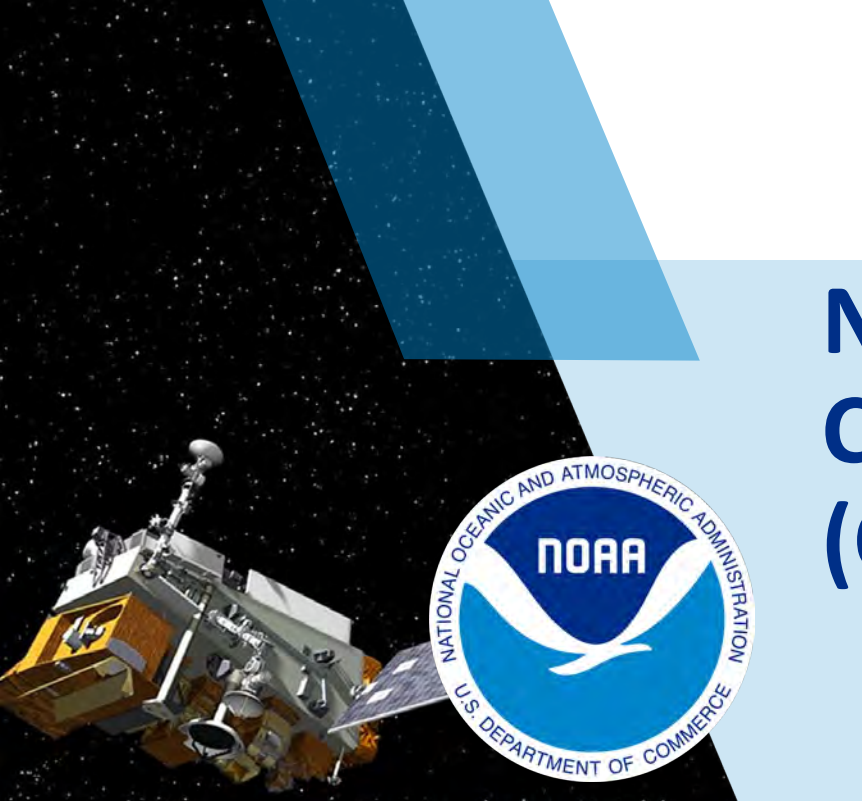


NOAA Climate Data Records (CDRs):

National Centers for Environmental Information (NCEI)

Ken Knapp, Xuepeng (Tom) Zhao, Candace Hutchins, and many more

September 19, 2024

Outline

- Satellite Data
- What is a Satellite Climate Data Record?
- NOAA's Climate Data Records
- Summary

What does *in situ* data lack?

SO, HOW MUCH OF THE EARTH'S SURFACE *IS* COVERED BY RAIN GAUGES?

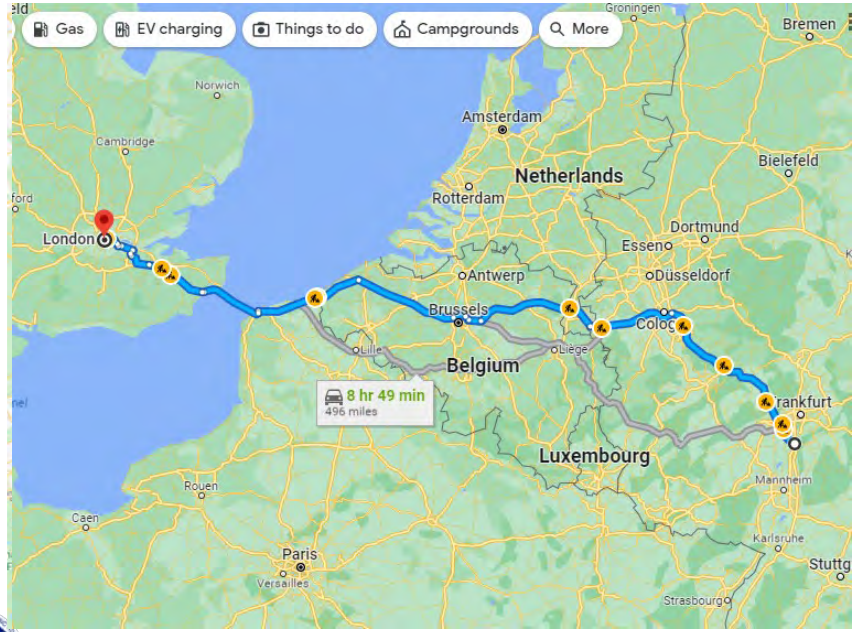
CHRIS KIDD, ANDREAS BECKER, GEORGE J. HUFFMAN, CATHERINE L. MULLER, PAUL JOE, GAIL SKOFRONICK-JACKSON, AND DALIA B. KIRSCHBAUM

