



# Global Ocean Climate Data Records: An Example of Integrating In-Situ and Satellite Data

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# Fundamental Climate Data Record (FCDR)

- Long-term data record involving a series of platforms, such as satellite and in-situ instruments each with different performance characteristics, usually with different space and time sampling, time extent, and stability
- Overlaps and calibrations sufficient for generation of homogeneous and well-characterized global data products that are stable for climate monitoring
- Includes metadata used for calibration

## Essential Climate Variable (ECV)

- ECV support work of the UNFCCC
- ESA Ocean ECV
  - Sea surface temperature
  - Sea level
  - Sea ice
  - Ocean color (for biology)



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## **ESA CLIMATE CHANGE INITIATIVE PHASE 1**

## **SCIENTIFIC USER CONSULTATION AND DETAILED SPECIFICATION**

## **STATEMENT OF WORK**

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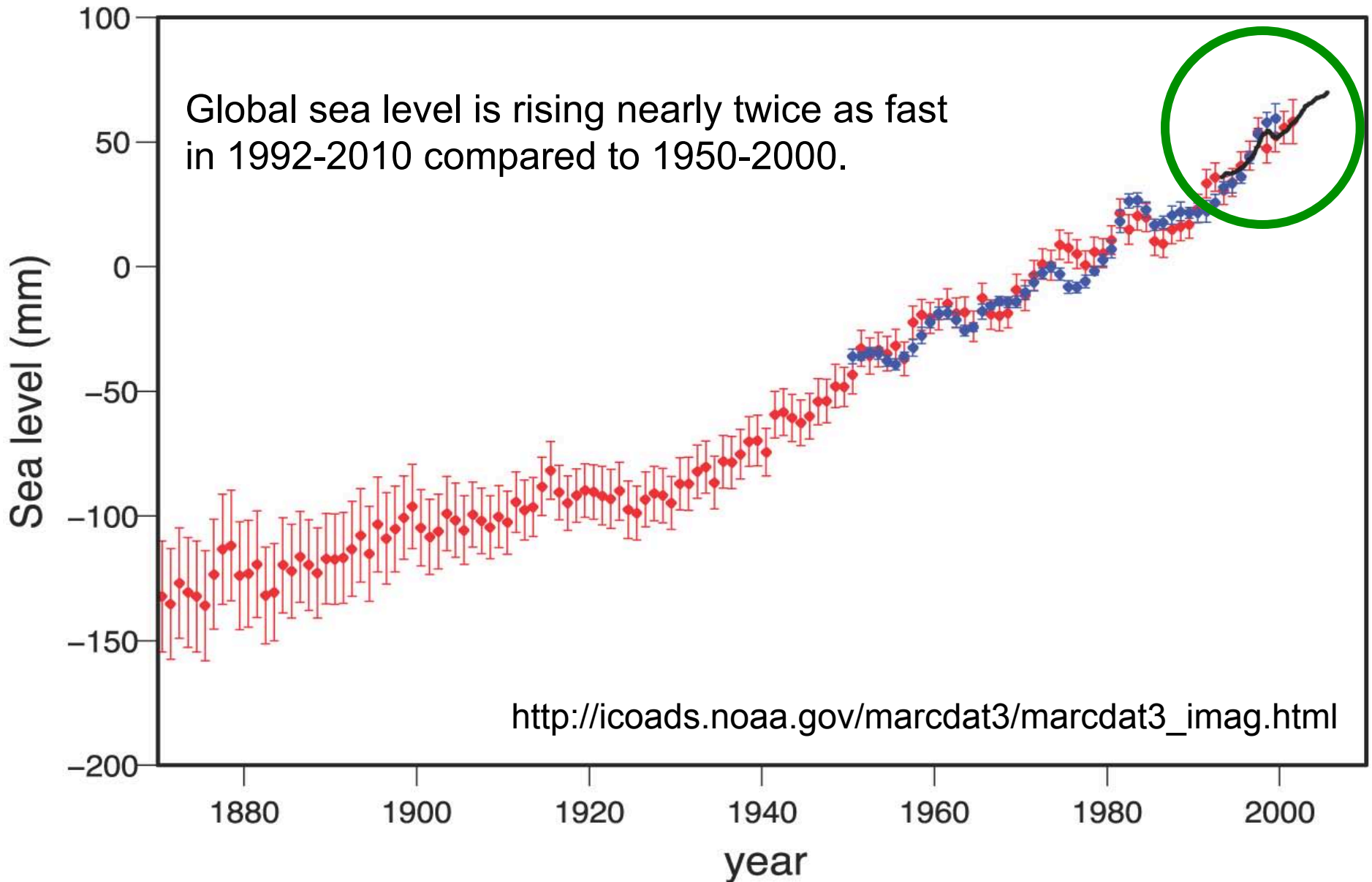
# FCDR Requirements

## Fundamental Climate Data Record Quality Priorities: High Accuracy and High Stability

- accuracy
- error
- uncertainty
- timeliness
- precision
- reliability
- completeness
- relevancy
- accessibility
- interpretability
- calibration
- open and transparent peer-review process
- documentation
- reprocessing
- stability traceable to international standards
- utility
- objectivity
- transparency
- reproducibility

