

NOAA's Climate Data Record (CDR) Program

Providing Trustworthy Climate Information from
3+ Decades of Satellite Data

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NOAA Began Developing CDR Program Concept at Start of Century

- NOAA White Paper on CDRs (2003)
- Began dialog with NRC as part of Committee Report “*Climate Data Records from Environmental Satellites*” (NRC, 2004)

NOAA should embrace its new mandate to understand climate variability and change by asserting national leadership for satellite-based Climate Data Record generation, applying new approaches to generate and manage satellite Climate Data Records, developing new community relationships, and ensuring long-term consistency and continuity for a satellite Climate Data Record generation program.

NOAA/NCDC Stands Up Remote Sensing Division

- The Remote Sensing Applications Division (RSAD) provides scientific leadership in the use of NCDC's satellite and radar data sets and their applications, particularly uses in numerical weather and climate prediction
- Scientific Data Stewardship (SDS) Project Mission:
Generate, validate, analyze, archive, and distribute high quality climate data records from environmental satellites and supporting ground based observations, and facilitate the use of these data in climate applications

NPOESS Climate Sensor “Remanifestation” Activity Provided Opportunity to Explain Need

- Some NPOESS climate capabilities eliminated in June 2006
- The White House/OSTP requested NOAA and NASA assess impacts and consider mitigation options and costs
- Primary goal: Ensure continuity of long-term climate records
 - Agencies agreed that “recovering climate capabilities” included space hardware *and* ground processing → CDRs
- Recovered OMPS-Limb, TSIS, CERES (NPP), ALT (via Jason-3)
- President’s FY09+ budgets included NOAA CDR language
 - “SDS Program” evolved into “CDR Program”

Thrusts Span Past, Present, Future Needs

1970

1980

1990

2000

2010

2020

2030

POES/GOES

NPP

JASON-3/JPSS/GOES-R

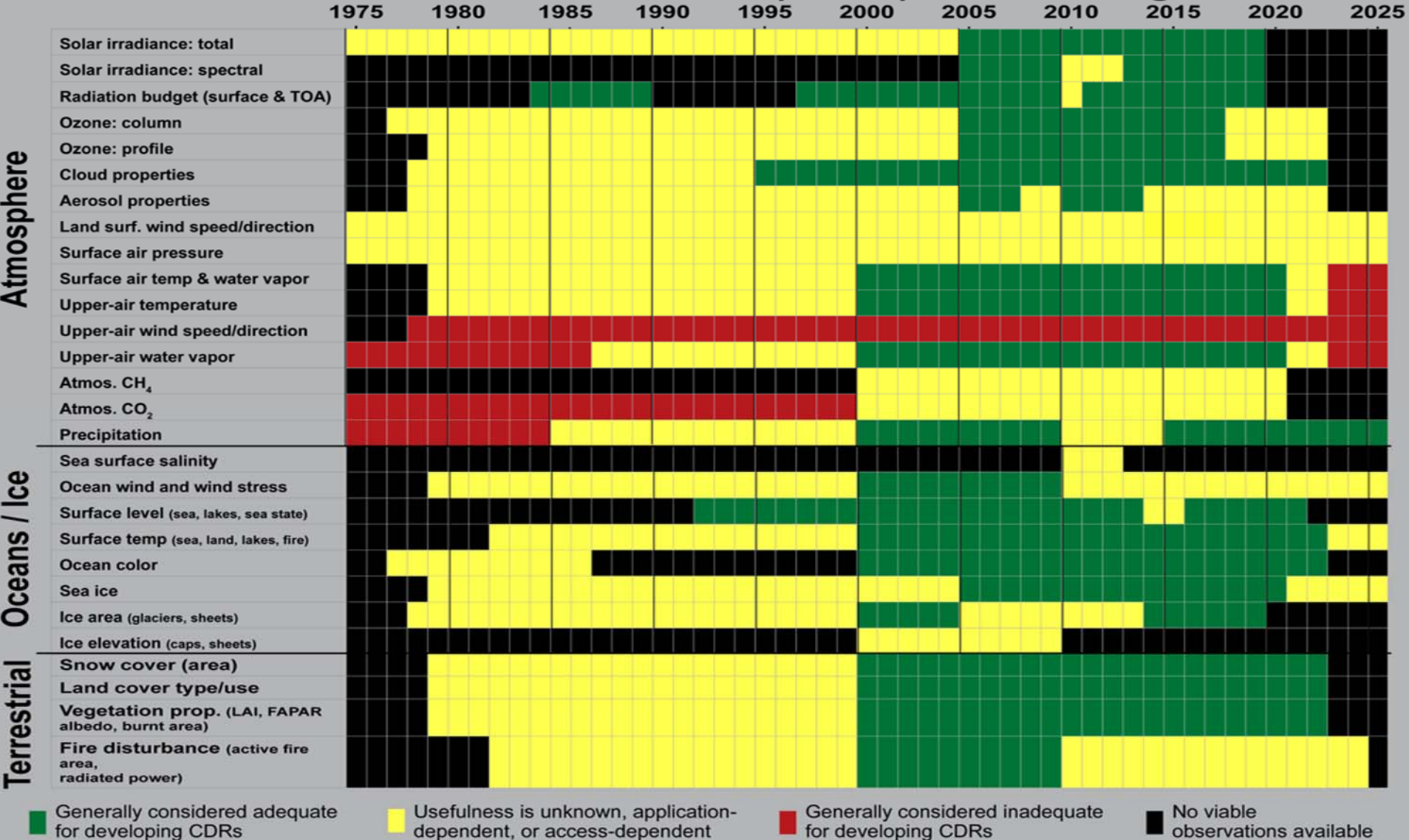
Uncover climate trend information
buried in four decades of heritage operational data