AMERICAN METEOROLOGICAL SOCIETY JANUARY 2017 BAMS | 69

Spatial coverage

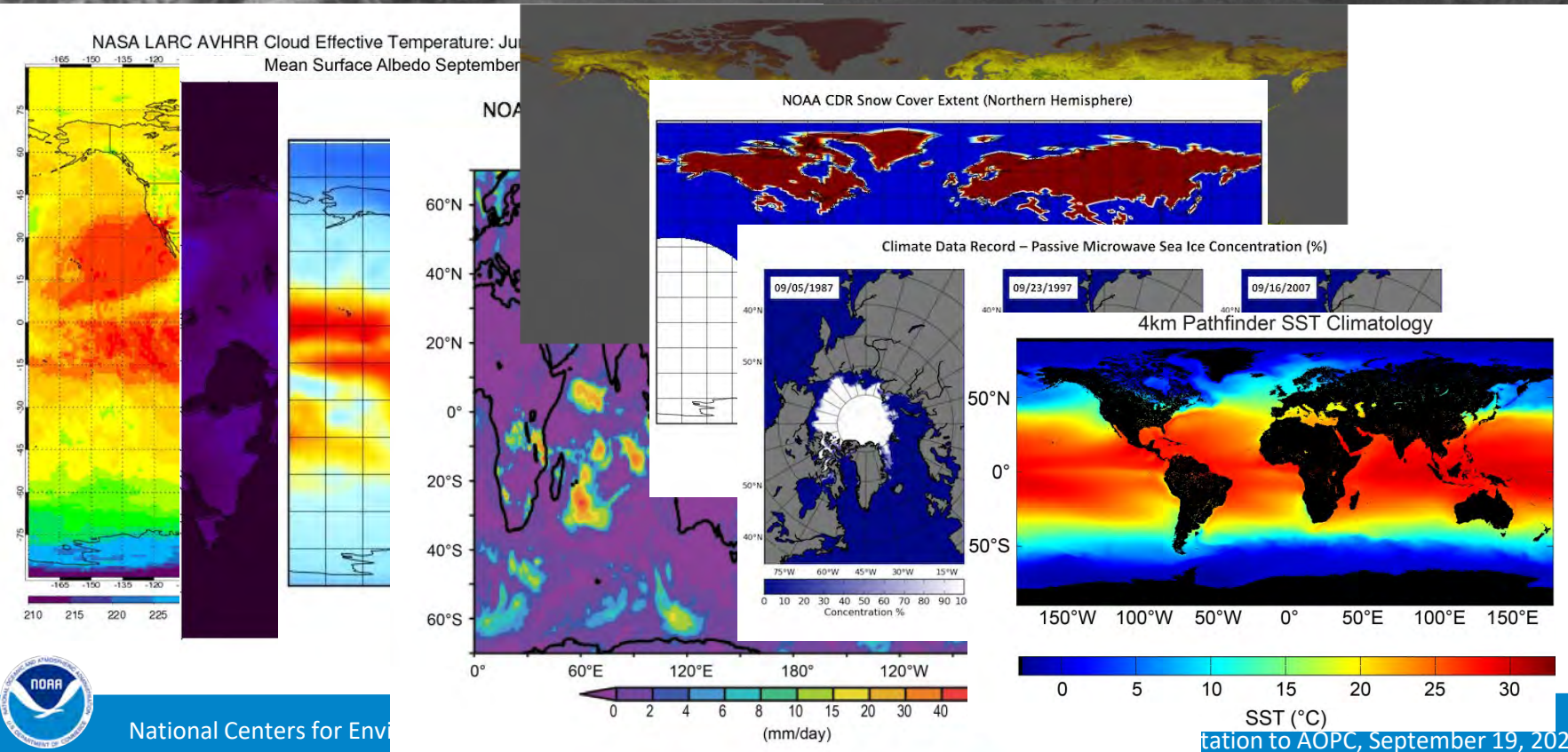
Satellites - Really, really, remote sensing

NOAA polar orbiters have an altitude of 512 miles



Geostationary orbit is at 22,236 miles

Despite that distance ...



Which should we use?

	in situ data	satellite data
Spatial coverage		
Actually *in* the environment		

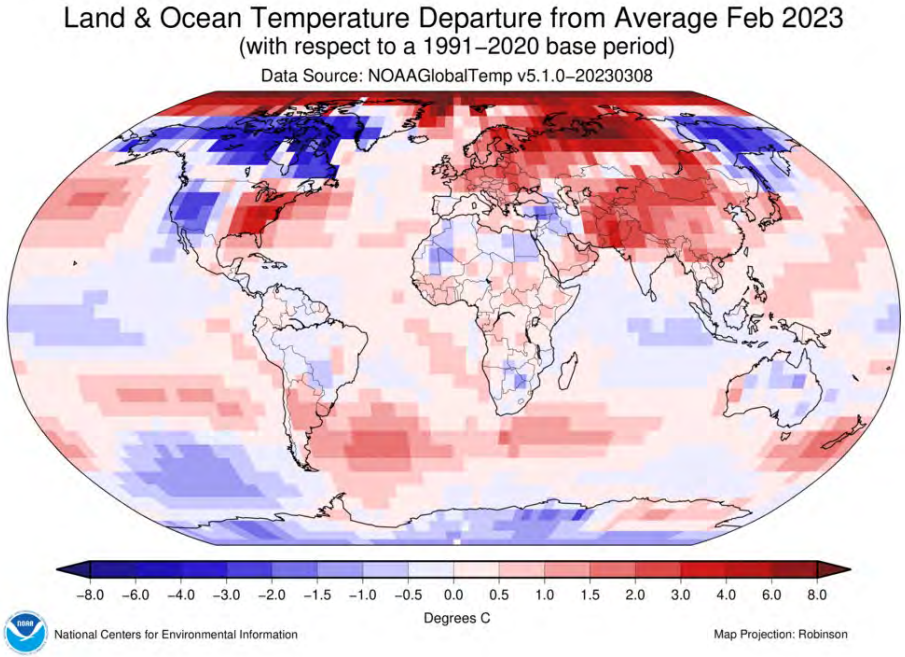
Which should we use?

