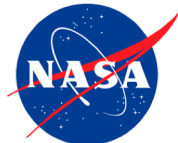


Welcome!



- Welcome to all participants (137 registrations, 36 presentations, 22 posters)
- Thanks to NASA for hosting
- Logistical aspects
- Meeting agenda and presentations on www.jcsda.org

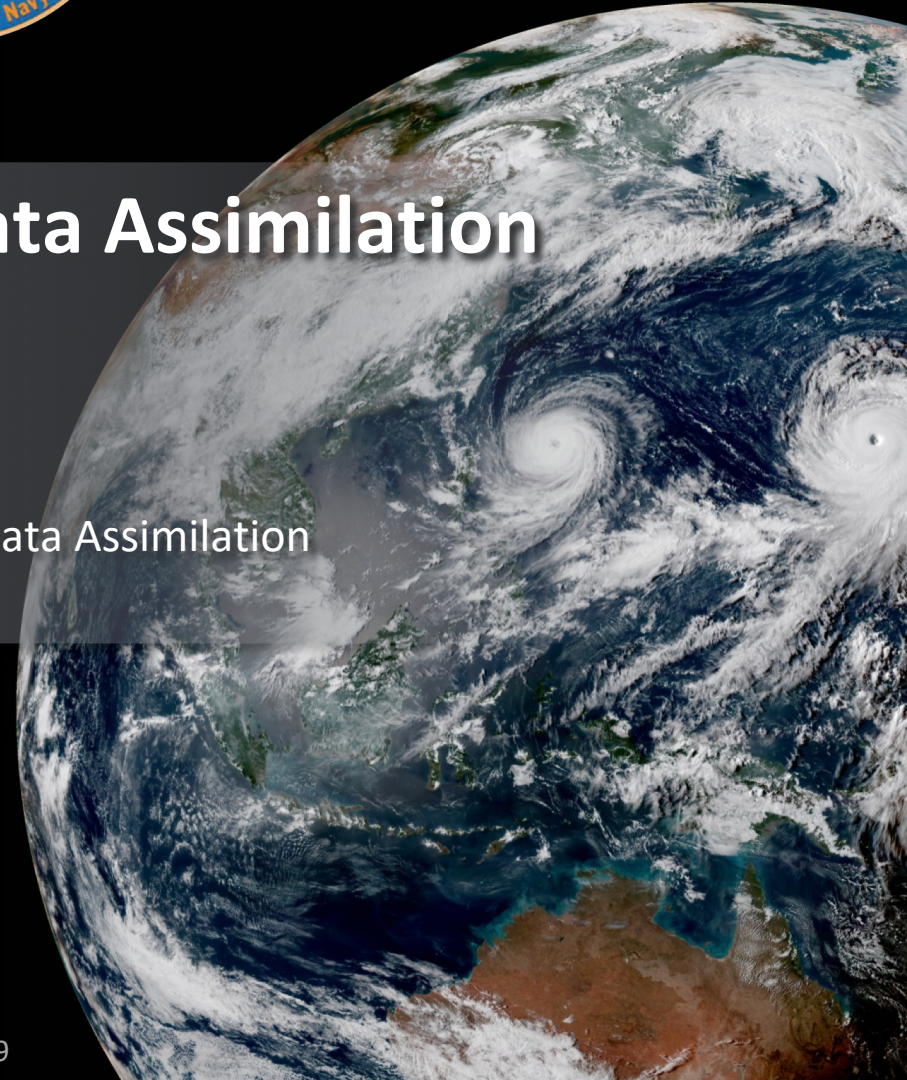




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Joint Center for Satellite Data Assimilation