Provide operations and
products for
“Remanifested” climate
sensors”

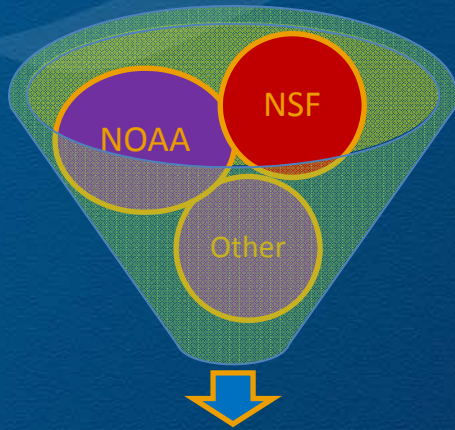
Ensure climate quality data from operational systems
and build efficiencies for future climate processing

Merging NASA/NOAA/USGS Data Will Provide Information at Climate Time Scales and Quality

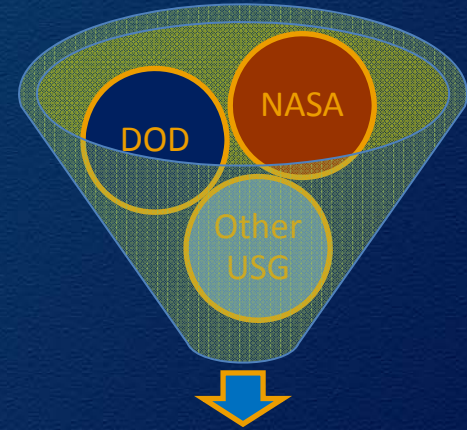
Global Essential Climate Variables (ECVs) with Heritage Records



