



NESDIS Center for Satellite Applications & Research

Present and Future Value

Mike Kalb, Acting Director

JPSS 2nd Annual Science Meeting
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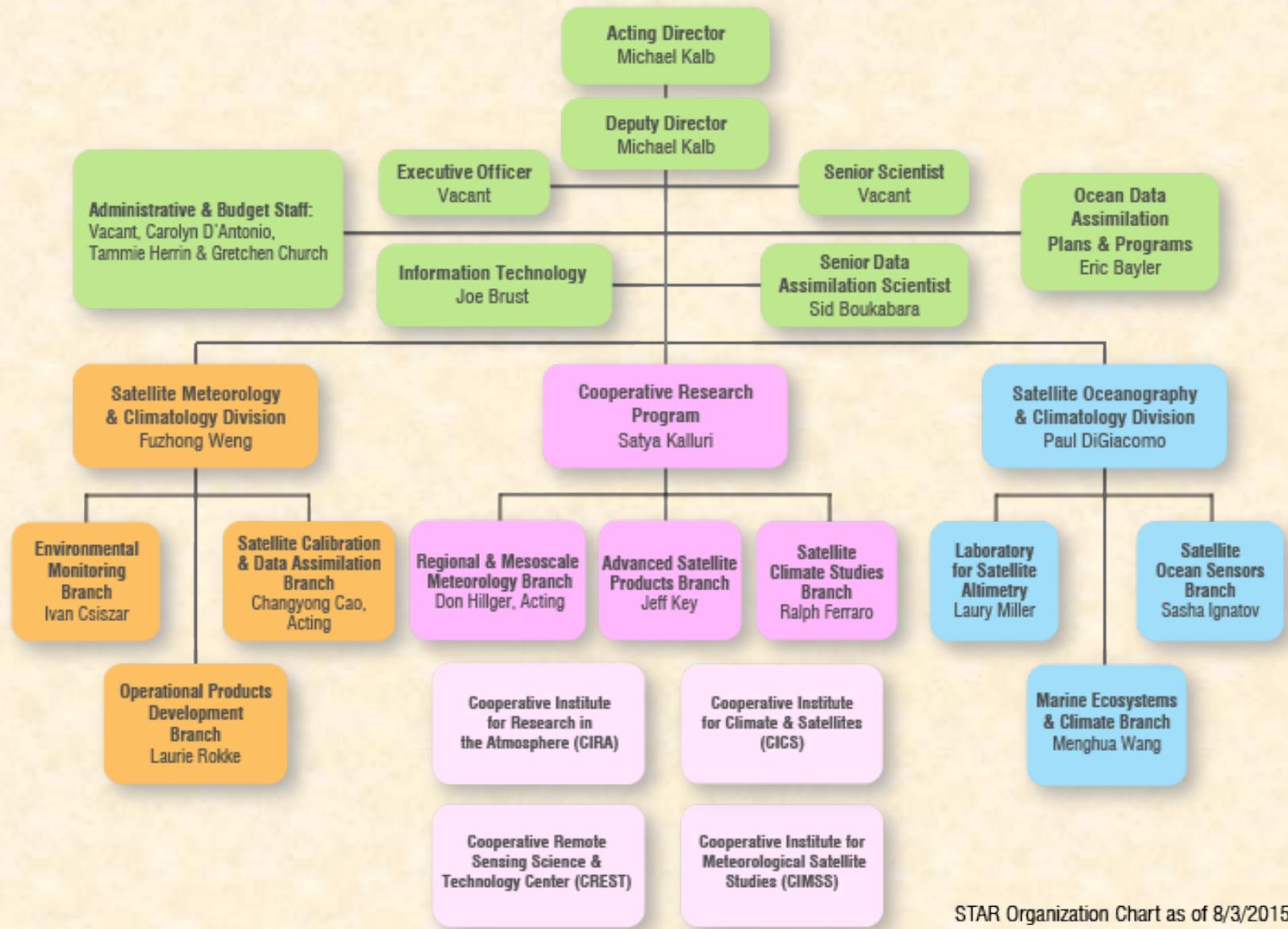


Center for Satellite Applications & Research

- *STAR provides NOAA-relevant applied research, development, and science services to accelerate the transition and transformation of raw satellite observations into operational information products that support environmental assessments and predictions by NOAA land, atmosphere and ocean user communities.*
 - Leads 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, develops methods and maintains systems for inter-calibrating NOAA satellite data with other agency and international satellites constellations.
 - Works 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;
 - Interfaces with NESDIS and NOAA operational organizations to improve the use of satellite data in operations, accelerating the transfer of new techniques and new satellite data sources (domestic or foreign) into NOAA operations to improve environmental prediction.



