



NPOESS Climate Sensors and Climate Data Records

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Executive Summary



- **The White House Science Office requested NOAA and NASA to provide:**
 - An analysis of possible mitigation options of the climate impacts of the NPOESS Nunn-McCurdy Certification through 2026
 - An assessment of the potential costs of these options
 - All options are contingent on getting new funding
- **Primary goal: Ensure continuity of long-term climate records**
- **NOAA and NASA analyzed the following options:**
 - Remanifesting the climate sensors on NPOESS spacecraft
 - Placing sensors on currently planned non-NPOESS spacecraft
 - Developing new gap-filling climate satellite missions
 - Partnering opportunities
- **Key results:**
 - NOAA's FY 2009 Passback included \$74M to mitigate the loss of climate sensors on NPOESS and to provide long term Climate Data records
 - Specifically targeted for most cost effective options for launching Clouds and Earth's Radiant Energy System (CERES) and Total Solar Irradiance Sensor (TSIS), as well as support for initial work on Climate Data Records



NPOESS Nunn-McCurdy Certification



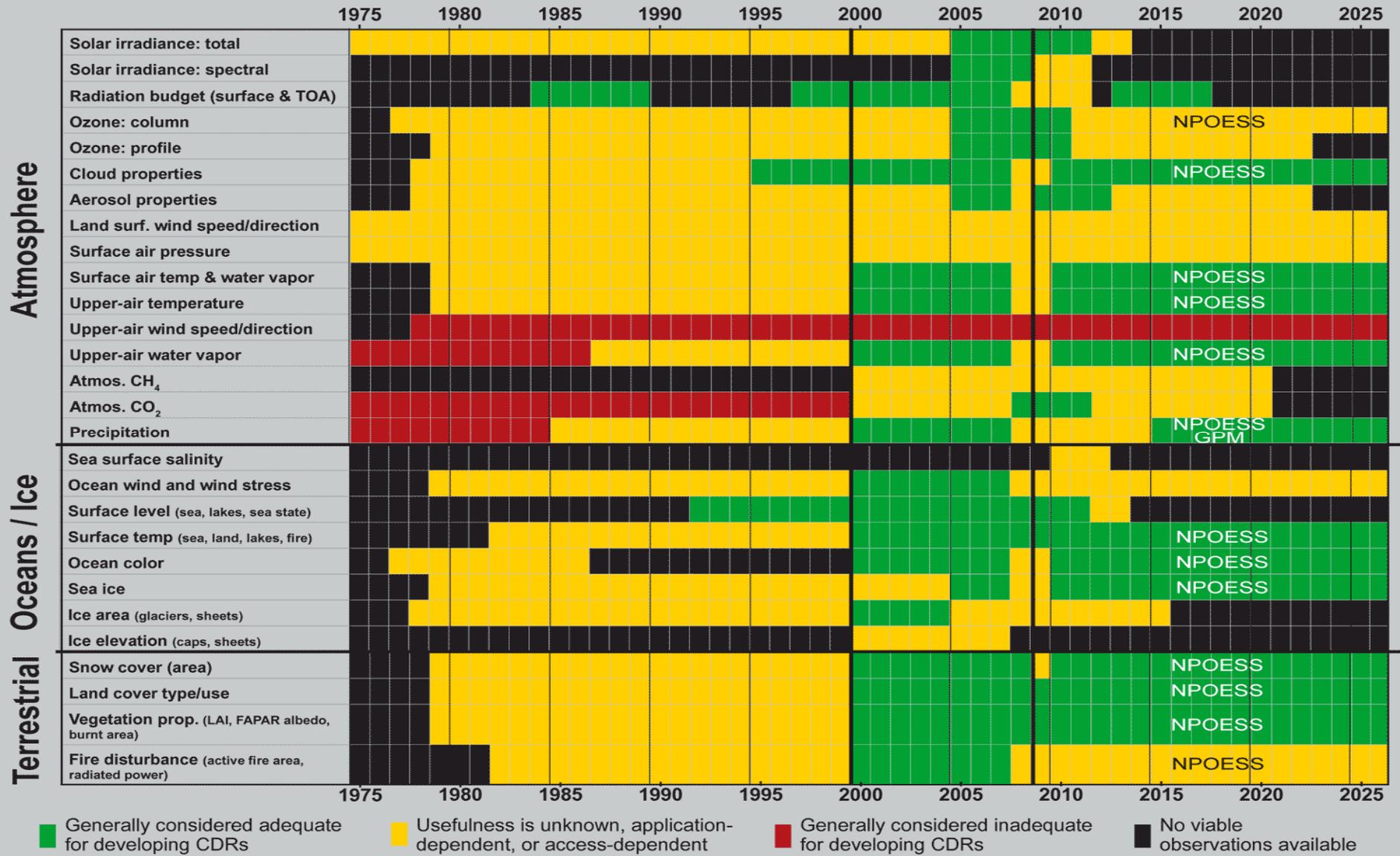
Reductions of Climate-Relevant Sensors

| NPOESS Instruments | NPP | EARLY-AM | | MID-AM | | | PM | |
|-----------------------------------|-----|-----------------|-----------------|-----------------|-----------|-----------------|-----------------|-----------------|
| | | New C2 (2016) | New C4 (2020) | Old (C3) (2013) | MetOp | Old (C6) (2016) | New C1 (2013) | New C3 (2018) |
| | | Old (C2) (2011) | Old (C5) (2015) | | | | Old (C1) (2009) | Old (C4) (2014) |
| <i>Reduced Capability Sensors</i> | | | | | | | | |
| CMIS* | | ✓ | ✓ | | | | | ✓ |
| <i>Reduced Coverage Sensors</i> | | | | | | | | |
