Center for Satellite Applications and Research (STAR)
Dr. Michael Kalb, Deputy Director

Center for Satellite Applications & Research
Summary of Roles & Responsibilities…

- **Delivers** leadership for NESDIS research, **development, validation and maintenance of satellite derived products and applications** from NOAA's operational geostationary and polar-orbiting satellites and from non-NOAA research and international satellites.

- **Develops** new environmental applications, **techniques and algorithms for transforming raw satellite observations into scientifically meaningful**, quality assured and calibrated **environmental measurements** and products, and develops the pre-operational computer codes to implement them.

- **Supports** the **calibration and validation of all satellite sensors used in NOAA's satellite operations**, and **develops methods and maintains systems for inter-calibrating NOAA satellite data with other satellites** in the international constellation of research and operational satellites.

- **Collaborates** **with other NESDIS and NOAA offices, universities, NASA and other U.S. agencies, and with international organizations** on exchange and evaluation of operational and research satellite data and products.
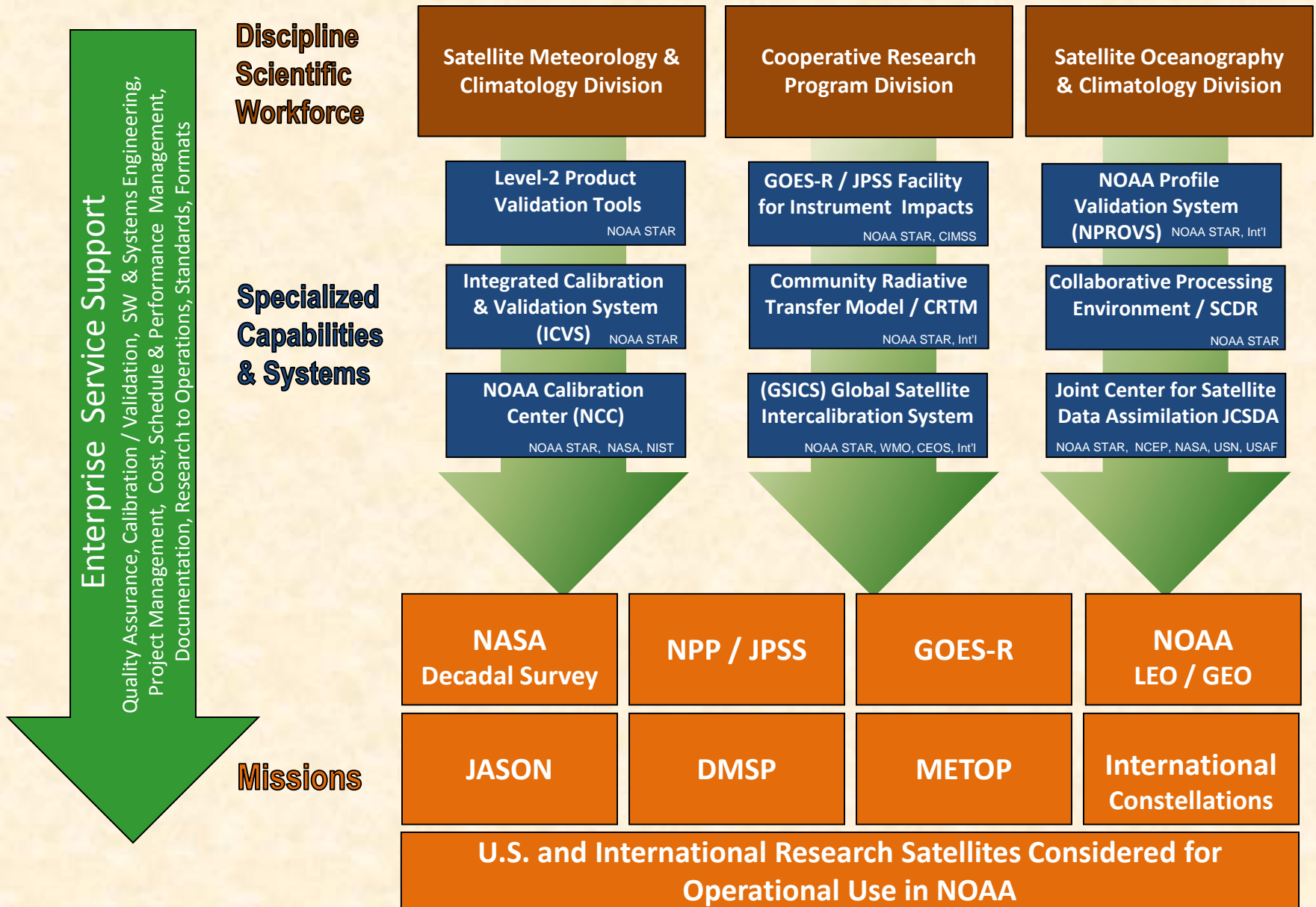
Major STAR Activities