STAR Organization





Major STAR Mission Commitments

- **JPSS Algorithm and Data Products, Cal/Val**
- **GOES-R** Algorithm Working Group (AWG)
- **GOES-R** Calibration/Validation Working Group (CWG)
- Joint Center for Satellite Data Assimilation (**JCSDA**)
- Community Radiative Transfer Model (**CRTM**)
- Calibration / Validation (ICVS, NCC, WMO/**GSICS**)
- Satellite Altimetry support to **JASON**-x series



The Mission Side - STAR Science Services



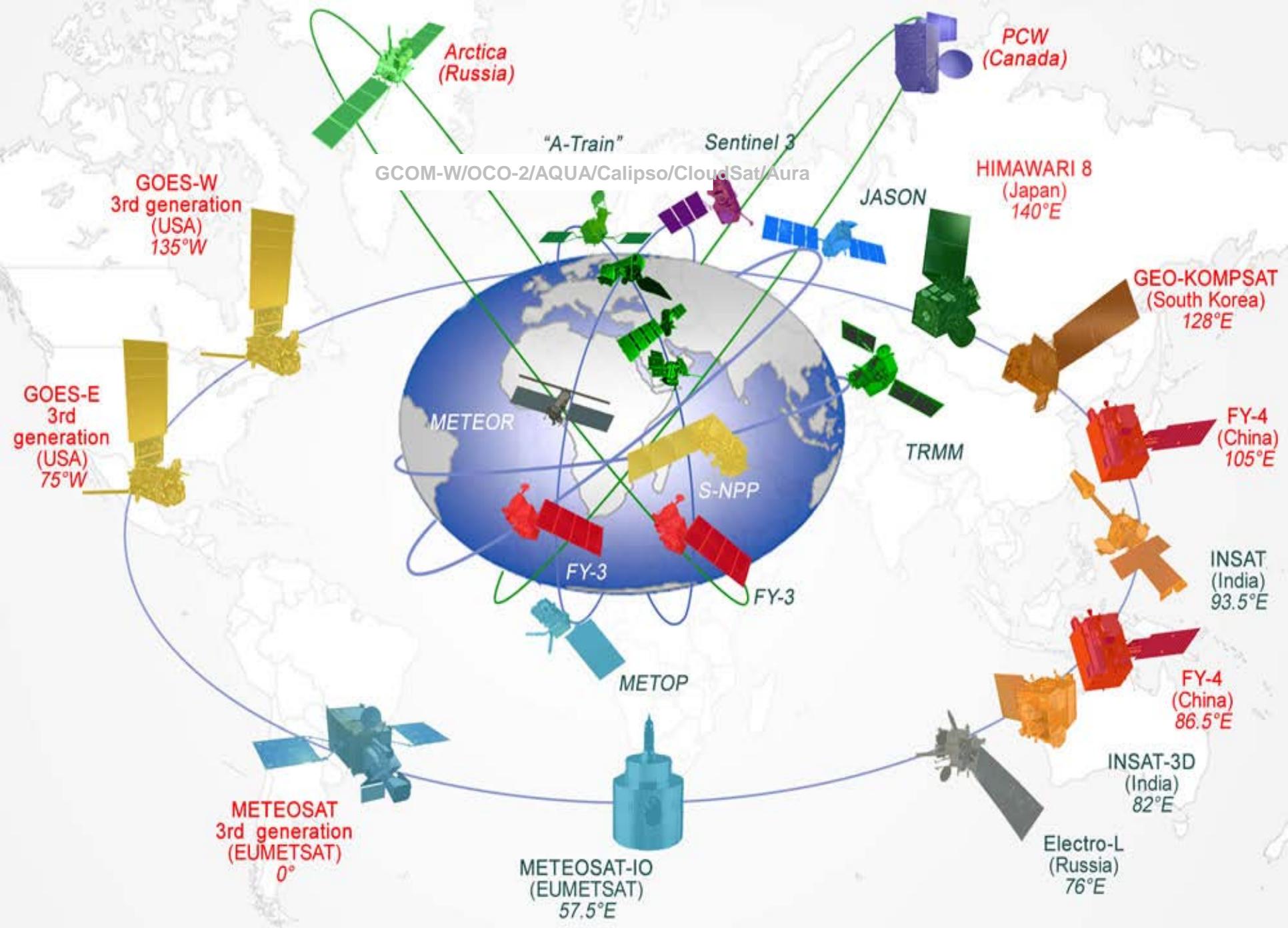
4.1	Science & Product Systems Development	4.3	Instrument & Product Calibration /Validation
4.1.1	Scientific algorithm & product systems development	4.3.1	Development, coordination and execution of instrument and product Cal/Validation techniques, technologies & activities;
4.1.2	Calibration / validation systems development	4.3.2	Interagency and international cal / val program coordination
4.1.3	Software and Algorithm Integration	4.3.3	Cal/Val campaigns
4.1.4	Configuration control and change management	4.4	Science Project & Program Management
4.1.5	Quality Assurance	4.4.1	Program and Project level mission science leadership and coordination
		4.4.2	Science Team Management & Support
4.2	Science & Product Services	4.4.3	Organization and coordination of internal and / or external science working groups, review boards, & advisory services
4.2.1	Requirements development and analysis	4.5	Post Launch Science Maintenance
4.2.2	Scientific algorithm & applications research, prototype development, testing, and validation	4.5.1	Science algorithm and instrument performance monitoring
4.2.3	Risk Reduction & Proving Grounds	4.5.2	Satellite / instrument performance issues mitigation services
4.2.4	User Readiness	4.5.3	Calibration updates and algorithm changes needed to ensure product quality or correct for anomalies or artifacts
4.2.5	Product Improvement	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



