proposed Mission Science objectives provided by the SDT
- The PACE mission budget has been identified by the Earth Science Division, supporting a launch in 2019/2020
  - Budget is supported by multiple instrument and mission design lab cost studies
- Mission acquisition options are well understood and in discussion within NASA.
  - As a general rule within the ESD, competition is preferred if there are two or more viable mission and/or instrument developers interested.
  - Competition is one of the considerations as we decide on the approach.
- In FY2013 / Q1 FY2014, NASA plans to:
  - Release an RFI for ocean color vicarious calibration approaches and instrumentation (21 responses, reviewed, next step underway)
  - Define the mission acquisition approach
  - Establish the expected partnership issues such as contributed instruments
  - Define the baseline mission science objectives
  - Release AO to the world, preceded by a draft AO for comment



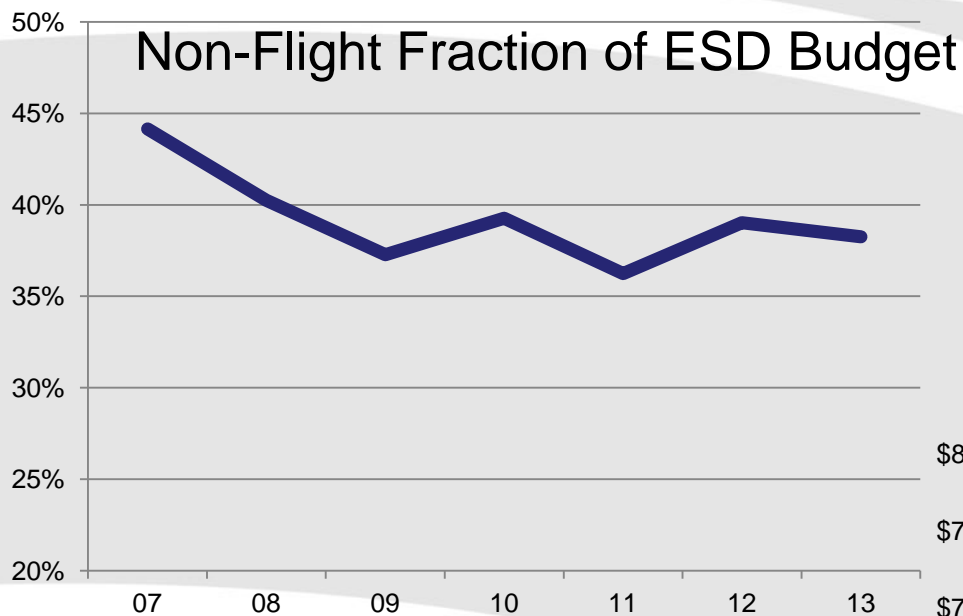


# VENTURE-CLASS UPDATE/STATUS

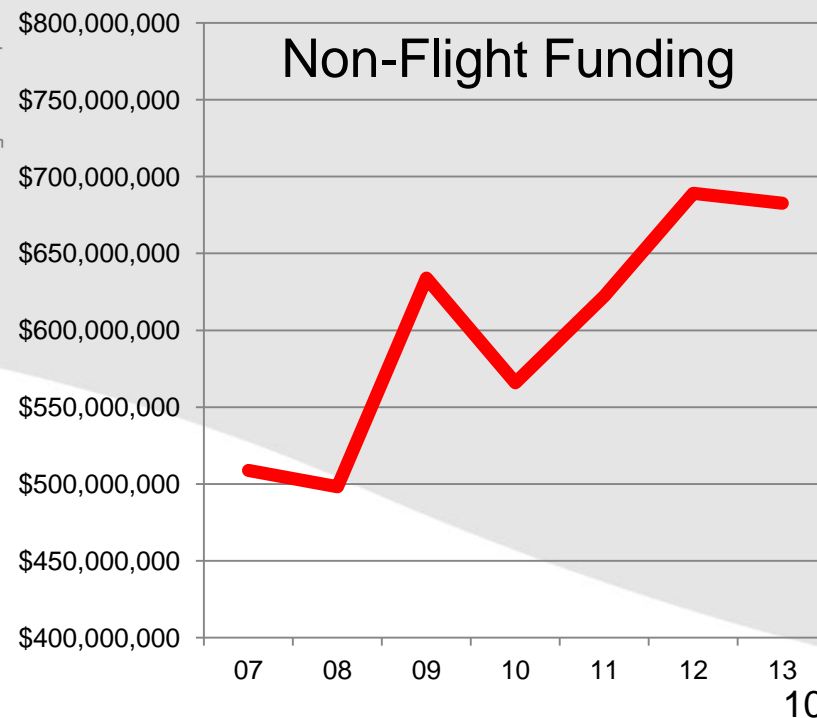


- **EV-1 (“EV-S” - Suborbital, Airborne)**
  - All 5 investigations have completed at least 1 sustained field campaign
  - All EV-1 investigations will fly during 2013
  - **Second EV-S solicitation funded, in preparation for release on schedule in mid-2013**
- **EV-2 (“EV-M” - Small-sat)**
  - **CYGNSS PI team and NASA program office making good progress, under contract 7 Dec 2012 (planned 2016-2017 launch)**
  - ESD/SMD developing detailed “Class D” management approaches and processes
- **EV-I (Instrument)**
  - **TEMPO selected for GEO hosted payload opportunity (2017 launch)**
  - ESD initiating formal host selection/negotiation process
  - **Second “EV-I/2” solicitation funded, on schedule for release**

# Non-Flight Budgets: 2007-2013



- R & A
- Applied Sciences
- Technology
- Competed Science Teams





# NASA OB&B Research – Research Opportunities in Space and Earth Sciences



- **ROSES 2012** - <http://nspires.nasaprs.com/> - Released 14 February 2012
  - **Interdisciplinary Research in Earth Science** –\$12M/yr, 145 proposals, under review
    - **Understanding Earth System Vulnerabilities to Climate Extremes (62)**
    - **Impacts of Changing Polar Ice Cover (26)**
    - **Water and Energy Cycle Impacts of Biomass Burning (29)**
    - **Impacts of Population growth on watersheds and coastal ecology (15)**
    - **Role of Permafrost in a Changing Climate (13)**
- **ROSES 2013** - <http://nspires.nasaprs.com/> - Released 14 February 2013
  - **Carbon Cycle Science** - 4 federal agencies, \$12M/yr – **386 Step 1 proposals [1 July 2013]**
    - **Carbon Research in Critical Regions (NASA, DOE, USDA)**
      - **Carbon Dynamics in Tropical Terrestrial Ecosystems (moist forests and woodlands/savannas)**
      - **Carbon Dynamics in Arctic/Boreal Terrestrial Ecosystems**
      - **Carbon Cycling and Ecosystem Dynamics in High Latitude Oceans**