- GOES-R Algorithm Working Group (AWG)

- GOES-R Calibration/Validation Working Group (CWG)

- JPSS Algorithm and Data Products Program, Cal/Val

- Joint Center for Satellite Data Assimilation (JCSDA)

- Community Radiative Transfer Model (CRTM)

- Calibration / Validation (ICVS, NCC, GSICS)

- Laboratory for Satellite Altimetry support to JASON Program

STAR Provides Life Cycle Mission Science Support

Requirements	Instrument Build and Design	Pre-Launch	Post-Launch	Operations and Sustainment
Requirements Definition	Design Requirements	Research to Operations (R2O)	Acceptance Testing	Lifecycle R2O
Product Research, Test, and Evaluation			Science Maintenance	
	Instrument Calibration	Calibration / Validation		
		Instrument and System Checkout		Product Improvements

TIME →

GOES-15
(launched in 2009)

GOES-R
(Launch in 2016 /17)

- 6 channel AVHRR Vis and IR
- 25-minute hemispheric imaging
- Spatial resolution (1, 2 and 4 km)
- HIRS Sounder
- Space Weather Suite
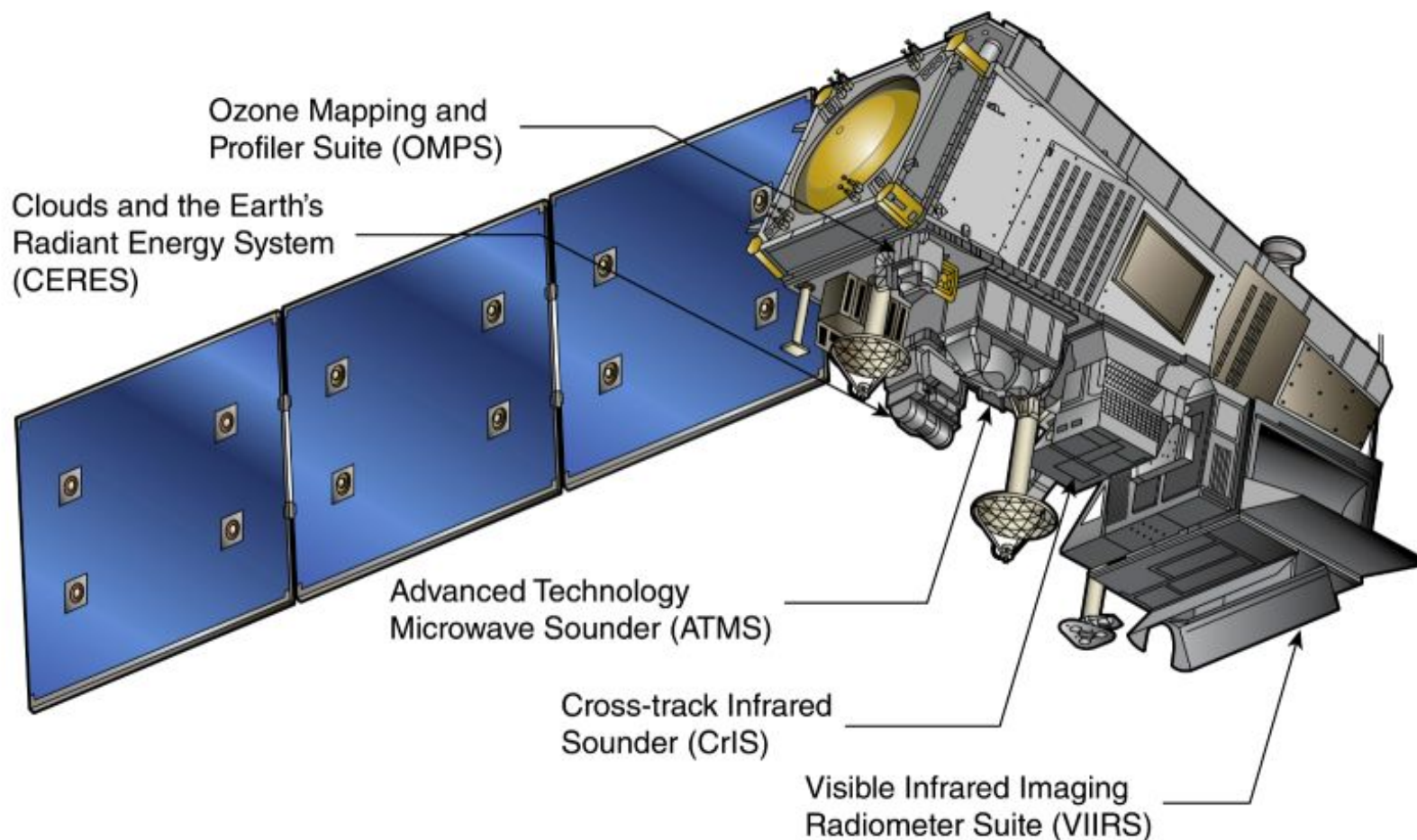
- ABI 16 channel visible and IR
- 10-minute; flexible taskable imaging
- Spatial resolution (½, 1 and 2 km)
- Global Lightning Mapper
- Space Weather Suite