STAR Provides Mission Life-Cycle 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







Satellite Strategies in Transition

PRESENT



PAST	FUTURE
Calibrate individual instruments	Inter-calibrate multiple instruments globally
Develop independent LEO & GEO Algorithms	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 & non-gov't partners
Address internal NOAA requirements	Participate in multiple US and international collaborations
Study climate using single instruments	Study climate using overlapping 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



Strategic Mission R&D Priorities

Bridging Present and Future



Development of technical methods among NOAA, allied agencies and communities of practice to ensure **traceable calibration and inter-calibration process standards among remote observing sensors, platforms and systems** necessary for NOAA to maintain long term consistency among remote sensing satellite and in situ observations and for **establishing and validating continuous, reliable and well-characterized global and regional Environmental Data Records across current, past and future generations of observing systems.**

Development of NOAA enterprise technical means for **leveraging non-NOAA domestic, and international satellite observations and capabilities** into service to NOAA's global and regional observing missions and operational decision support needs.

Integrated Observing Systems and Data Fusion – Development of internally consistent multi-variate, and multi-scale 4D environmental state descriptions (initially atmospheric and surface state variables) to provide improved situational awareness for forecasting and other decision support, **based on adaptation of advanced dynamical-mathematical optimization methods employed in NOAA's hydrodynamical prediction model data assimilation.**

Development of **physically consistent satellite data products across orbits and sensors (e.g. "blended" GEO & LEO) enabled by adoption of universal standard channel selections, further enabling use of common scientific retrieval algorithms** that can be implemented more effectively within a single enterprise development, testing and processing framework **built on consistent physics, radiative transfer, and analysis utilities, and accelerated with consistent repeatable business processes.**



Organizational Perspectives

Requirements

vs.

Needs (L0)

Present Value

Future Value

- Defined by Boundaries
- Inward Focus by Design
- Self Contained / Constrained
- Motivated by Fear of Failure
but often perceived as Fear of Success
- Projects

- Broader Mission Context
- Externally Engaged
- Collaborative
- Motivated by Possibility
- Programs

Ultimately, Needs have to Drive Requirements, or Organizations Struggle



Limitations as Excuses

If (lower Level) Requirements drive (higher level) Needs:

- Limitations Lead

When Limitations Lead, it is easier to:

- Defer Leadership
- Stop Investing and Innovating
- Stop Pursuing Excellence

Who Knows Why?