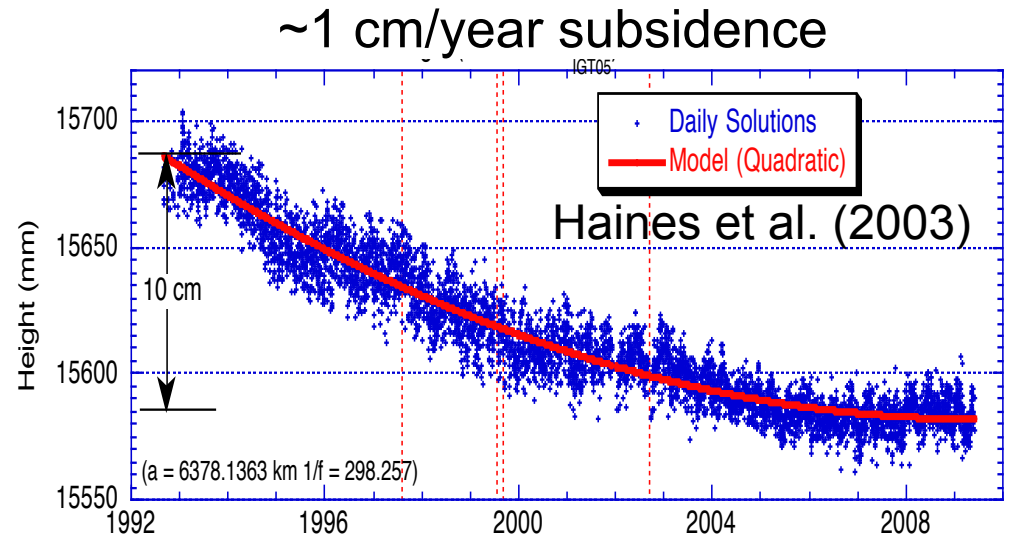


# ESA CCI ECV FDCR: Global Sea Level (1)

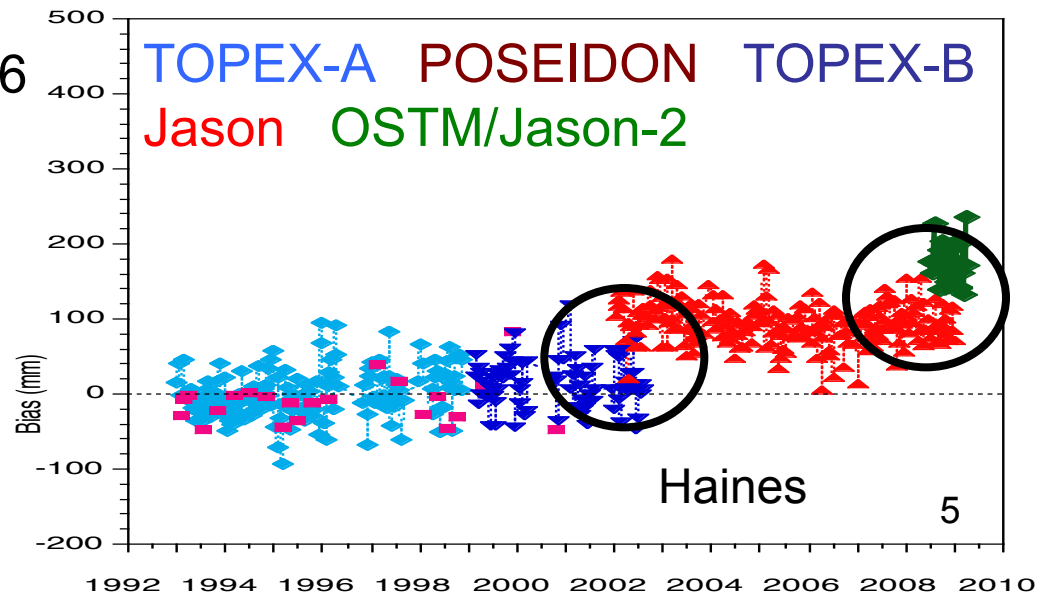
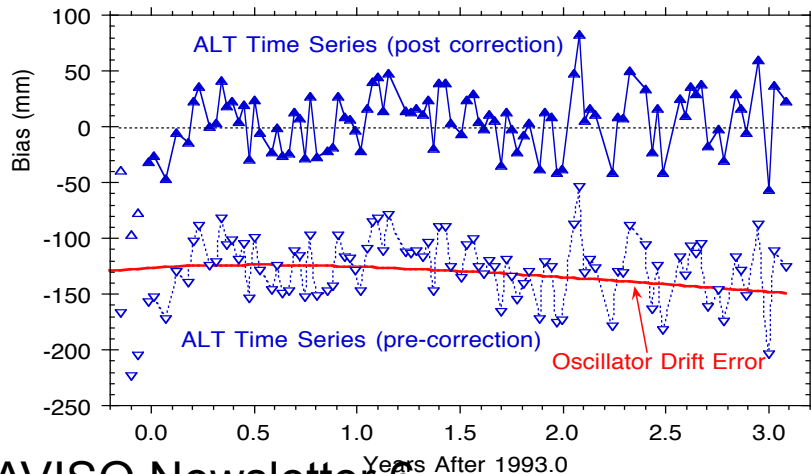




# ESA CCI ECV FDCR: Global Sea Level (2)

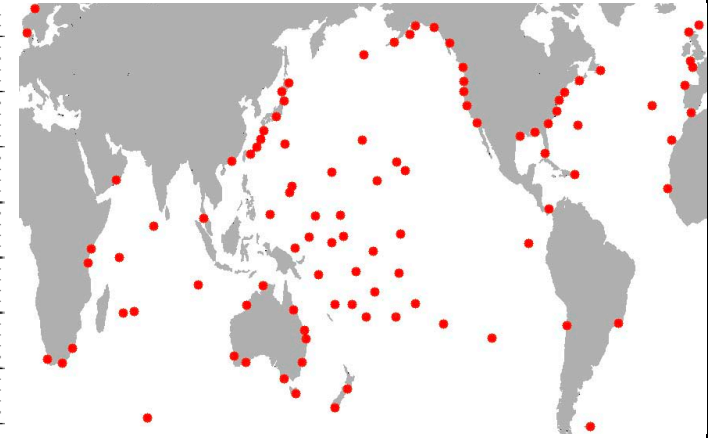
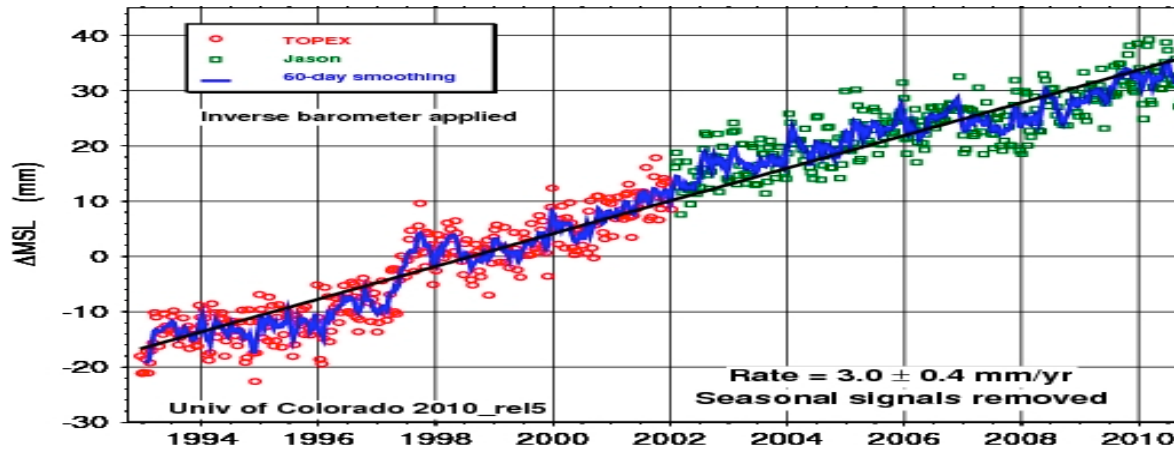