Suomi NPP polar-orbiting satellite Launched 2011
(To be followed by JPSS-1 and JPSS-2)

Ozone Mapping and Profiler Suite (OMPS)

Clouds and the Earth's Radiant Energy System (CERES)

Advanced Technology Microwave Sounder (ATMS)

Cross-track Infrared Sounder (CrIS)

Visible Infrared Imaging Radiometer Suite (VIIRS)

Satellite Strategies in Transition

PRESENT

PAST	FUTURE
Calibrate **individual instruments**	Inter-calibrate **multiple instruments globally**
Develop **algorithms** for GEO & LEO instruments independently	Develop **common algorithms for GEO and LEO instruments**
Develop **individual products**	Develop **product suites and blended products**
Transfer algorithms to **NESDIS/OSPO**	Transfer algorithms to **NESDIS/OSPO & International and non-government partners**
Address **internal NOAA** requirements	Participate in **multiple US and international collaborations**
Study climate using **single instruments**	Study climate using **chains of instrument data**
Assimilate data from **individual satellites**	Assimilate data from **suites of satellites**
Manage projects for **Principal Investigators**	Manage algorithm deliveries to **entire acquisition programs**

Jason Measured Global Mean Sea Level Rise
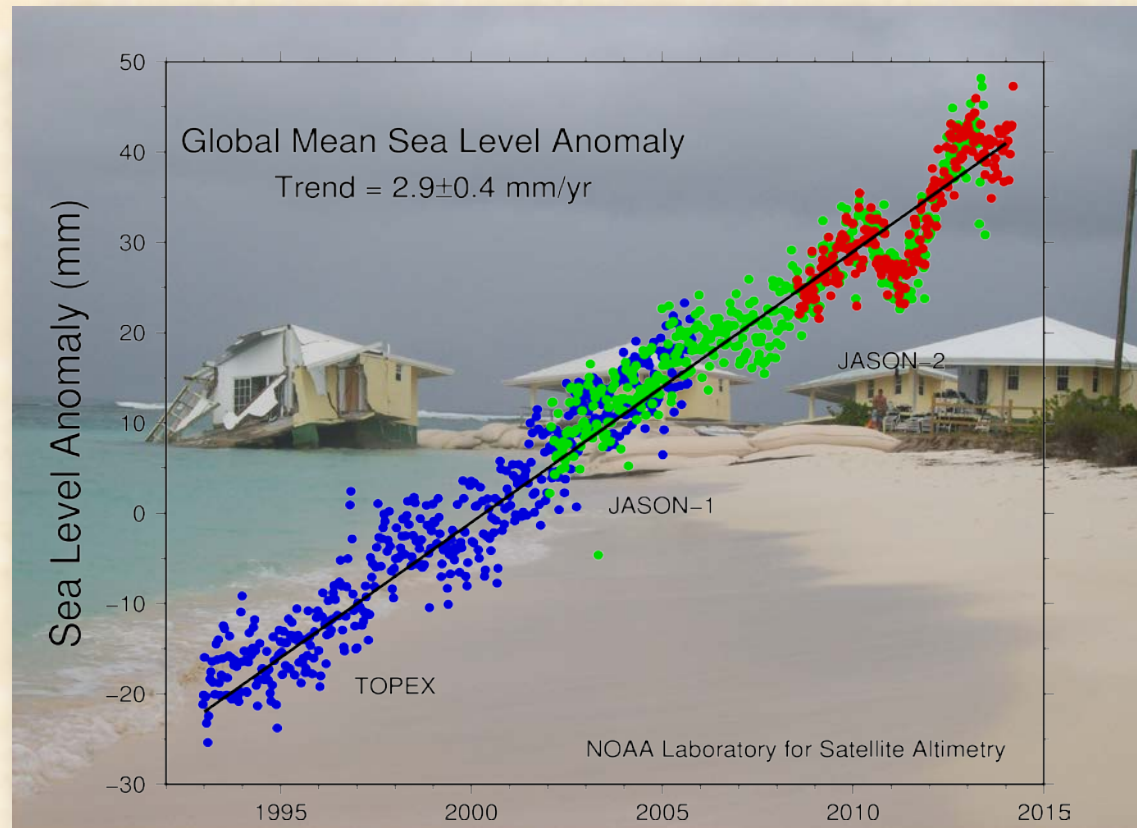
Global Mean Sea Level