    - **Carbon Dynamics along Terrestrial-Aquatic Interfaces (NASA, DOE, USDA)**
    - **Belowground Carbon Processes and Soil Carbon (USDA, DOE)**
    - **Carbon Dynamics within Urban-Suburban-Forested-Agricultural Landscapes (NOAA, USDA, DOE, NASA)**
    - **The Impact of Rising CO<sub>2</sub> on Aquatic Ecology (NASA)**
    - **Carbon Cycle Science Synthesis Research (NASA, USDA, DOE)**





# NASA OB&B Research – Research Opportunities in Space and Earth Sciences



• ROSES 2013 - <http://nspires.nasaprs.com/> - Released 14 February 2013

• **NASA Data for Operation and Assessment** – \$2M/yr – **24 NOIs [15 May 2013]**

- Operational short-term weather prediction
- Joint Center for Satellite Data Assimilation
- Data and Methodology for climate projection assessment
- Ecological forecasting

• **The Science of Terra and Aqua** ~\$11.5M/yr – **200 NOIs [20 May 2013]**

- Science Data Analysis
  - Multiplatform and sensor data fusion
- Algorithms – New Data Products
- Real- or Near-Real-Time Data Algorithms

• **Ocean Biology and Biogeochemistry** ~ \$500K/yr – **12 NOIs [30 May 2013]**

- Scoping proposals for field campaigns (e.g., ICESCAPE)
  - COOPEX selected in ROSES 2012, talk by Dave Siegel today

• **The Science of Terra and Aqua – Algorithms – Existing Data Products** ~\$2.5M/yr [**NOIs 15 May 2013, Proposals 1 July 2013**]

• **PACE Science Team** – TBD for 2013

• **Ocean Color “Vicarious” Calibration** - TBD





# NASA OB&B Research – Research Opportunities in Space and Earth Sciences



- **ROSES 2013** - <http://nspires.nasaprs.com/> - Released 14 February 2013
  - **Rapid Response and Novel Research in Earth Science – A.26** – (Diane Wickland, POC) **[rolling deadline]**
    - **2.1 Targets of Opportunity: Rapid Response to Earth System Events and Opportunities to Collaborate (Rapid Response)** - Research proposals having great urgency for action 1) involving quick-response research on natural or anthropogenic extreme events, disasters, and/or similar unanticipated or unpredictable events, and 2) requiring a quick funding decision to take advantage of an opportunity for research collaboration that is only available for a short time.
    - **2.2 First-Time Development of Innovative, Novel Ideas in Earth Remote Sensing (Novel Earth Science)** - proposals to conduct highly novel scientific research that cannot be considered as relevant under any other NASA solicitations. Research that is new and different: initial exploration of a novel idea or a first demonstration of new scientific use of remote sensing data or technology
  - **Topical Workshops, Symposia, Conferences – E.2** – (Max Bernstein, POC) – **[rolling deadline]**
    - Proposals for topical workshops, symposia, conferences, other scientific/technical meetings that advance the goals and objectives of only the following SMD Divisions: Earth Science, Heliophysics, and Planetary Science.
    - up to three year duration, can be multiple workshops in one proposal