| CrIS/ATMS | ✓ | | | | IASI/AMSU | | ✓ | ✓ |
| VIIRS | ✓ | ✓ | ✓ | | AVHRR | | ✓ | ✓ |
| <i>De-manifested Sensors</i> | | | | | | | | |
| TSIS | | | | | | | ✓ | |
| CERES/ERBS | | | | | | | CERES | |
| ALT | | | | | | | | |
| OMPS** | ✓ | | | | | | ✓ | ✓ |
| APS | | | | | | | | |

- Remains Intact
- No Change/Not Relevant
- Reduced Capability
- Related Missions
- Deleted
- Implies Sensor Present

*CMIS to be redefined as a less capable, less expensive sensor
 **OMPS Limb Subsystem is cancelled and only the Nadir capability is maintained

Global Essential Climate Variables (ECVs - Groups of CDRs) with Heritage Records



■ Generally considered adequate for developing CDRs
 ■ Usefulness is unknown, application-dependent, or access-dependent
 ■ Generally considered inadequate for developing CDRs
 ■ No viable observations available



De-Manifested Climate Sensors - Status



- **TSIS**
 - EXCOM approved option for the TSIS instrument to fly on the NPOESS C1 mission
 - NPOESS C1 option offers lowest cost solution, with an acceptable level of technical and schedule risk
 - Options to fly TSIS on spacecraft other than NPOESS were examined by NASA – these options are more expensive and present greater schedule risk in terms of assuring measurement continuity
 - We have identified required funding to implement TSIS on NPOESS C-1 including accommodation costs

- **CERES**
 - The CERES instrument originally scheduled for a 2013 flight on NPOESS C1 has been accelerated to fly in 2010 on NASA's NPOESS Preparatory Project (NPP) mission
 - EXCOM approved additional CERES to fly on C1

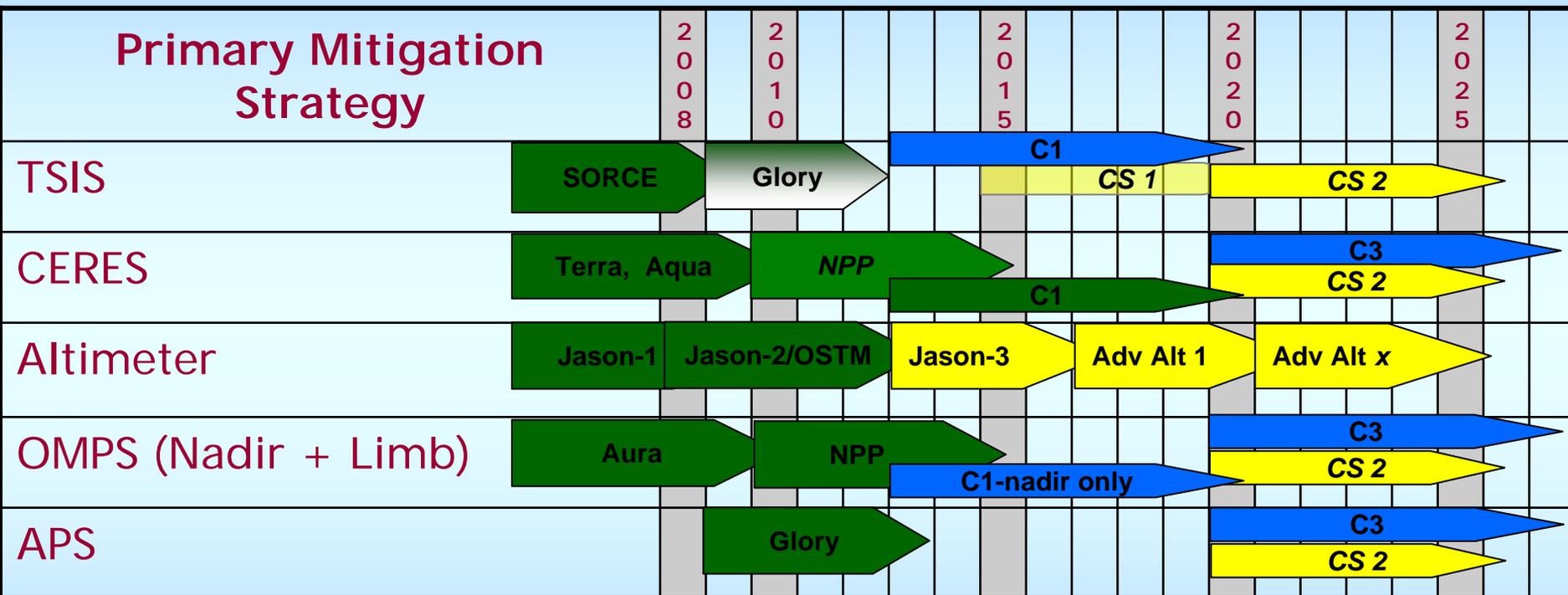
- **ALT**
 - NOAA plans to provide operational continuity for satellite altimetry data with a Jason-3 mission (Jason-2 launch scheduled June 20)
 - Jason-3 is a NOAA-EUMETSAT partnership mission, planned for launch in 2013