Zanife et al. discover S/W error, 1996



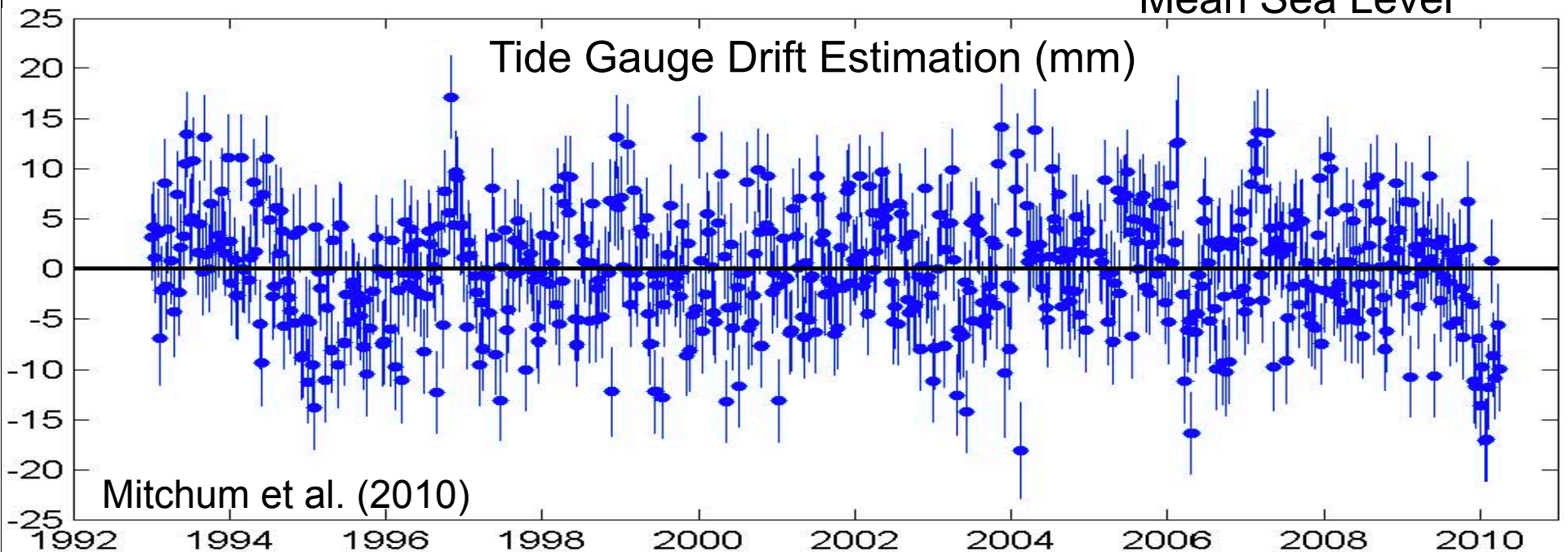


# ESA CCI ECV FDCR: Global Sea Level (3)



[http://sealevel.colorado.edu/current/sl\\_ib\\_ns\\_global.jpg](http://sealevel.colorado.edu/current/sl_ib_ns_global.jpg)