Developing CDRs From Satellites Requires a New Collaborative Framework



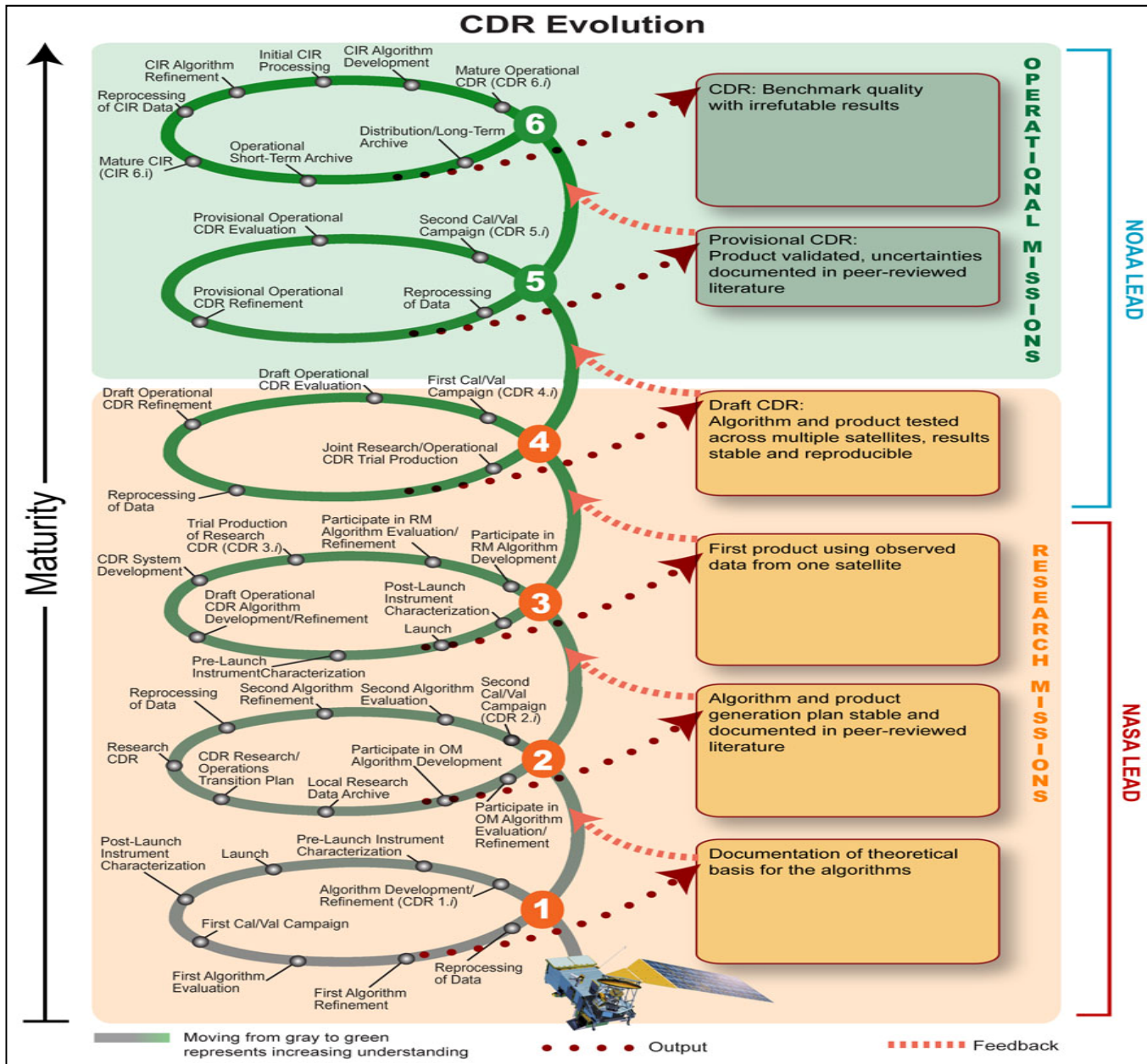
New Research and Development



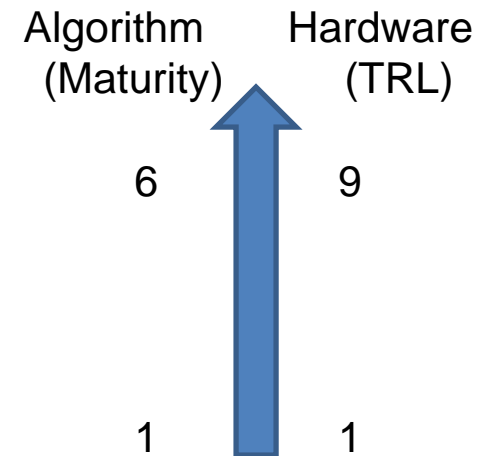
New Research and Development



NOAA CDR Starts With "Space Qualified" Algorithms



Algorithm Maturity Scale
roughly analogous to
Technology Readiness
Scale



Maturity Matrix Identifies Milestones and Research-to-Operations Transition Points