- **OMPS**
 - OMPS limb added back to NPP (but not to NPOESS)

- **APS**
 - NOAA is monitoring NASA's development of APS scheduled to launch in March 2009 on the GLORY mission and will evaluate it before making a decision



Flight Schedule - Climate Sensors



- Current and Planned Missions
- NASA-NOAA Mitigation Flight
- NPOESS Mitigation Flight

Reduced Capability-Coverage Sensors



- MIS (CMIS)
 - EXCOM approved NRL build of for C2
 - 1.8 m antenna, all low frequency and polarimetric channels retained
 - Potential international partnership (JCOM-W AMSR)
- CrIS/ATMS
 - No action recommended
- VIIRS
 - Potential international partnership (JCOM-C SGLI)
- NOAA and the Japanese Aerospace Exploration Agency (JAXA) are actively exploring prospects for cooperation in NPOESS and the Japanese Global Change Observation Mission (GCOM) series of satellites
 - GCOM-W (Water Cycle observation) – series of 3 satellites, beginning in 2012
 - GCOM-C (Climate observation) – series of 3 satellites, launch TBD
- NOAA and JAXA are drafting Joint Letter of Intent for GCOM / NPOESS cooperation.
 - Formal agreement contingent on both sides obtaining budget support for their part in the cooperation