# OB&B Program Issues



- **Uncosted carryover** – Carryover of funds from one fiscal year to next
  - Budget Control Act of 2010 – assessment of agency uncosted carryover and a rescission applied to the current agency budget as a result. Funds taken from each program were based on their uncosted carryover amounts.
  - Obligation and costing problem for NASA linked to invoicing from institutions, POP
  - Currently in your awards there is \$7.25M in uncosted FY10-FY12 carryover. \$625K is FY10 and FY11 dollars, the balance in FY12.
  - Sent Email 9 April to PIs with uncosted. PIs/Institutions need to invoice the agency for 100% of FY10/11 funds immediately, and FY12 by the end of calendar 2013
  - In the early spring of 2014 the government will look at each agency's uncosted again, and calculate a budget reduction accordingly.
  - Please check with your ORSP or equivalent, and please check with the NSSC to ensure your invoices have been received
  - Can exchange fiscal year funds in spring
- **Sequestration** – travel on grants and cooperative agreements are not affected, but NASA centers/PIs are affected
- **E/PO** – FY13 guidance is that grants/cooperative agreements not affected, only NASA center staff and projects (can apply for a waiver). FY14 and out is TBD – many budgets zeroed out







# Programmatic Last Thoughts

- **Costing and Obligation – timely obligation and costing of funded projects (we lose funds due to uncosted carryover every year!)**
- **Reporting our accomplishments both within and outside the agency.**
  - **Copies of publications, ideally with an accompanying ppt slide(s) and narrative explaining the result(s) and scientific/societal significance**
- **Thank you to all who participate in science requirement development on missions (Decadal Survey and Climate Initiative)**
  - **GEO-CAPE- SWG workshop 21-23 May at Ames Research Center**
- **Next OCRT Meeting – 2014 in US April timeframe**
- **Feedback on IOCS**
- **PACE AO**
- **Future field campaigns and solicitations**





# International Relations

- **Support Committee on Earth Observing Satellites (CEOS) - Co-lead/POC for Ocean Color Radiometry Virtual Constellation + Formulation of INSITU-OCR (International Network for Sensor InTercomparison and Uncertainty assessment for Ocean Colour Radiometry)**
  - **INSITU-OCR – NASA Program Office (?) through Field Program Support Office**
  - **Aeronet-OC**
- **Support Working Group on Essential Climate Variables (met Sunday, 5 May)**
- **Many topics of discussion at this meeting so please make sure your voice is heard**



# INSITU-OCR components (under discussion)

## Mission Feedback

- Science community input
- Comparison with other appropriate products
- New Mission
- Protocol development

## Satellite Data from Calibrated Sensors

## Calibration Strategy

### Pre-launch

- Lab. characterization & calibration (SI-traceable)
- Solar calibration (transfer-to-orbit)

### Postlaunch (operational adjustments)

- Solar calibration (daily)
- Lunar calibration (monthly)
- Multiple sites  $L_{wn}$  time series for vicarious calib. (ISRO, MOBY-C)

## Improved Products & Algorithms

- Reprocessing due to improvements in calibration, masks, binning schemes, product compatibilities, etc.
- New products from bio-geochemical, atmospheric fields, etc
- Data distribution interface

Feedback

## IN SITU-OCR OFFICE

SIMBIOS type follow-on office (NASA?) with agency representatives (under investigation)

## In Situ Data

- Collection of required bio-optical and atmospheric measurements (INSITU-OCR PIs)
- *in situ* instrument calibration (Project round robin SI-traceable, IOPs, AOPs)
- Data collection following NASA Ocean Optics protocols
- Archive of calibrated QC *in situ* data (SeaBASS)
- Calibrated instrument pool
- Development of new instrumentation

## Satellite data processing software

- SeaDAS & BEAM for ACE, OCM-2, MERIS, OLCI, SGLI, GOCI, GEO-CAPE, etc.

## Product & Algorithm Validation

- Atmospheric & bio-optical algorithm validation & development (INSITU-OCR PIs & project staff)
- Match-up analysis via Aeronet OC sites, satellite QC, time series eval., Bio-Argo, ChloroGIN etc.
- Earth System/Climate Model data assimilation