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Why? It's not in the requirements



Balancing Past, Present and Future Making the Future

- Challenge recognizing and transitioning significant technical capabilities that may not meet official "requirements", but none-the-less constitute important future strategic "needs", and leveraging of investments made by NOAA and external partners.
- It is a discussion about *achieving excellence* and full value of the nation's investment in NOAA; long term / short term.
- It is about a *forward looking culture ... advanced skills and concepts*
- It is about creating *future value and a future*
- It motivates !



Backup



Excellence



Pursuit of Excellence

- I. How does NOAA measure Excellence?
- II. We are Excellent when others say we are excellent, not when we say.

Innovation Investment (*Assuring continuity of NOAA Excellence and Leadership*)

- i. What we investment in communicates direction, Identity and brand
- ii. Strategic IRD Equivalent
- iii. Leverage Innovation Potential of Cooperative Institutes
- iv. High TRL, Strategic Importance, Maximum Leveraging of Investment,



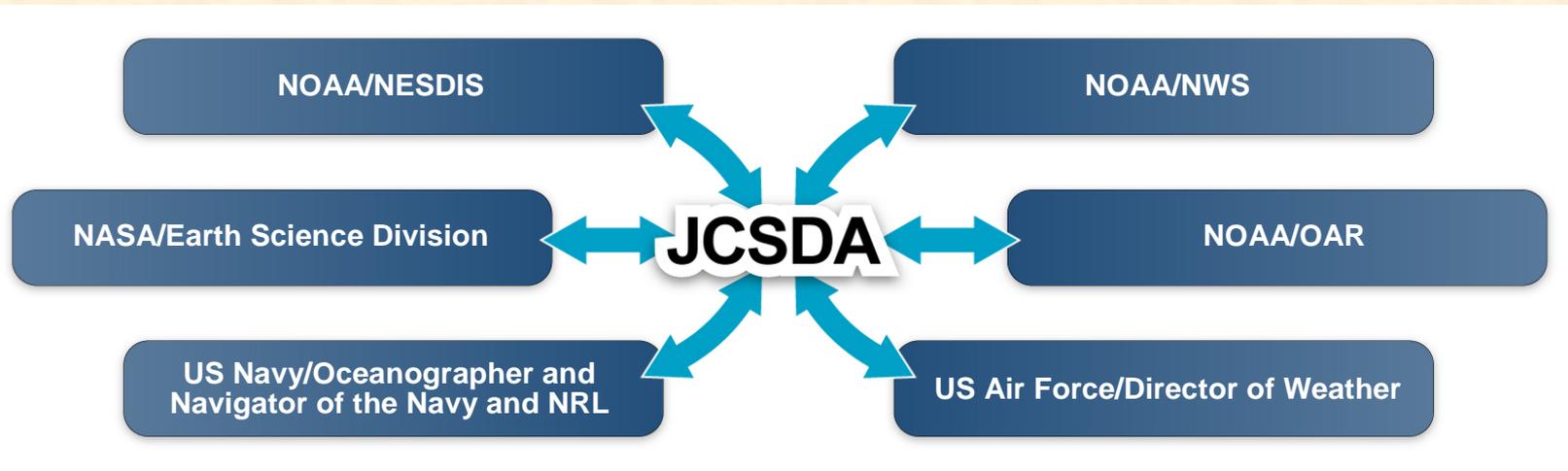
Succession Investments

- Radiative Transfer
- Ocean Science Modeling
- Data Assimilation
- Science Data Systems
- Instrument Science & Engineering
- Science Liaison



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.