22 yr record shows steady sea level rise of about 3 mm/yr, nearly twice as fast as during the last century.

½ due to ocean warming (expansion) & ½ due to ice melt.

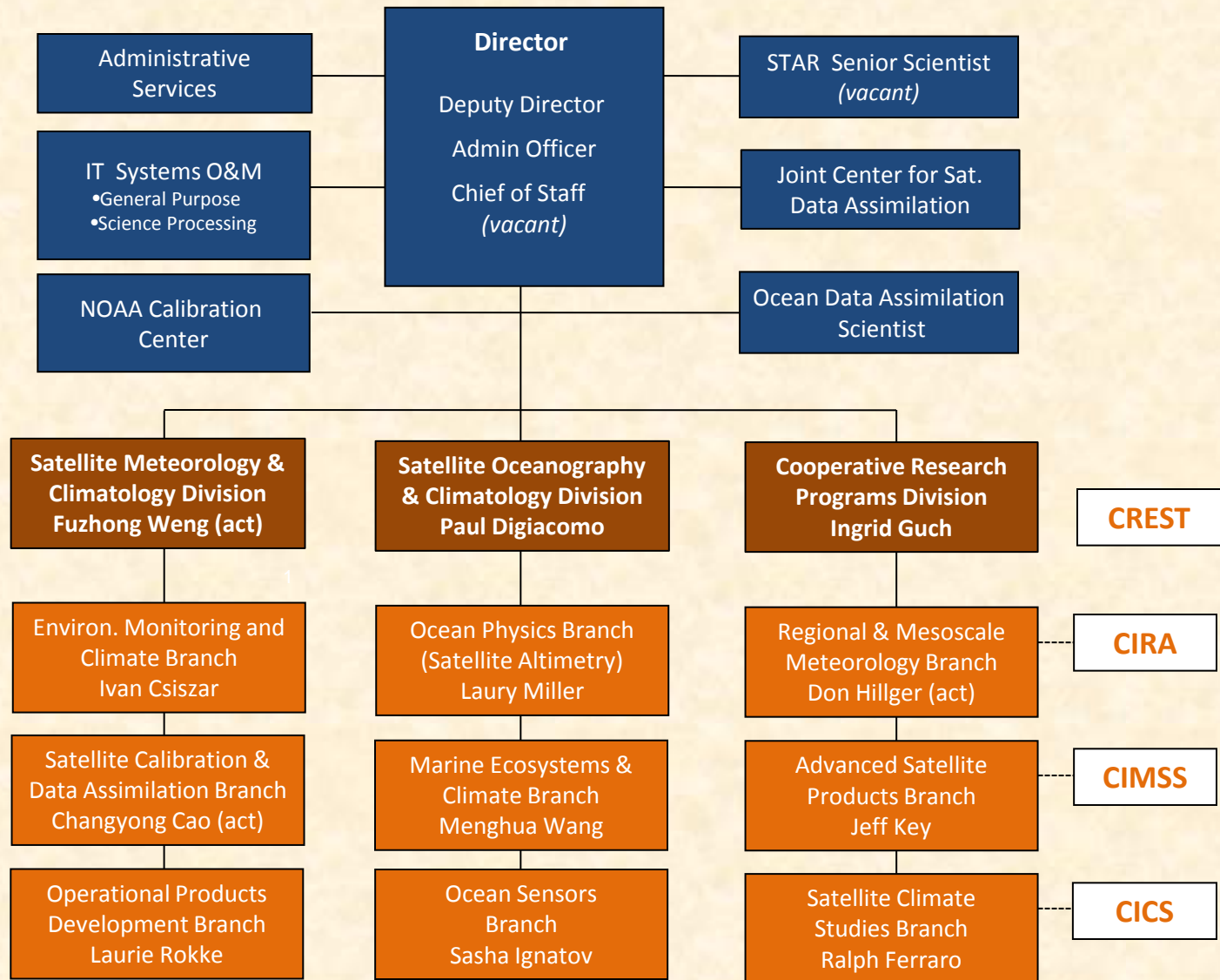Data used to validate model simulations & projections which suggest larger increases by end of 21st century