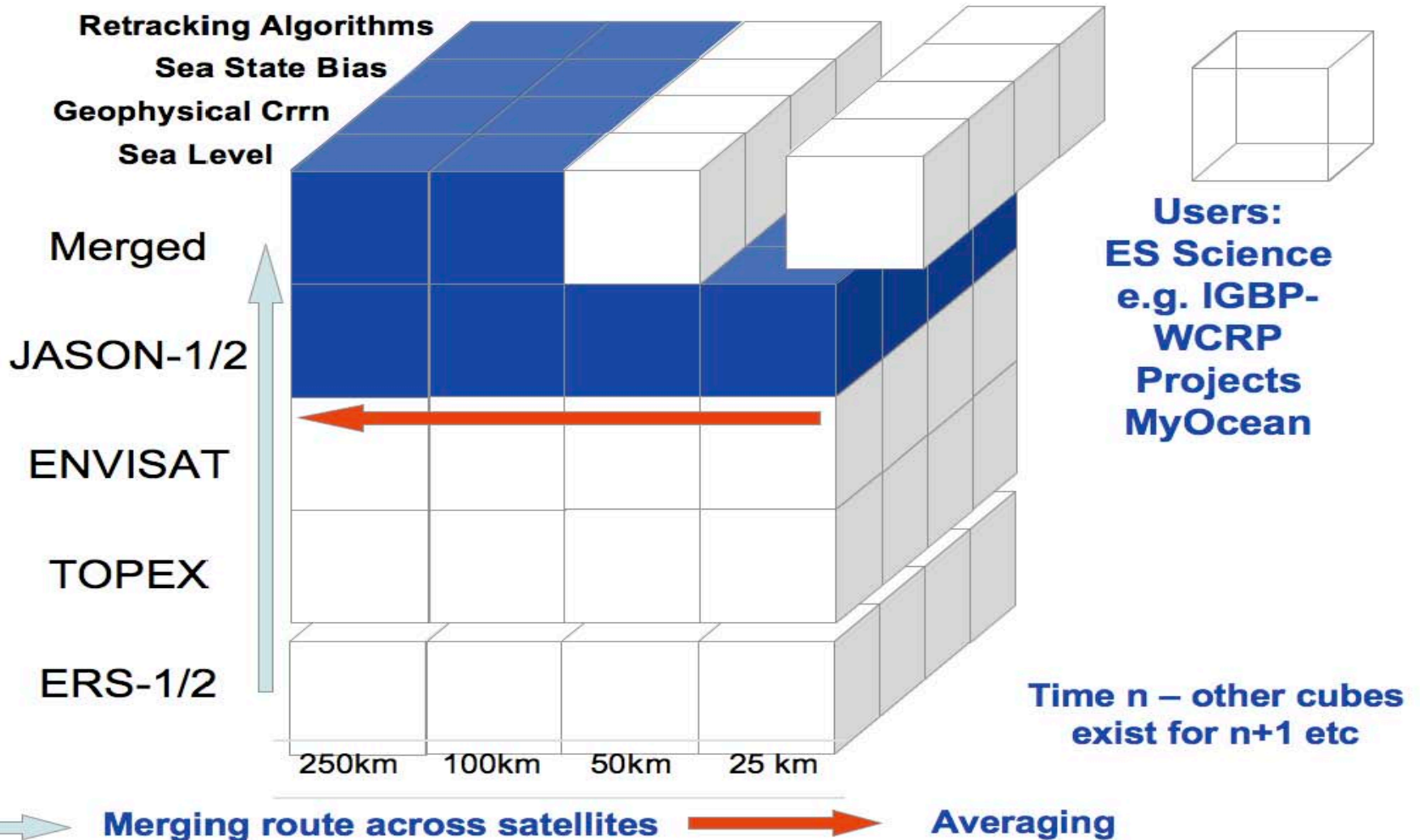
Permanent Service for Mean Sea Level





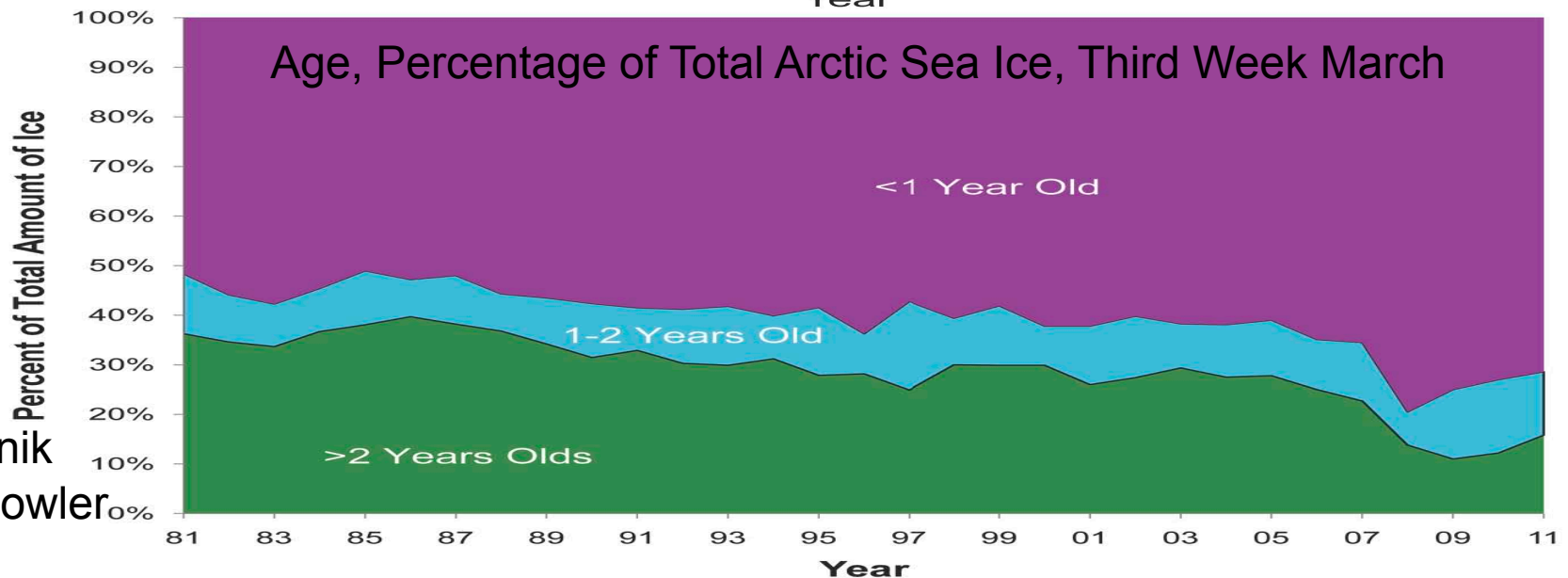
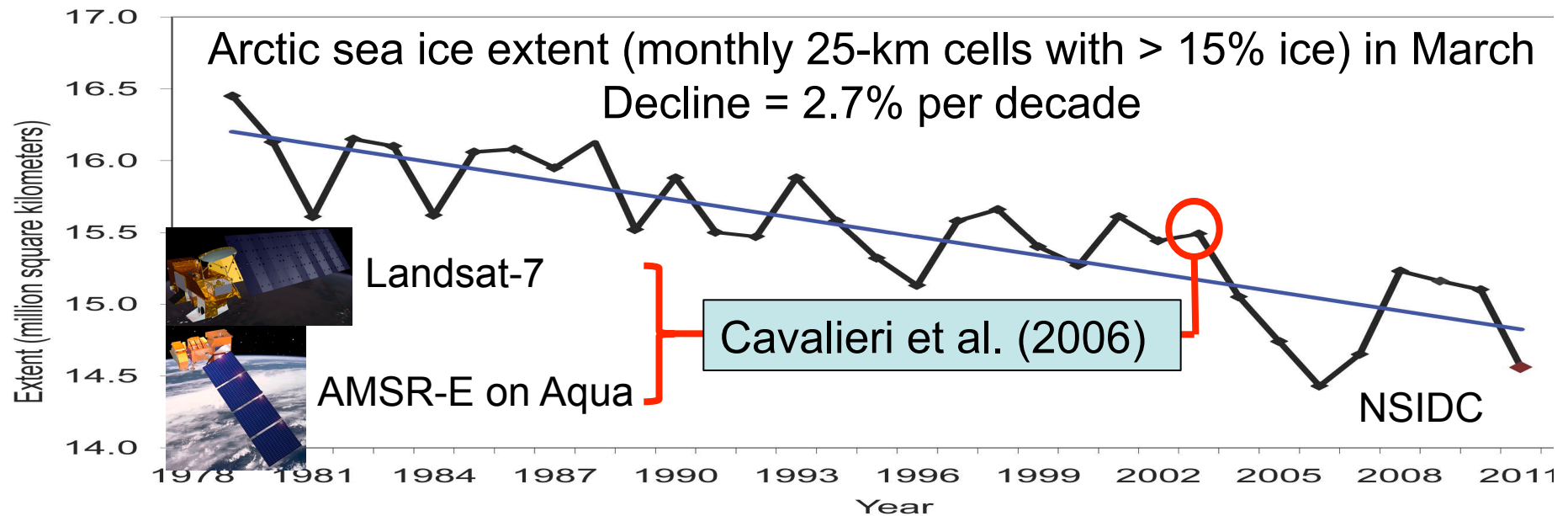
# ESA CCI ECV FCDR: Sea Level (4)