A major focus 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



STAR's Contributions to the JCSDA

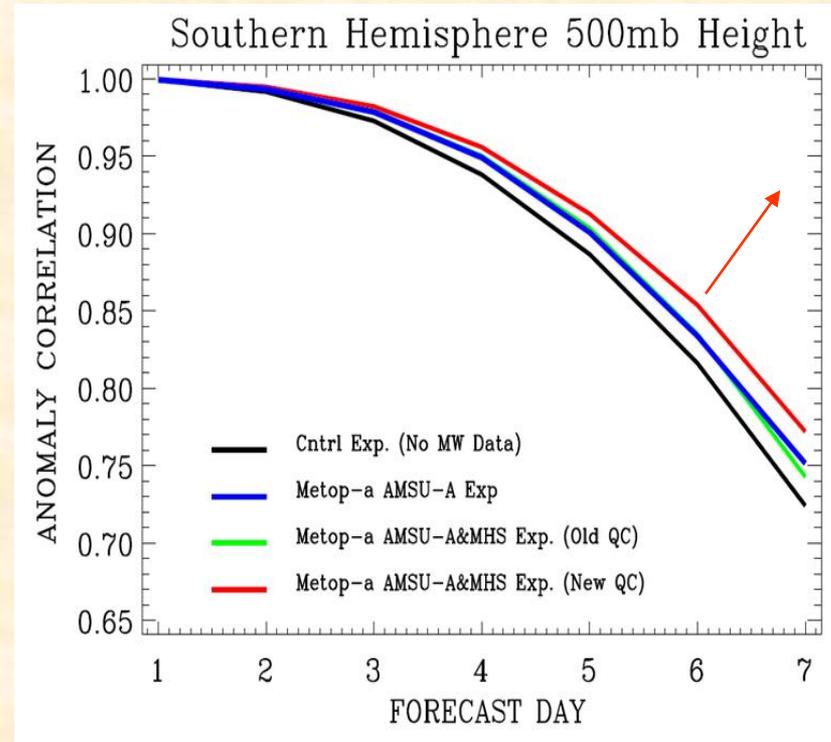
Community Radiative Transfer Model and Surface Emissivity modeling

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

Implementation of Cloudy Radiance assimilation

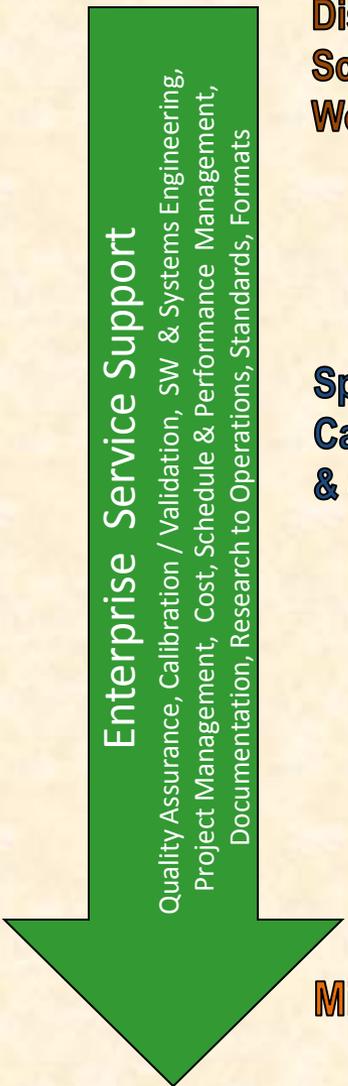
Data Impact Experiments: Observing System Simulation Experiments (OSEs, OSSE's)

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



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

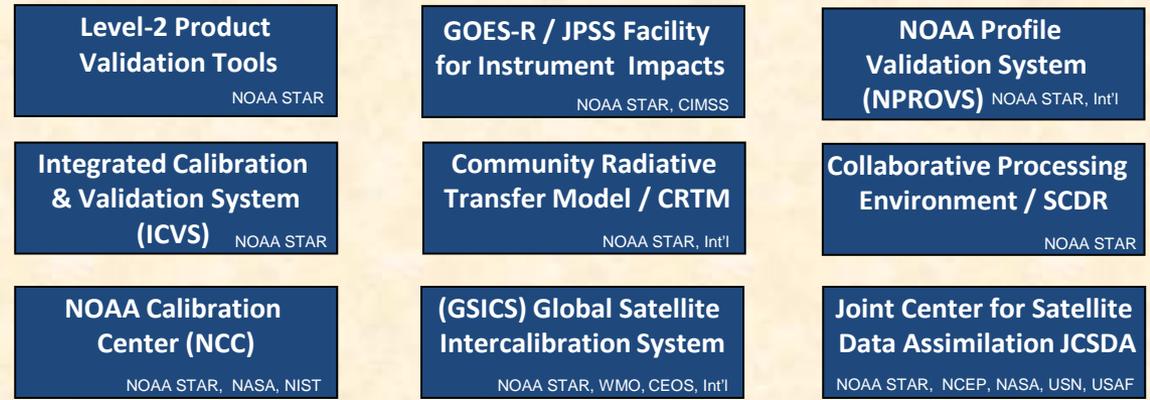
Center for Satellite Applications and Research (STAR)



Discipline Scientific Workforce



Specialized Capabilities & Systems



Missions