Daily Optimum Interpolation Sea Surface Temperature

■ : Completed
■ : In Process

Maturity	Sensor Use	Algorithm Stability	Metadata & QA	Documentation	Validation	Public Release	Science & Applications
1	Research Mission	Significant changes likely	Incomplete	Draft ATBD	Minimal	Limited data availability to develop familiarity	Little or none
2	Research Mission	Some changes expected	Research grade (extensive)	ATBD Version 1	Uncertainty estimated for select locations/times	Data available but of unknown accuracy; caveats required for use.	Limited or ongoing
3	Research Missions	Minimal changes expected	Research grade (extensive); Meets international standards	Public ATBD; Peer-reviewed algorithm and product descriptions	Uncertainty estimated over widely distribute times/location by multiple investigators; Differences understood.	Data available but of unknown accuracy; caveats required for use.	Provisionally used in applications and assessments demonstrating positive value.
4	Operational Mission	Minimal changes expected	Stable, Allows provenance tracking and reproducibility; Meets international standards	Public ATBD; Draft Operational Algorithm Description (OAD); Peer-reviewed algorithm and product descriptions	Uncertainty estimated over widely distribute times/location by multiple investigators; Differences understood.	Data available but of unknown accuracy; caveats required for use.	Provisionally used in applications and assessments demonstrating positive value.
5	All relevant research and operational missions; unified and coherent record demonstrated across different sensors	Stable and reproducible	Stable, Allows provenance tracking and reproducibility; Meeting international standards	Public ATBD, Operational Algorithm Description (OAD) and Validation Plan; Peer-reviewed algorithm, product and validation articles	Consistent uncertainties estimated over most environmental conditions by multiple investigators	Multi-mission record is publicly available with associated uncertainty estimate	Used in various published applications and assessments by different investigators
6	All relevant research and operational missions; unified and coherent record over complete series; record is considered scientifically irrefutable following extensive scrutiny	Stable and reproducible; homogeneous and published error budget	Stable, Allows provenance tracking and reproducibility; Meeting international standards	Product, algorithm, validation, processing and metadata described in peer-reviewed literature	Observation strategy designed to reveal systematic errors through independent cross-checks, open inspection, and continuous interrogation	Multi-mission record is publicly available from Long-Term archive	Used in various published applications and assessments by different investigators

SDS Grants Began in 2007

- SDS Grants Competitions
 - Funding source: internal redirects
 - Administered through NOAA's Climate Program Office (CPO)
 - Goals: Develop and acquire Climate Data Records
 - Generate authoritative long-term records
 - Demonstrate quality assurance for production
 - Record context for information preservation
 - Includes satellite data, *in situ* data, and standards/tools
- FY 2007
 - 7 Awards
- FY 2008:
 - 3 Awards

CDR Grant Awards Began in 2009

- Received 45 competitive proposals in December
 - Focus: Earth's Water & Energy Cycles; Project infrastructure
 - Product Development Teams, allowing community self-organization
- Panel and Mail peer-review
- 7 Awards (~\$2M)

- Additional awards coming in FY10

- New Announcement of Opportunity this summer

SDS vs. CDR Program Differences

	SDS	CDR
Data Types	<i>In situ</i> , Satellite	Satellite*
Thematic Focus	General	FCDRs; Water/Energy TCDRs
Grant Size (\$k/year)	75-125	175-520
Funding Source	Redirects	Fed. Appropriation
Administration	CPO	NCDC