Tom Auligné, Director, Joint Center for Satellite Data Assimilation



JCSDA Operations in 2019

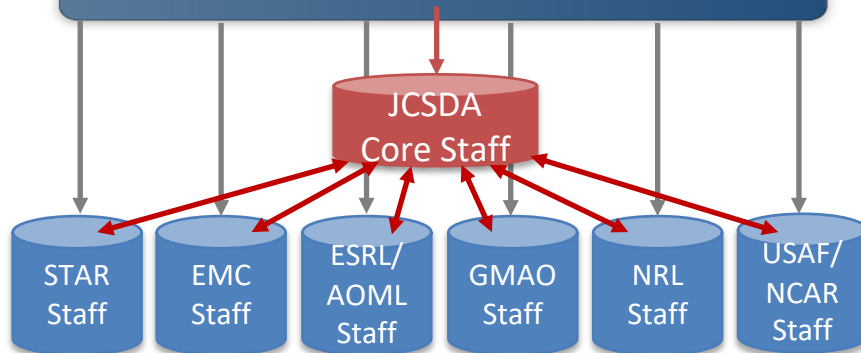


Agency Executives
NASA, NOAA, Departments of the Navy and Air Force

Management Oversight Board
NASA/GSFC/Earth Sciences Division (Pawson, Chair)
NOAA / NWS / NCEP (Gross)
NOAA / NESDIS / STAR (Cikanek)
NOAA / OAR / ESRL (Mahoney)
Dept. of the Navy / N84 and NRL (McCarren and Hansen)
Dept. of the Air Force / Air Force Weather (Farrar)

Science Advisory Committee →

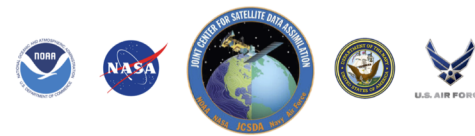
Executive Team
Director (Auligné) *
Associate Directors and CAO
(Gelaro, Kleist, Garrett, Benjamin, Yoe, Baker, McMillen)



Joint Center for Satellite Data Assimilation
Operating Plan 2019

110 staff (54 FTEs)

- **In-kind: 19 FTEs**
- **Core (UCP): 35 FTEs**



24 New Hires Last Year



- DOF** Sandra Claar, Kat Shanahan, Phil Gibbs
- CRTM** Patrick Stegmann, Jim Rosinski
- SOCA** Travis Sluka, Hamideh Ebrahimi
- JEDI** Xin Zhang, Anna Shlyaeva, Mark Miesch, Steve Herbener, Dan Holdaway, Maryam Abdioskouei, Benjamin Menetrier, Clementine Gas, Mark Olah. EMC Liaison PSI, ESRL Liaison PSI (offers accepted)
- NIO** UFO ASIII, Radiance PSII, GIIRS PSI (offers accepted)
- IOS** Hailing Zhang, David Hahn. FSOI PSI (offer accepted)