Key Science Bodies: **OSTST**





# ESA CCI ECV FDCR: Sea Ice (1)

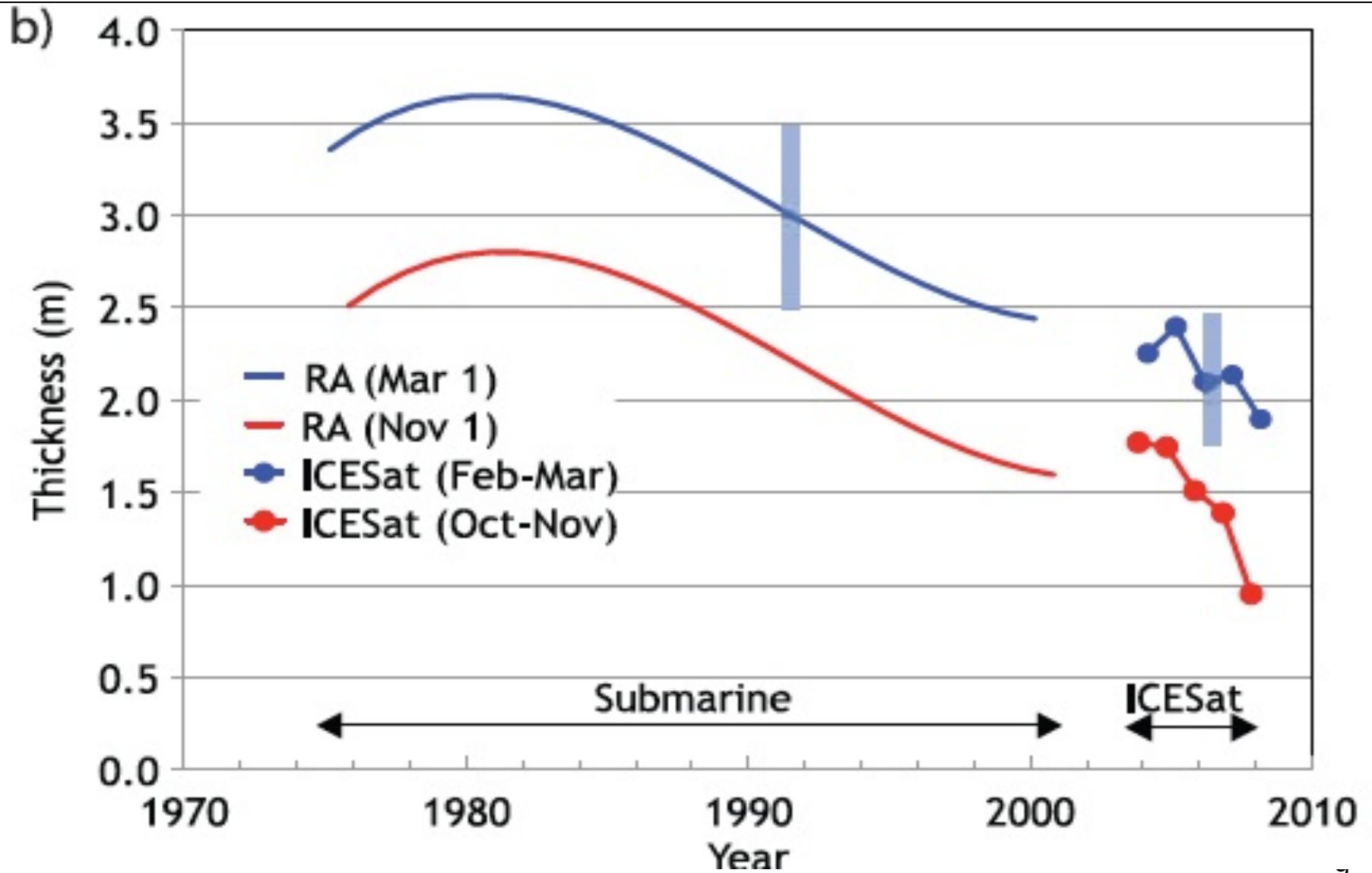


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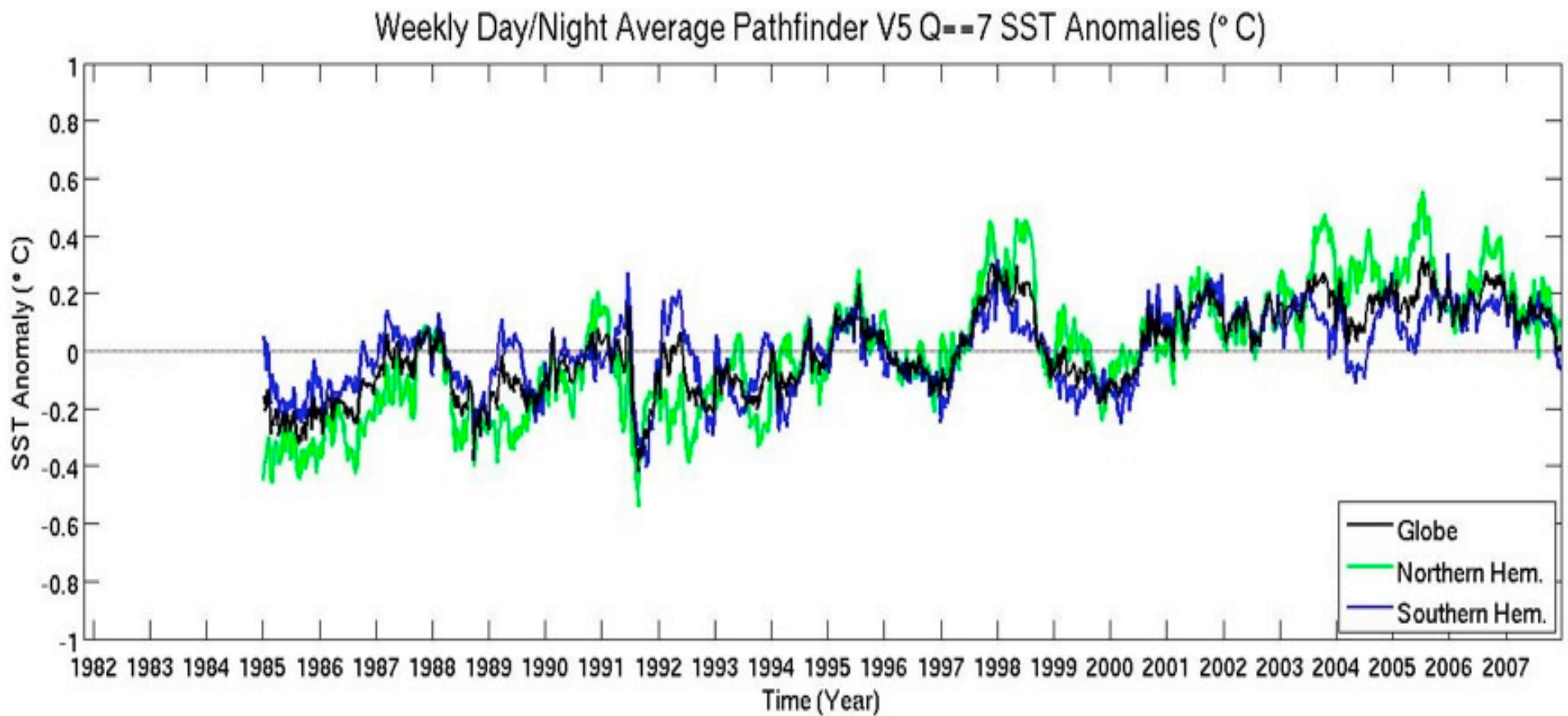
# ESA CCI ECV FCDR: Sea Ice (2)



Kwok and Rothrock (2009)