	in situ and satellite data
Spatial coverage	
Actually *in* the environment	

Clearly, both provide the best picture of the Earth

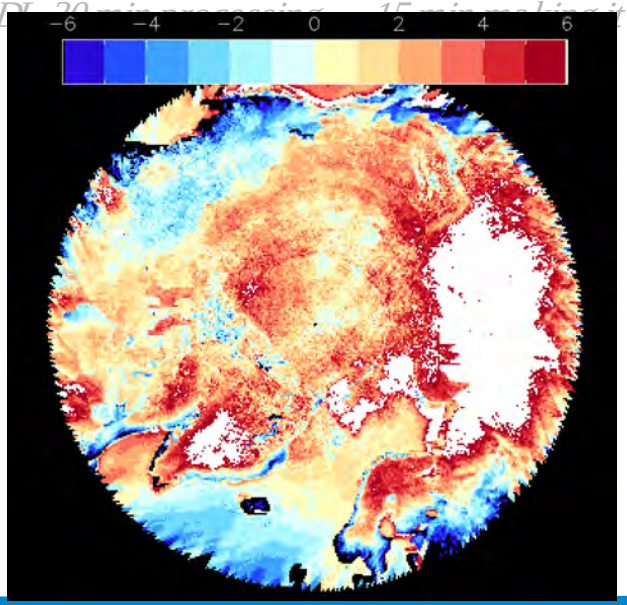
CDRs are not required to be satellite-based nor are they required to include in situ data.

What does that look like in real life?



APP-Extended CDR - February Anomaly Surface Temperature

(10 min DL, 30 min processing, ~15 min making it 'pretty')



What is a Climate Data Record (CDR)?

"A CDR is a time series of measurements of sufficient length, consistency, and continuity to determine climate variability and climate change." -- *NRC definition*

	EDR	CDR
Key Attribute	Timeliness	Length, Homogeneity
Shelf life	days-months	years-decades
Reprocessing?	No	Yes
Historical Context	No	Yes
Customer	NWS, ...	Nat'l Assessments, Industry, Academia,...

No hardened rule defines all CDRs:

- Single mission & multi-mission
- Satellite only, *in situ* & blended
- Radiance & geophysical
- One variable & some produce dozens
- Routinely produced & some aren't

What is a CDR? A historical answer.

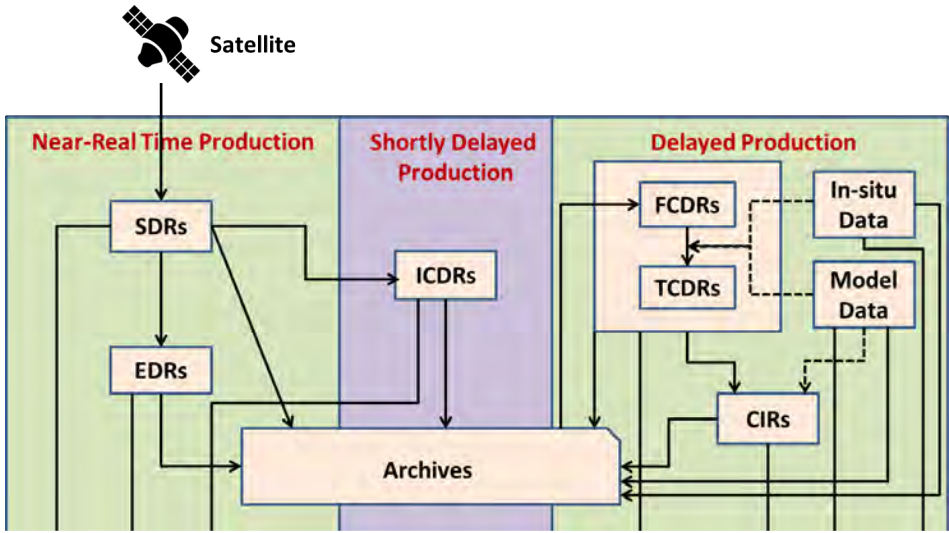
A Climate Data Record (CDR) is a time series of measurements of sufficient

length,

consistency,

continuity

to determine climate variability and change [NRC, 2004].

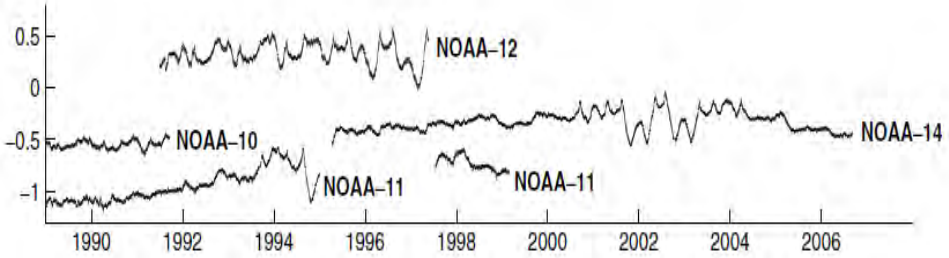


European CDR: Difference?