**In situ* relevant for fused (satellite+*other*) or validation products

Climate Sensor Coverage By FY09 CDR Award

AVHRR (VIIRS)

- Snow/Ice (Key)
- Land/Carbon (Vermote)
- Thermal Calibration (Mittaz)
- VNIR Cal./Clouds (Minnis; FY10)

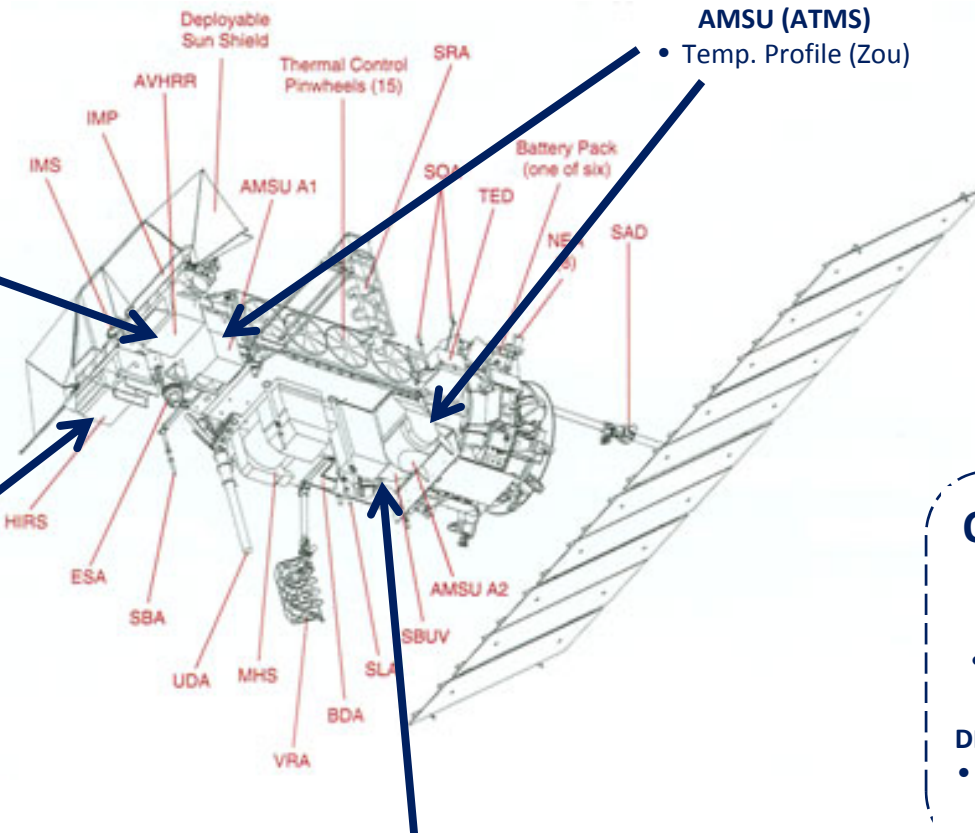
AMSU (ATMS)

- Temp. Profile (Zou)

HIRS (CrIS) TBD

SBUV (OMPS)

- Ozone (Flynn)



Other Satellites

SORCE, Glory (TSIS)

- Solar Irrad. (Pilewskie)

DMSP: SSM/I, SSMIS (MIS)

- Calibration (Kummerow)
 - Snow/Ice (Key)

Arrows identify key climate instruments

CDR Program Principles

- Program seeks transparency, trust and responsiveness to CDR user needs
- Goals will be achieved by competing CDR development, public release of codes and documents, external oversight boards, and...
- FY09 AO requires winners to hold a community workshop to inform, solicit feedback and respond to community
- Passive Microwave Workshop represents first of these

Program's Goals for Workshop

- Seek and respond to input from the science and user communities on all concepts and concerns to ensure NOAA CDRs are both highly useful and appropriately up-to-date
- Describe technical approach to help ensure CDR is transparent and gains community acceptance and credibility
- Provide formal mechanism for input from external parties
- Define community consensus best practice approaches for NOAA CDRs