# ESA CCI ECV FDCR: Sea Surface Temperature (1)



R. Evans, p.c., 2011

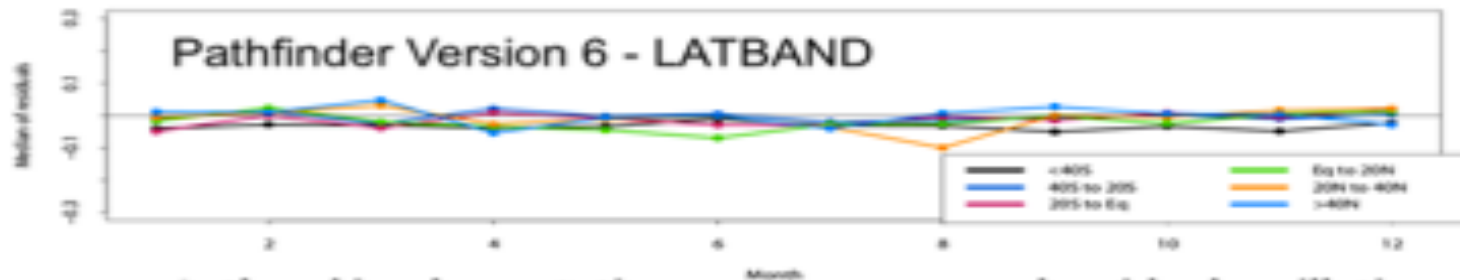


# ESA CCI ECV FDCR: Sea Surface Temperature (2)

## Buoy Comparison of Pathfinder Versions 5 & 6

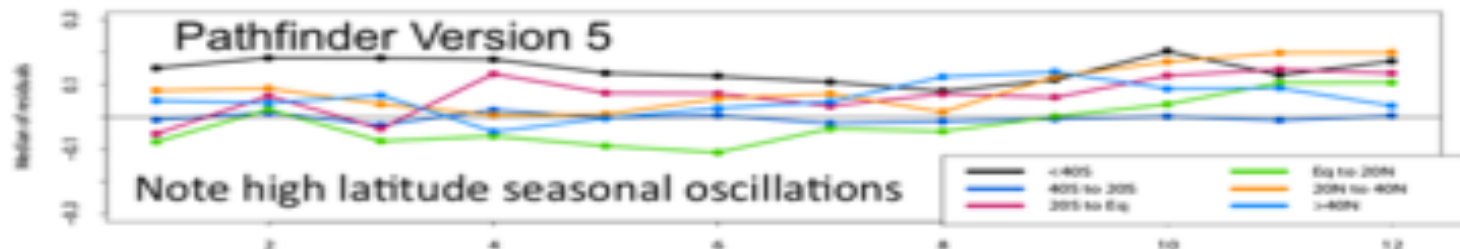
### Application of LATBAND to NOAA-18

NO18 – Latband1 SST Median of Residuals



Latband implementation removes seasonal residual oscillations

NO18 – Latband1 SST Median of Residuals



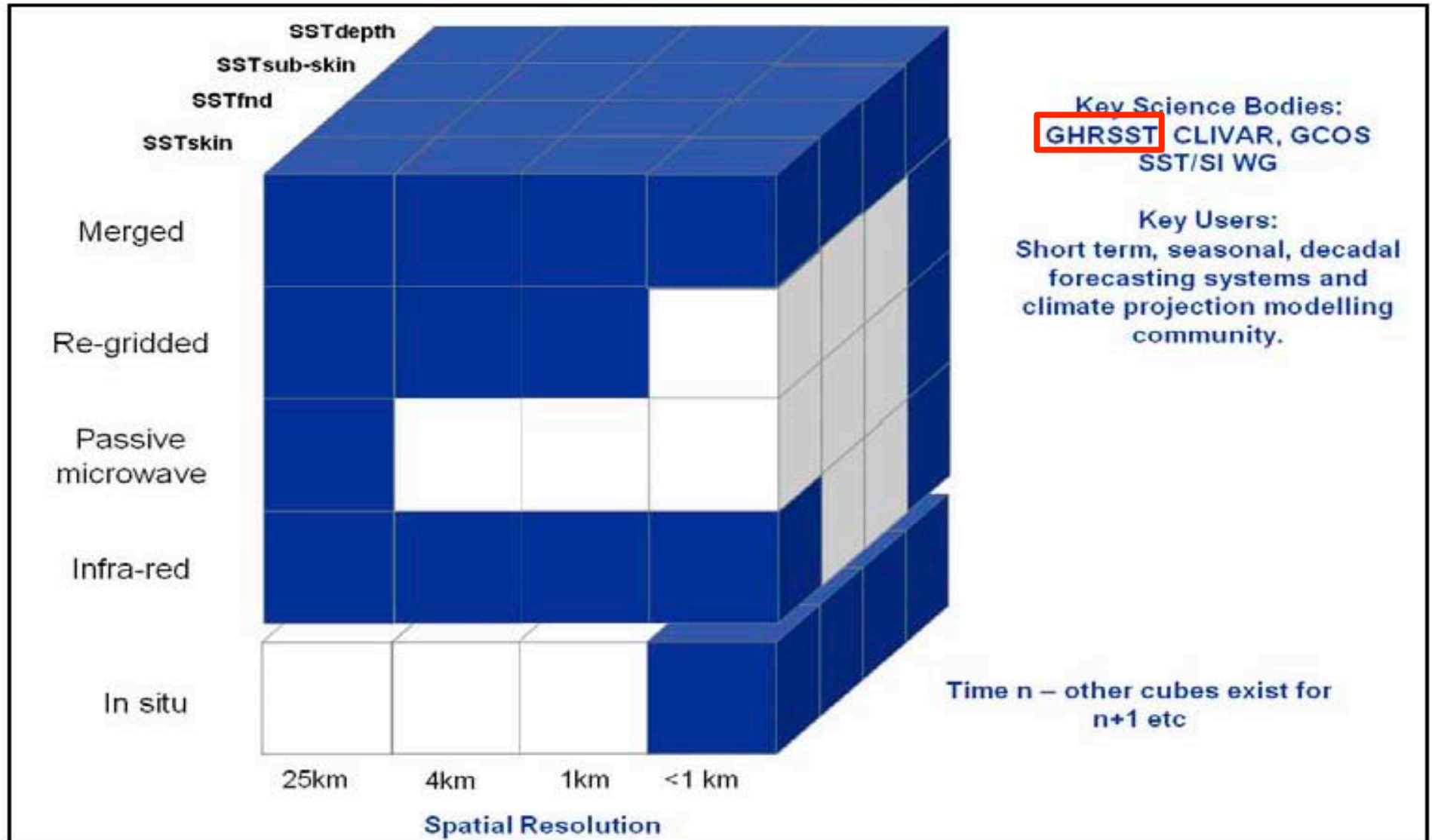
Note high latitude seasonal oscillations

Summary statistics for SST residuals, NOAA-18. (11-12 $\mu$ m bands)

Pathfinder Algorithm	Median	Mean	StdDev
Validation LATBAND (skin)	-0.178	-0.198	0.37
Validation Pathfinder V5	-0.093	-0.115	0.39