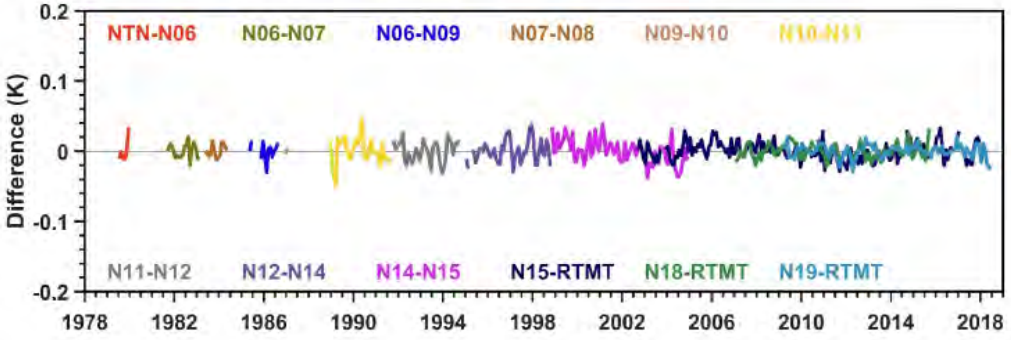
- What are climate data records?
  - The term climate data record refers to any long-term record of calibrated data that is useful for climate science or climate applications.
- Fundamental Climate Data Records (FCDRs):
  - time series of sensor observations, located in time and space, and of sufficient length and quality to be useful for climate science or applications.
- Climate Data Records (CDRs):
  - time series of a geophysical variable or related indicator, located in time and space, and of sufficient length, consistency and quality to be useful for climate science or applications.
- Interim Climate Data Records (ICDRs):
  - times series of CDR values produced at lower latency [or higher timeliness] than, but otherwise minimising differences with, the estimated CDR values

What is a CDR? Recalibrated data!

In-Consistent SDR Time Series



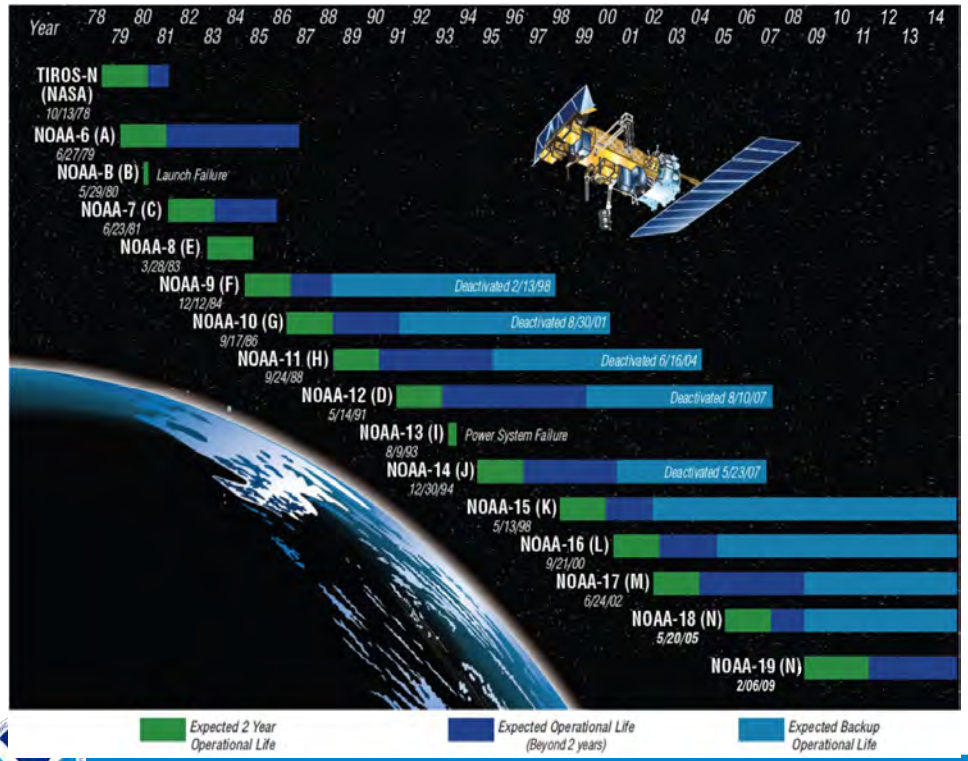
Consistent BT CDR Time Series

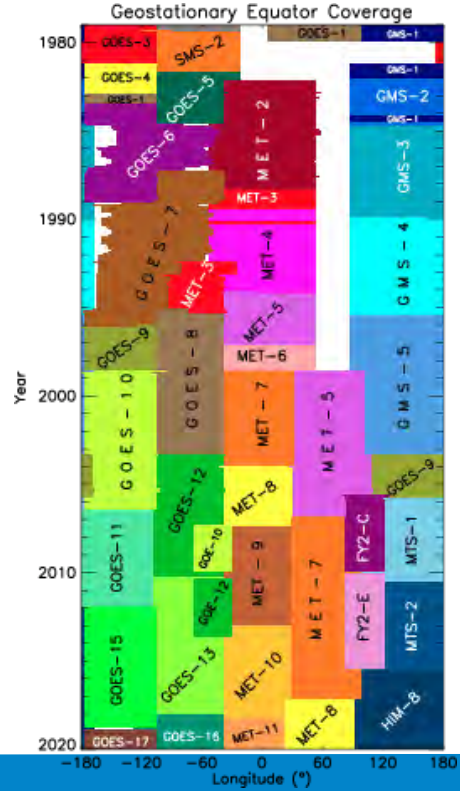


BT CDR adjustments include:

1) diurnal drift
2) calibration drift
3) channel frequency differences
4) incident angle differences
5) warm target temperature effects

CDR Goal: Uniformity from 14+ LEOs and 30+ GEOs





What is a CDR? Reprocessed data!