Global Mean Sea Level Anomaly
Trend = 2.9±0.4 mm/yr

JASON-2

JASON-1

TOPEX

NOAA Laboratory for Satellite Altimetry

Sea Level Anomaly (mm)

BACKUP

Center for Satellite Applications and Research (STAR)

Administrative Services

Director
Deputy Director
Admin Officer
Chief of Staff
(vacant)

STAR Senior Scientist *(vacant)*

IT Systems O&M
•General Purpose
•Science Processing

Joint Center for Sat. Data Assimilation

NOAA Calibration Center

Ocean Data Assimilation Scientist

Satellite Meteorology & Climatology Division
Fuzhong Weng (act)

Satellite Oceanography & Climatology Division
Paul Digiacomo

Cooperative Research Programs Division
Ingrid Guch

CREST

Environ. Monitoring and Climate Branch
Ivan Csiszar

Ocean Physics Branch (Satellite Altimetry)
Laury Miller

Regional & Mesoscale Meteorology Branch
Don Hillger (act)

CIRA

Satellite Calibration & Data Assimilation Branch
Changyong Cao (act)

Marine Ecosystems & Climate Branch
Menghua Wang

Advanced Satellite Products Branch
Jeff Key

CIMSS

Operational Products Development Branch
Laurie Rokke

Ocean Sensors Branch
Sasha Ignatov

Satellite Climate Studies Branch
Ralph Ferraro

CICS

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STAR Science Services

4.0 Science

4.1 Science & Product Systems Development

4.1.1 Scientific algorithm & product systems development

4.1.2 Calibration / validation systems development

4.1.3 Software and Algorithm Integration

4.1.4 Configuration control and change management

4.1.5 Quality Assurance

4.2 Science and Product Services

4.2.1 Requirements development and analysis

4.2.2 Scientific algorithm & applications research, prototype development, testing, and validation

4.2.3 Risk Reduction & Proving Grounds

4.2.4 User Readiness

4.2.5 Product Improvement

4.3 Instrument & Product Calibration /Validation

4.3.1 Development, coordination and execution of instrument and product Calibration / Validation techniques, technologies and activities;

4.3.2 Interagency and international cal / val program coordination activities

4.3.3 Cal/Val campaigns

4.4 Science Project & Program Management

4.4.1 Program and Project level mission science leadership and coordination

4.4.2 Science Team Management & Support

4.4.3 Organization and coordination of internal and / or external science community working groups, review boards, and advisory services

4.5 Post Launch Science Maintenance

4.5.1 Science algorithm and instrument performance monitoring

4.5.2 Satellite / instrument performance issues mitigation services

4.5.3 Calibration updates and algorithm changes necessary to ensure product quality or correct for unanticipated anomalies or artifacts