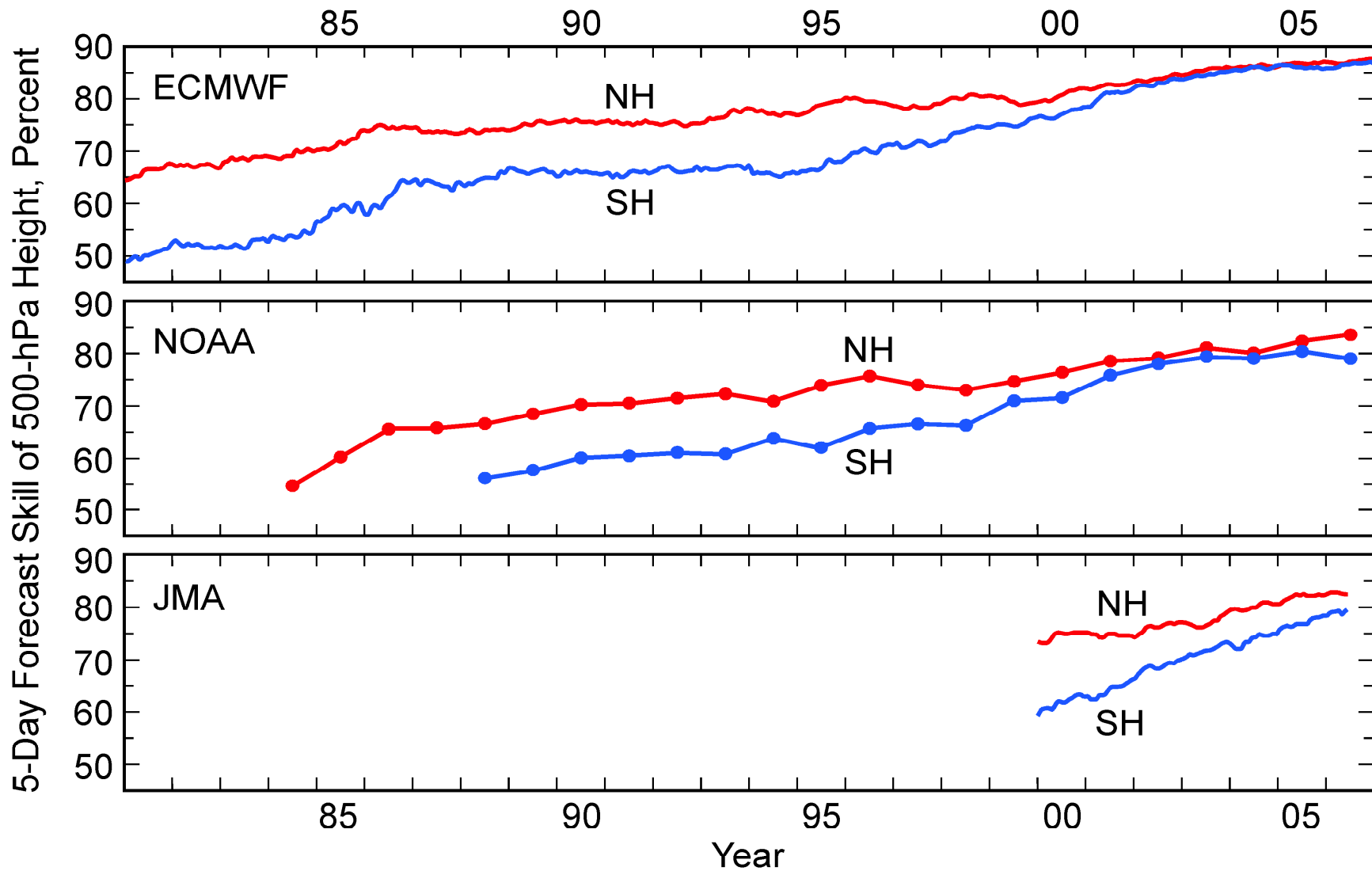


# ESA CCI ECV FDCDR: Sea Surface Temperature (3)



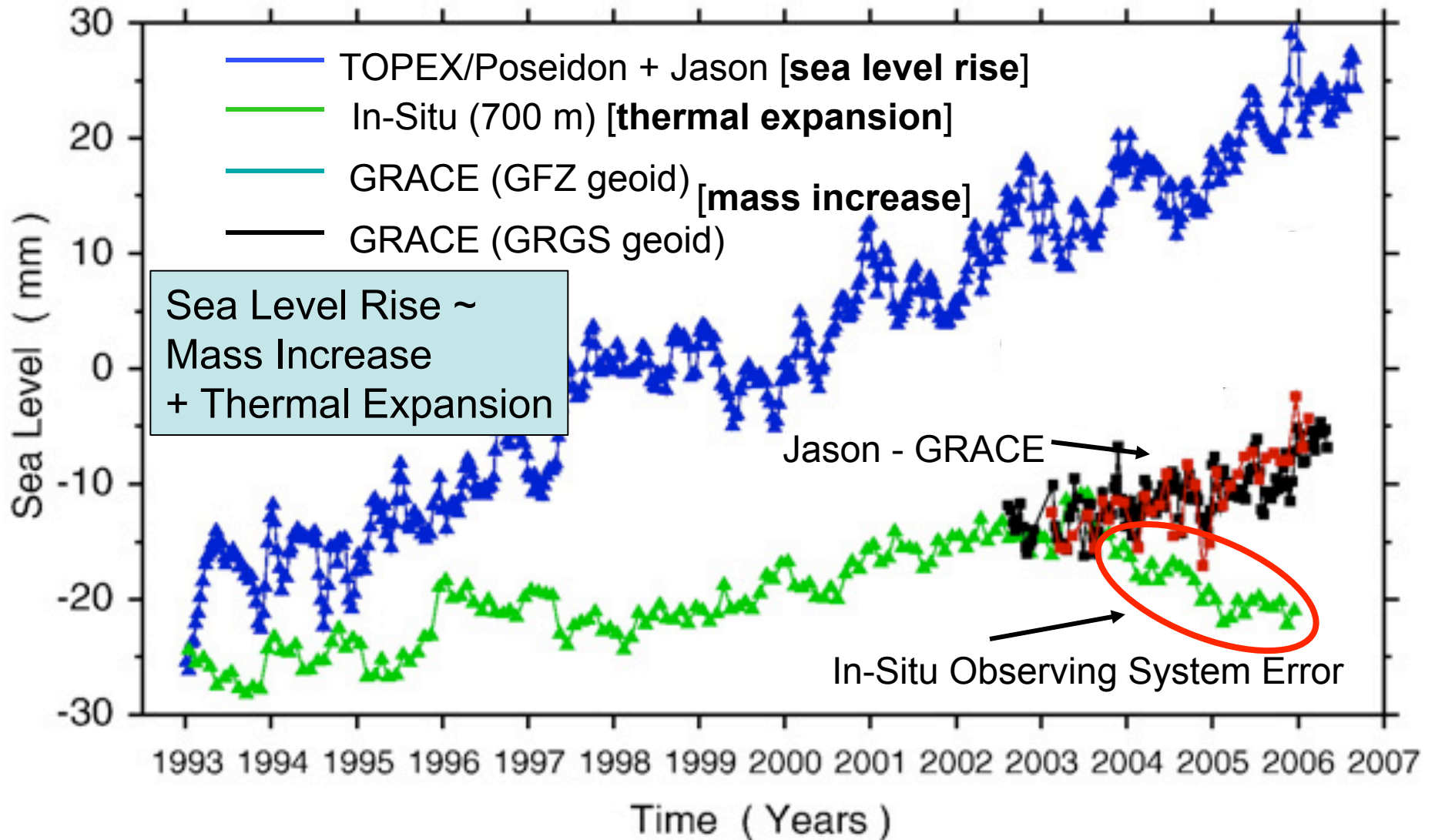


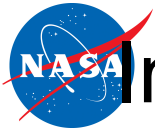
# Successful Example of Integrating Satellite and In-Situ Data: Weather Forecasting