Reprocessed means updated …

calibration,

assumptions,

constraints,

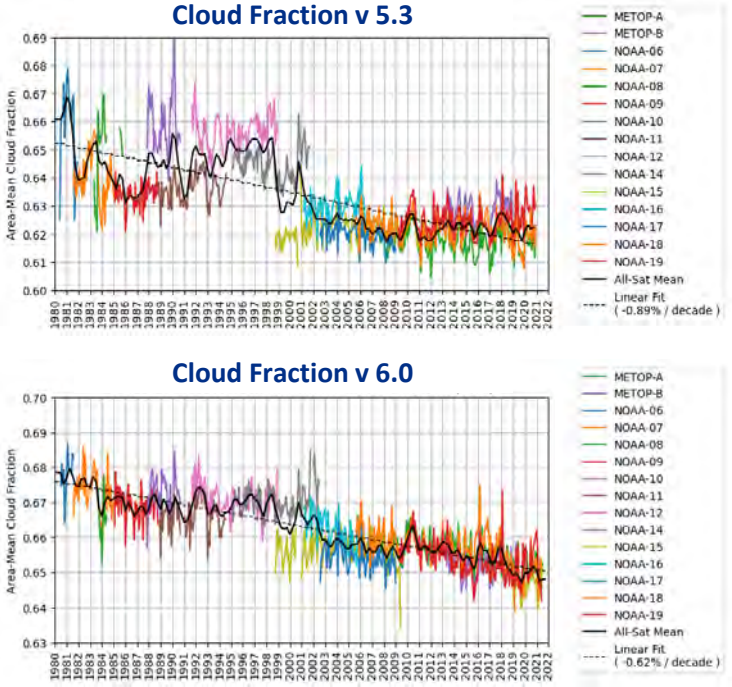
models,

algorithms,

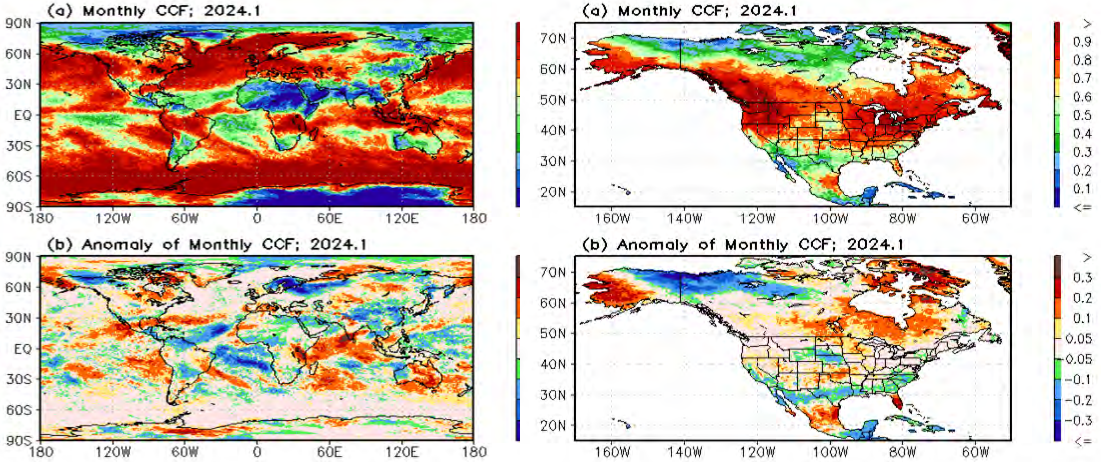
ancillary data,

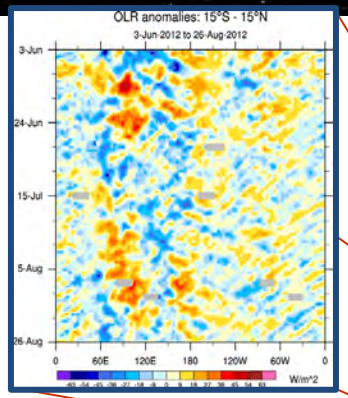
understanding,

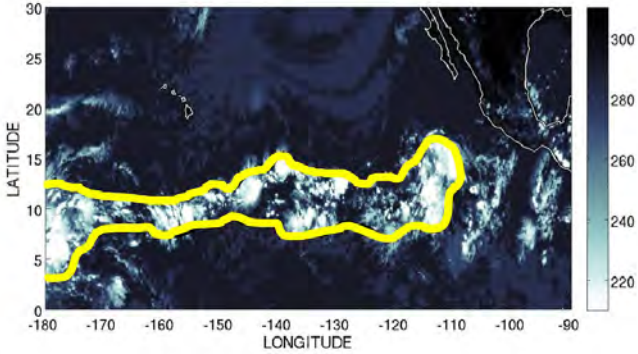
Pathfinder Atmosphere Extended (PATMOS-x)



What is a CDR? Useful data!