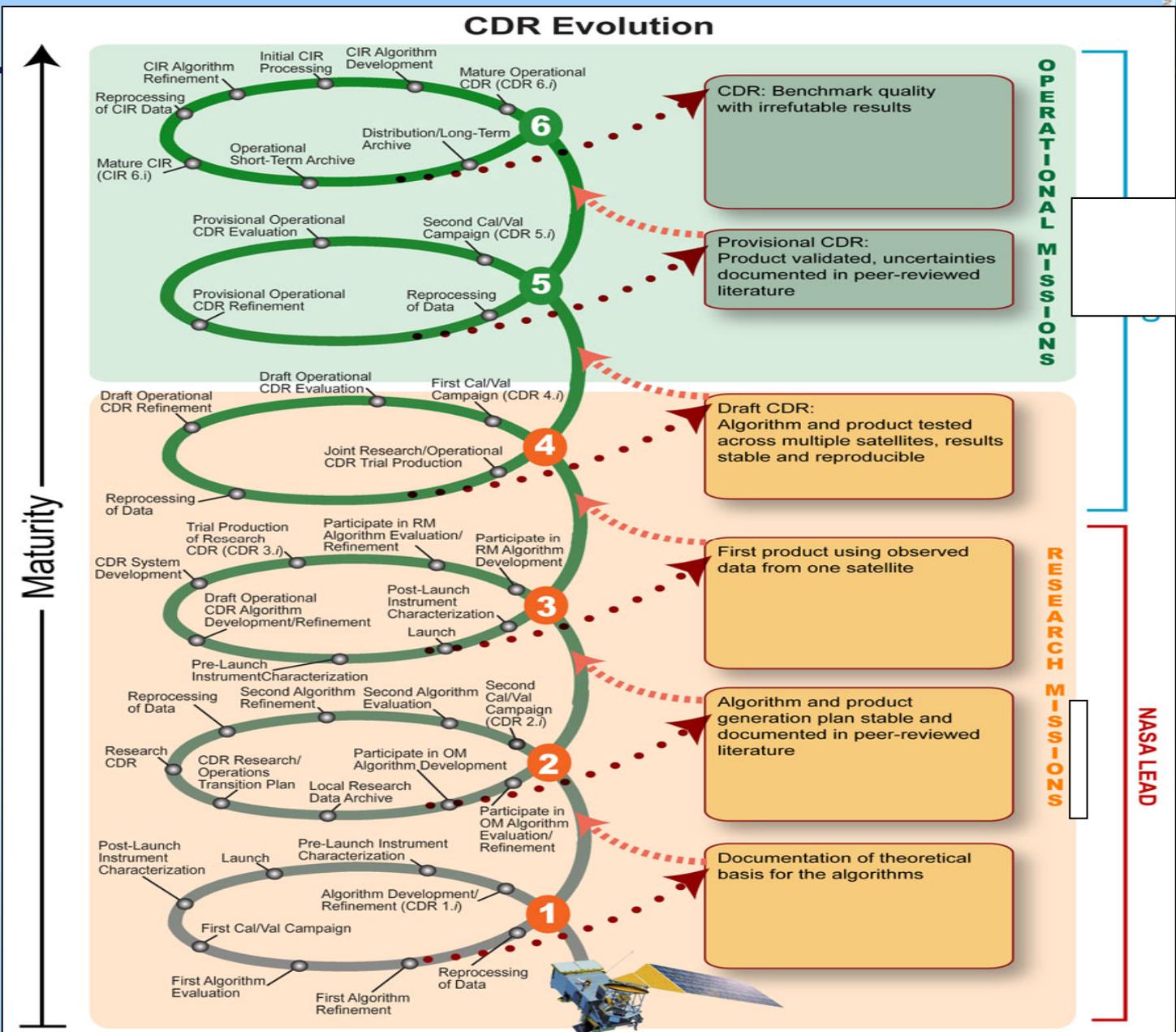


Current Studies - Climate Data Record (CDR) Science Support



- Includes development, production, reprocessing, stewardship, and distribution
- Assumes data from all NPOESS certified sensors and mitigation sensors / sources
- Covers about 30 Climate Change Science Program essential climate variables
- Includes a range of options bounded by a 'proof of concept' costing only for Fundamental CDRs (FCDRs) to a full production costing for all Thematic CDRs (TCDRs)

CRD Maturity Research-Operations





FY09 Activities



| Requirements | Execution | Deliverables |
|--|--|--|
| Preservation of homogeneous, raw satellite observations from operational satellites | Grants for Fundamental CDRs and Metadata | NASA PEATE Joint Teams Homogeneous NOAA/DMSP FCDRs Data and Metadata stewardship |
| Derived geophysical products of Essential Climate Variables | Grants for Thematic CDRs and Metadata | Identify maturity of all ECVs Establish Joint NOAA-NASA CDRs Fund pathfinder team CDRs |
| Ensure transfer to routine production of ECVs and apply to critical science questions identified in IPCC, GCOS, and NRC reports | Cooperative Institute - Climate Information Records | CIRS - hurricanes, solar power, water vapor, etc |
| Risk Reduction - FCDRs, TCDRs, CIRs | Directed Projects within NOAA | Transfer of existing CCDD ARC to operations - ISCCP regional, SSMI, etc NOAA teams on NASA Decadal missions Research-Operations transitions within NOAA |
| Planning, Oversight, Reporting | Project Office | Vetted Project Management Plan Panning and Reporting Activities |



Potential Collaboration with CIs



- CDR pilot project will include:
 - CI in Ashville area (cooperation with other CIs)
 - Independent Grants announcement (Sept?)
 - Risk reduction and NOAA infrastructure
 - Project office and infrastructure
- Potential for hiring students through SCEP (Student Career Experience Program)
 - 1) Student must be enrolled either full-time or half-time in an accredited institution.
 - 2) Student must work 640 hours on-site at the agency before they are eligible for conversion. Hours must be worked before they graduate
 - 3) Agency has 120 days after the student graduates to convert them non-competitively to a career-conditional appointment.
 - 4) An agreement must be filled out between the institution and the agency so that both parties are aware of the requirements.
 - 5) Students are normally hired at the ZP-II level and depending on type of degree they will receive, will either be converted to a ZP-II (Bachelors and Masters Degree) or ZP-III (Ph.D.).



Conclusions



- The foundations of research-operations transition of satellite CDRs has begun within NOAA and NASA
- \$74M for FY09-FY13 is in the President's budget for TSIS, CERES, and CDR pilot project (other sensors in other budgets)
- NESDIS Cooperative Institutes are seen as a key partner in this project