4.6 Long Term Monitoring

4.6.1 Product Monitoring and long term error assessment

4.6.2 Reprocessing of long term data to ensure highest quality

Joint Center for Satellite Data Assimilation

The JCSDA was established in 2001 to improve and accelerate the use of research and operational satellite data in numerical weather, ocean, and climate analysis and prediction.
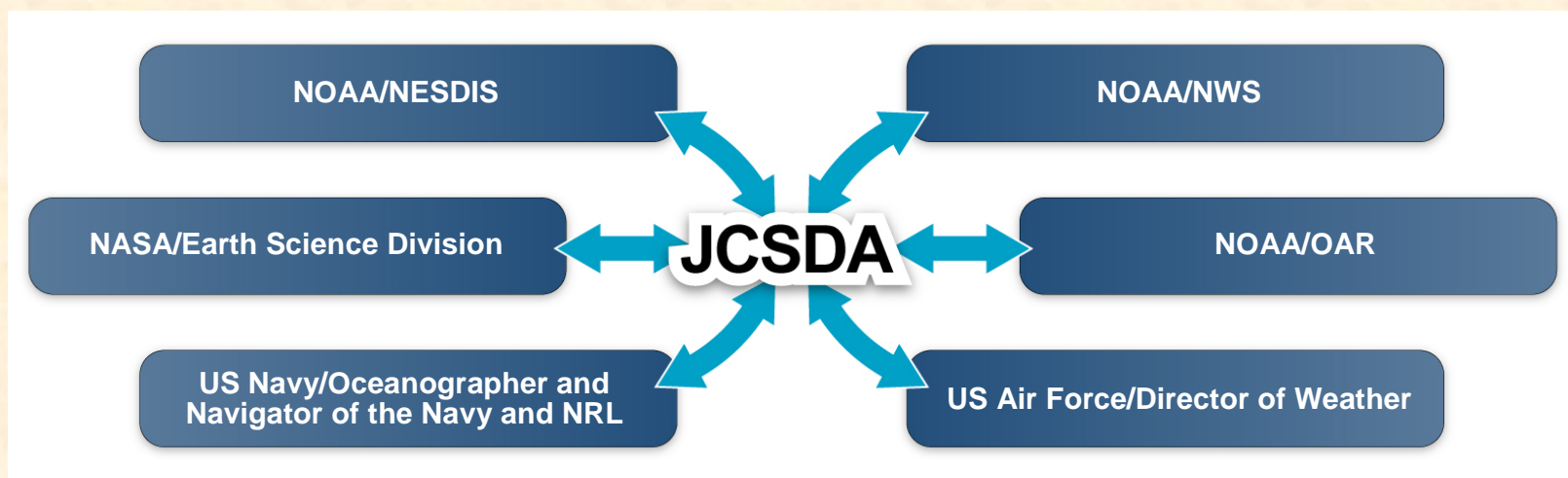
The goal of the JCSDA is to contribute to making the forecast skill of the operational NWP systems of the JCSDA partners internationally competitive by assimilating the largest possible number of satellite observations in the most effective way
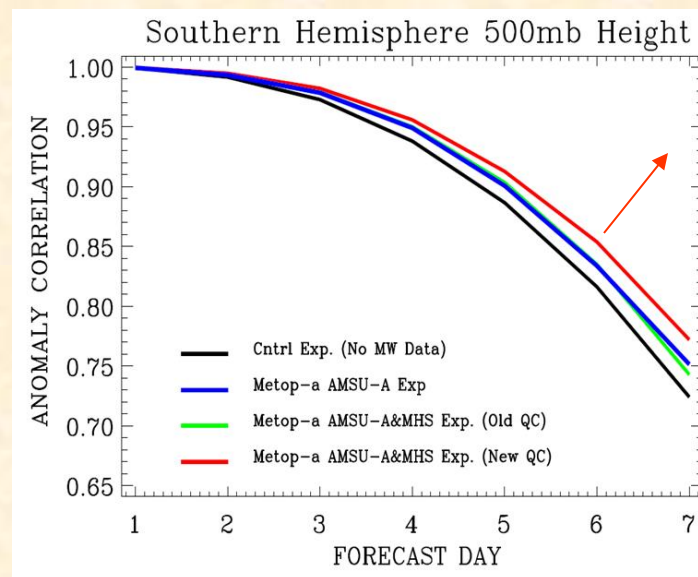
Community Radiative Transfer Model and Surface Emissivity modeling

Data assimilation of new sensors (AIRS, IASI, SSMIS, COSMIC)

Implementation of Cloudy Radiance assimilation

Data Impact Experiments: Observing System Simulation Experiments (OSSEs)

Improvement in the assimilation of existing sensors (new QC approach for Metop-A and POES data assimilation)