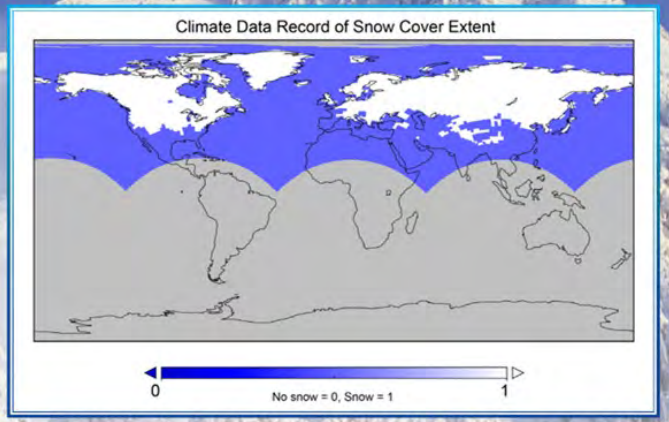






National Oceanic and Atmospheric Administration | National Centers for Environmental Information

Snow Cover Extent (Northern Hemisphere)



Climate Data Record Specifications

- Northern hemisphere
- 89 x 89 grid
- Weekly product
- 1966–present
- Updated monthly

Some Uses of this Climate Data Record

- Studying long-term climate changes
- Initializing weather prediction models
- Estimating snow melt runoff

National Centers for Environmental Information (NCEI)

Example of a CDR

Product Details

Principal Investigator

David Robinson, Rutgers University

Citation

Cite dataset when used as a source. See the dataset's landing page for citation details at doi:10.7289/V5N014G9.

Data Access

- Download
- THREDDS
- Google (Cloud)
- Amazon (Cloud)

Information

- Contact

Documentation

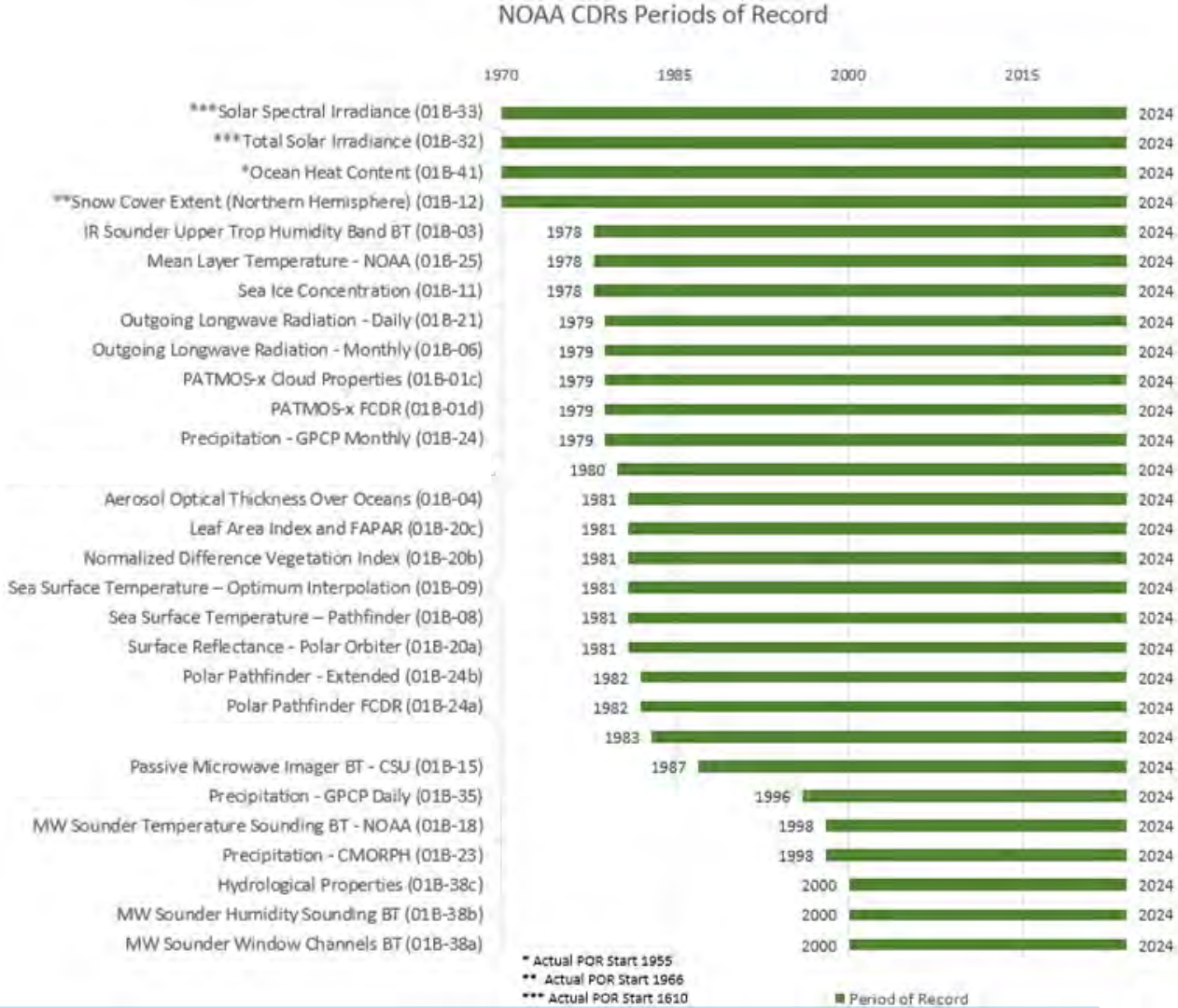
- CDR Flyer
- Use Agreement
- Algorithm Description
- Data Flow Diagram
- Maturity Matrix
- Technical Note
- Source Code