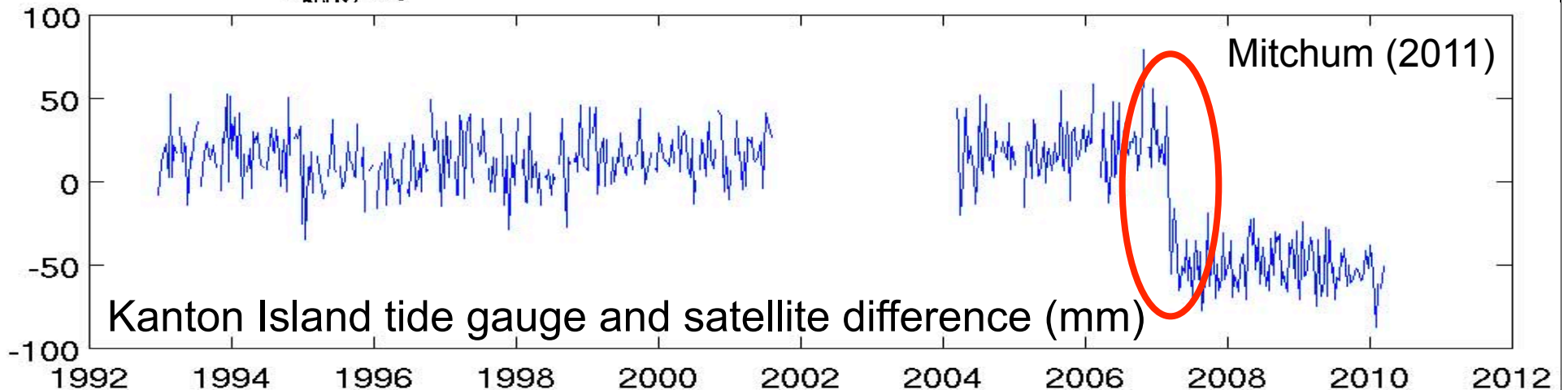
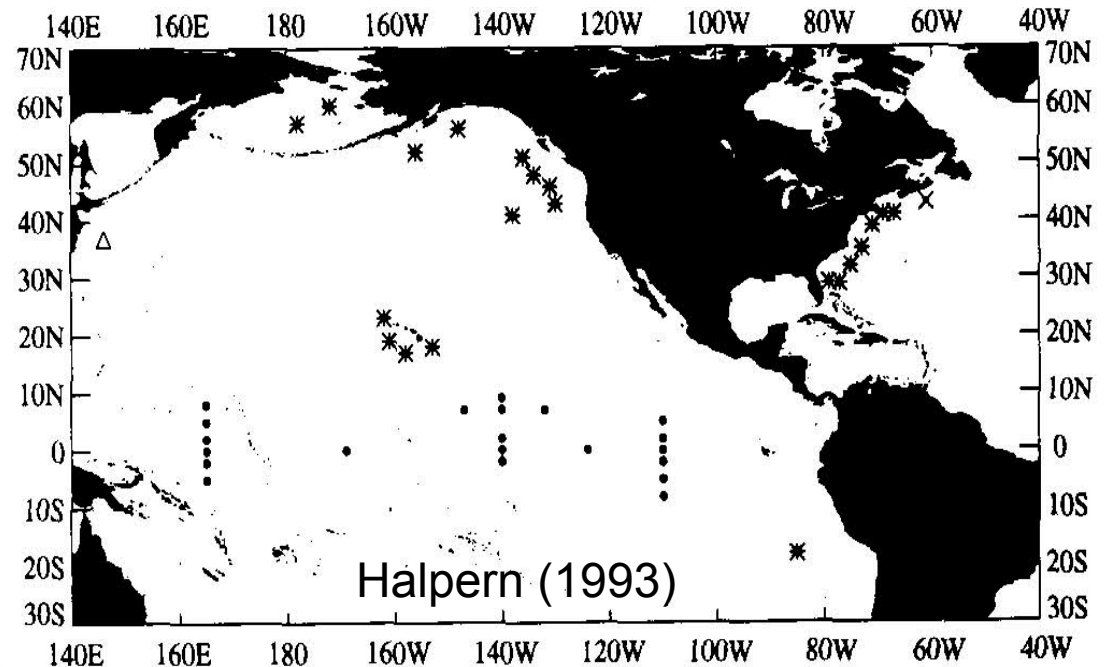
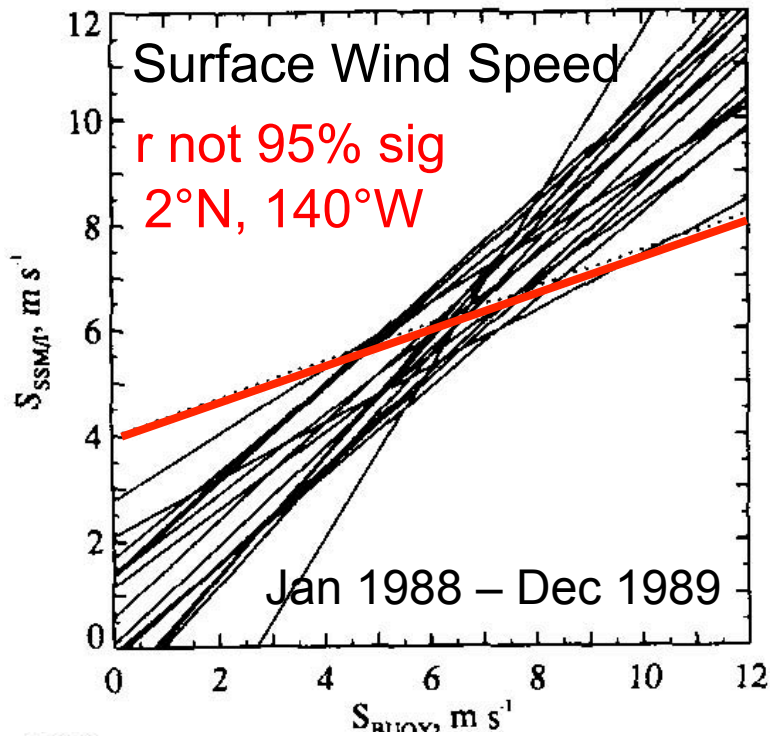


# In-Situ Data Calibration With Satellite Data (1)





# In-Situ Data Calibration With Satellite Data (2)





# Critical Quality FCDR Attributes

- Multiple instruments characterization
- Calibration
- Data processing and product generation
- Interaction with scientific community
- Continuous vigilance
- Expert scientific staff
- Open and transparent data processing information
- International collaborative effort