Southern Hemisphere 500mb Height

Cntrl Exp. (No MW Data)
Metop-a AMSU-A Exp
Metop-a AMSU-A&MHS Exp. (Old QC)
Metop-a AMSU-A&MHS Exp. (New QC)

Example showing the positive impact of Metop-A on global forecast skill

How Radar Altimeter Works
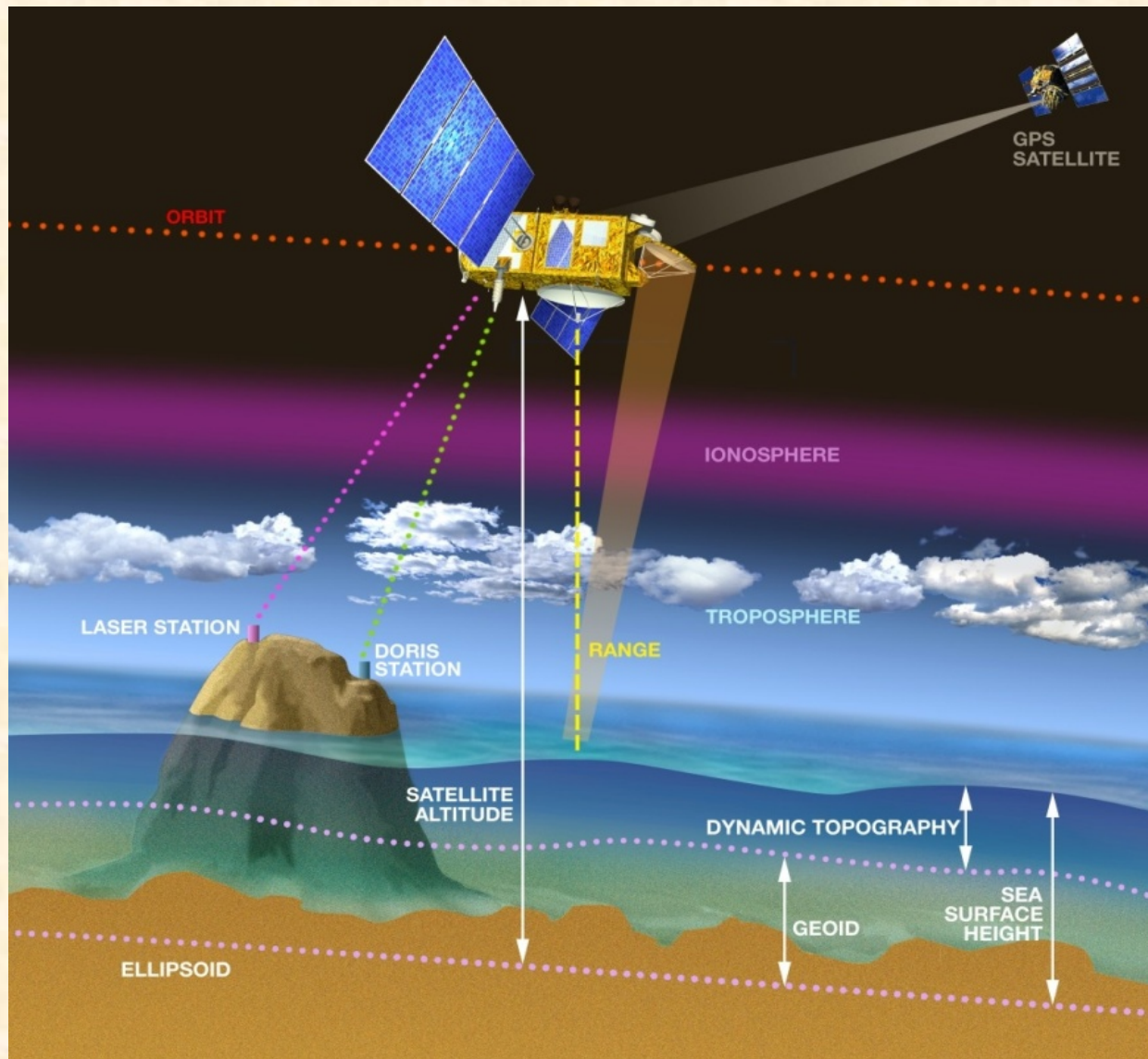
Sea Surface Height
=

Satellite Altitude (measured by GPS)
–

Satellite Range to Surface (measured by radar)