Routine CDRs by variable

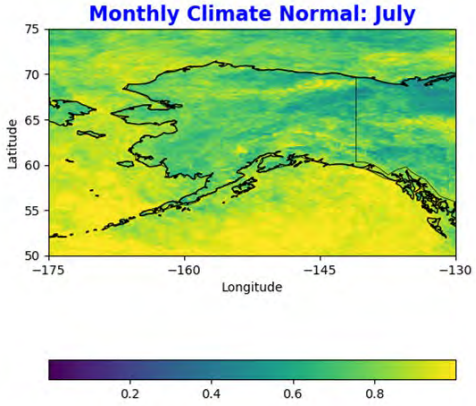
Precipitation (5)
Snow cover (2)
Clouds (4)
OLR (daily & monthly)
Radiative fluxes (2)
Aerosol Optical Thickness
Mean Layer Temperature
Water vapor (2)

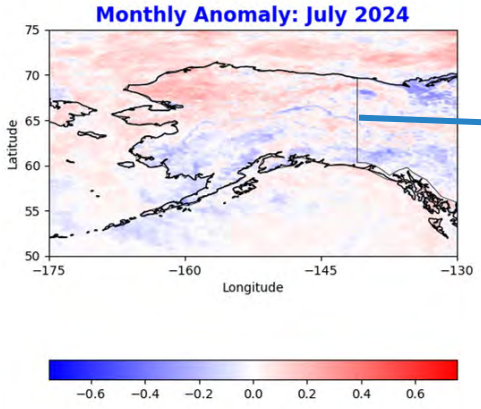
Sea Ice (2)
SST (3)
Ocean Heat Content
Surface Vegetation (2)
Surface albedo/emissivity (3)
Surface temperature (2)
Solar Variables (2)
Calibrated Satellite data (9)

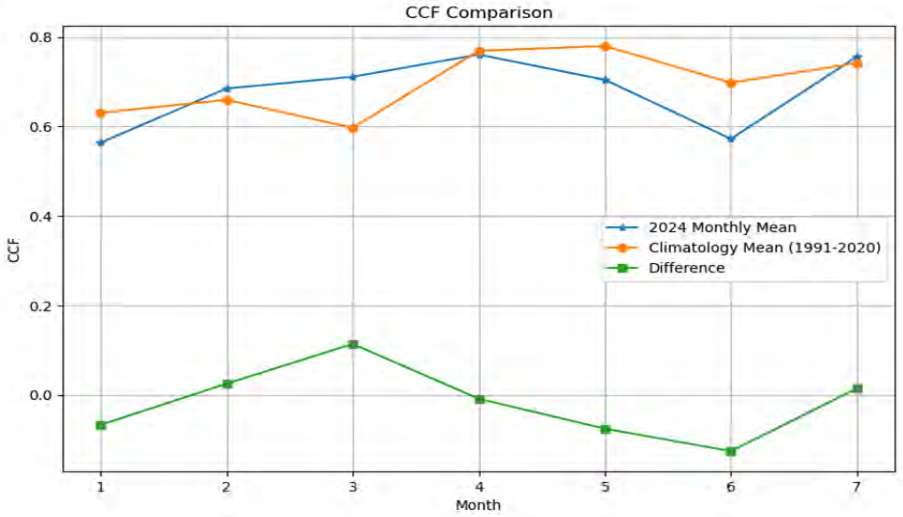
NOAA CDRs by Period of Record



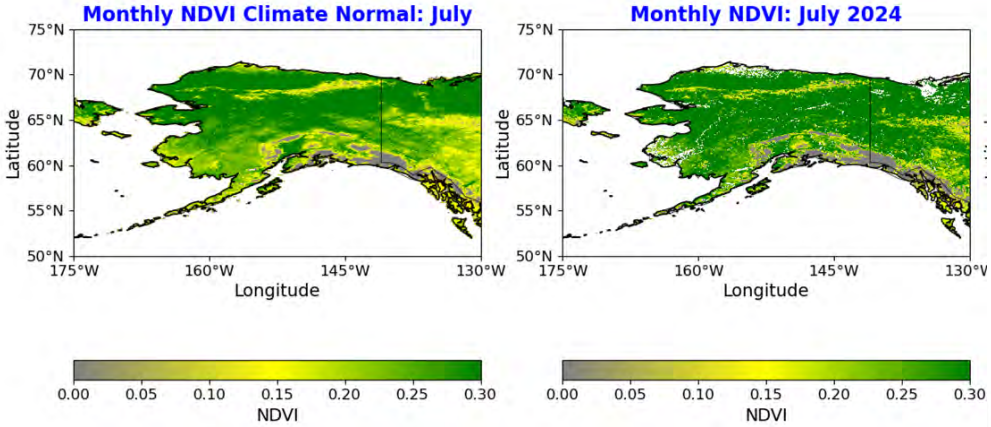
Cloud Cover Fraction (CCF)

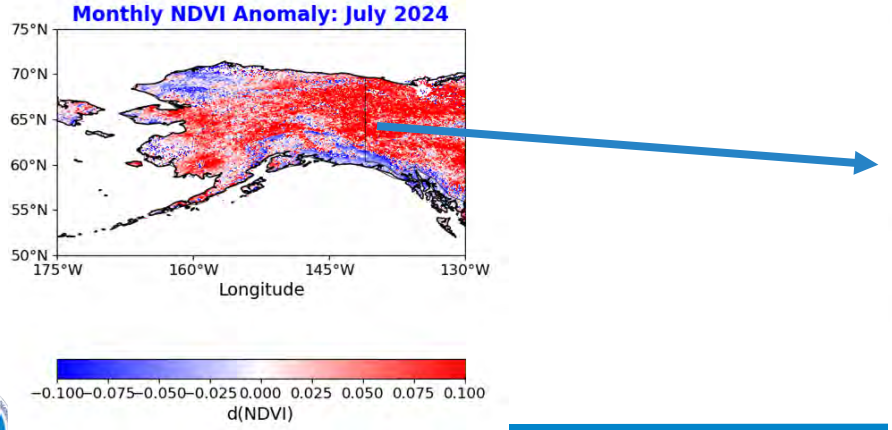


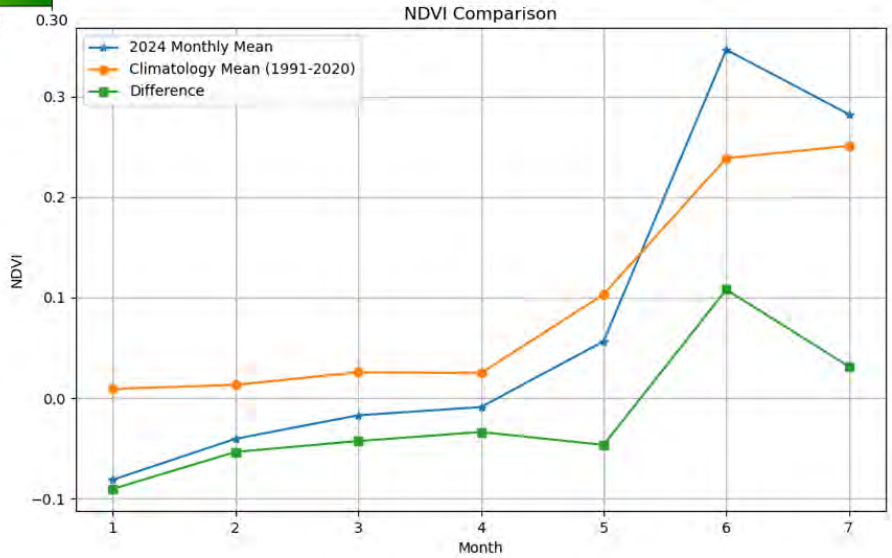




NDVI Climate Normal & Anomaly

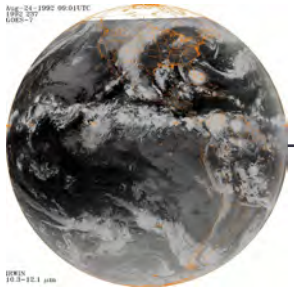


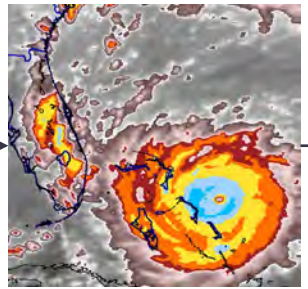




CDRs answer business questions...

Business: *What is my short term risk?* **NOAA: *Check out our EDR***



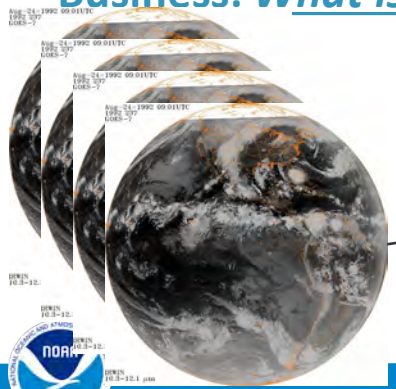


T#=7.5
CI=7.0

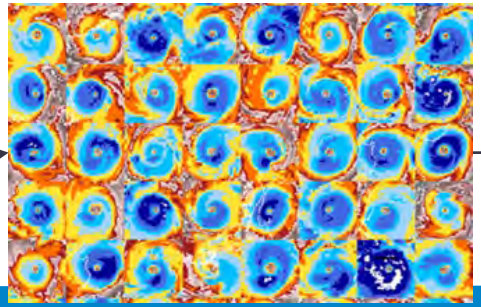
Intensity: 140 kt
Cat 5

Decision:
Protect property
Evacuate employees

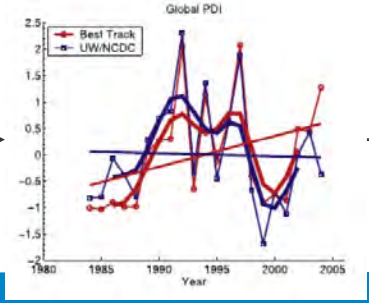
Business: *What is my long term risk?* **NOAA: *Check out our CDR***



3200+ storms, 200K images



Objective Intensity Algorithm



Decision:
Mitigation.
Invest in improved structures

NOAA CDRs: a second life for satellite data

All CDRs provided in netCDF4

All CDRs are available on the cloud (AWS *et al.*)

16 primary variables updated routinely *(but 100s more available)*

Sustaining production with newer satellites (JPSS, GOES-R, …)

Collaboration of NCEI with other NOAA offices, NASA, and academia

Collecting requirements to meet stakeholder needs