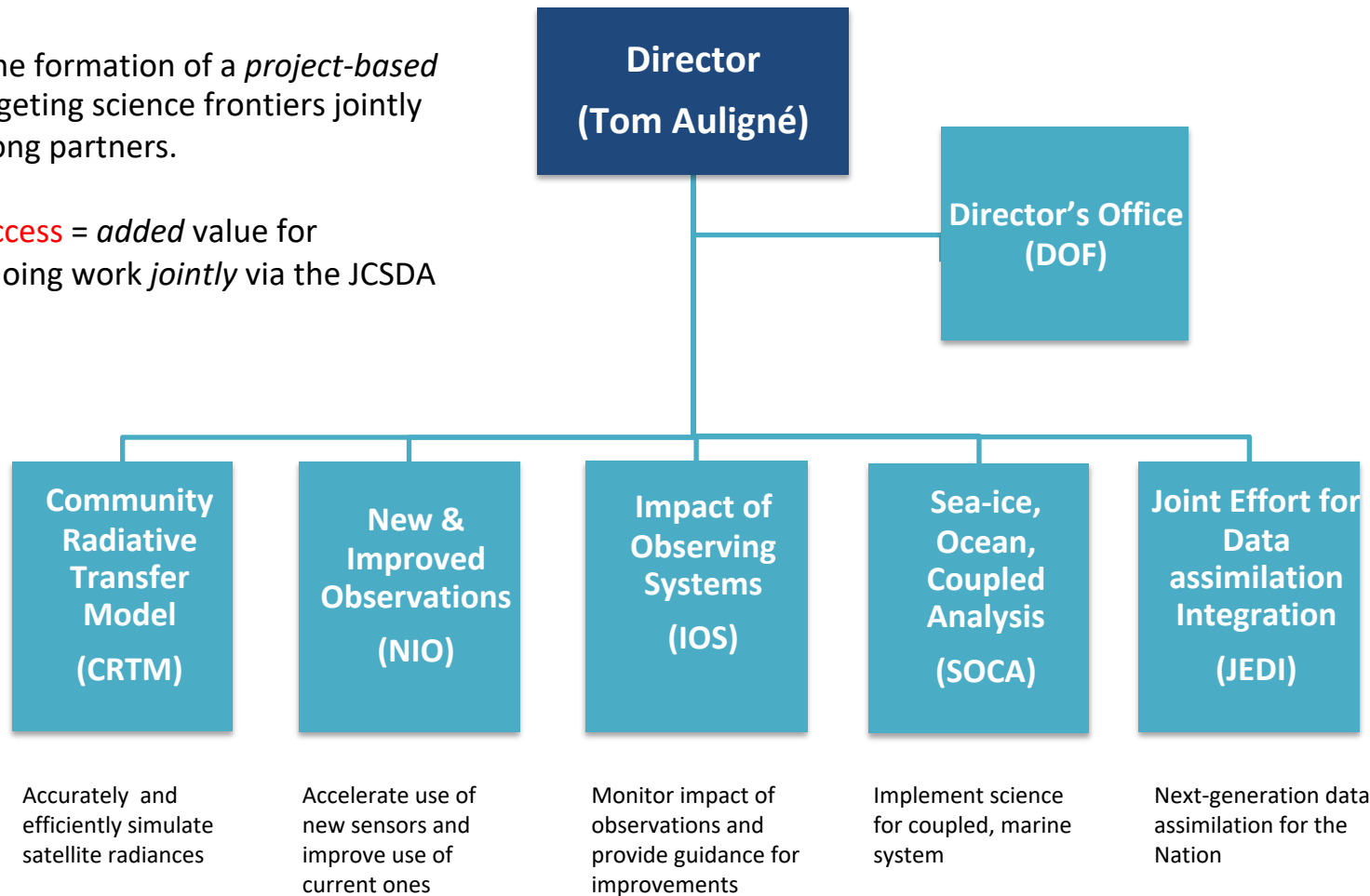
JCSDA Project Structure



Scope of activities of JCSDA: Collaborative, inter-dependent activities inside AOP

Approach: The formation of a *project-based structure* targeting science frontiers jointly pursued among partners.

Metric of success = *added* value for Partners of doing work *jointly* via the JCSDA



JCSDA is about R2O and O2R

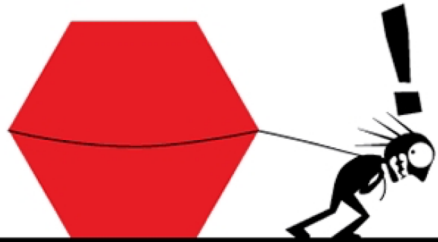


- **FY20 President's Budget:** "NOAA saves lives and property through accurate weather forecasts. The greatest opportunity for improving these forecasts is in the transition of research findings into the operational forecast."
- Conduct state-of-the-art scientific research standing on the shoulders of 'operational' infrastructure



PROCESSES: Evolve from Waterfall to Agile

THE WATERFALL PROCESS



*'This project has got so big,
I'm not sure I'll be able to deliver it!'*

THE AGILE PROCESS



*'It's so much better delivering this
project in bite-sized sections'*

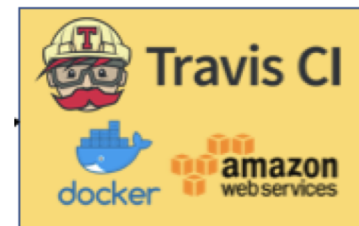
Agile Code Management and CI/CD



- JCSDA is committed to delivering open-source software to the community
- Easy access to up-to-date source code
- Issue tracking inspired by Agile/SCRUM
- Collaborative peer reviews (developers become testers)
- Toolbox for writing and running tests, automated enforcement of coding norms
- Portability on several compilers and platforms (incl. containers, Cloud HPC)
- Dynamic documentation

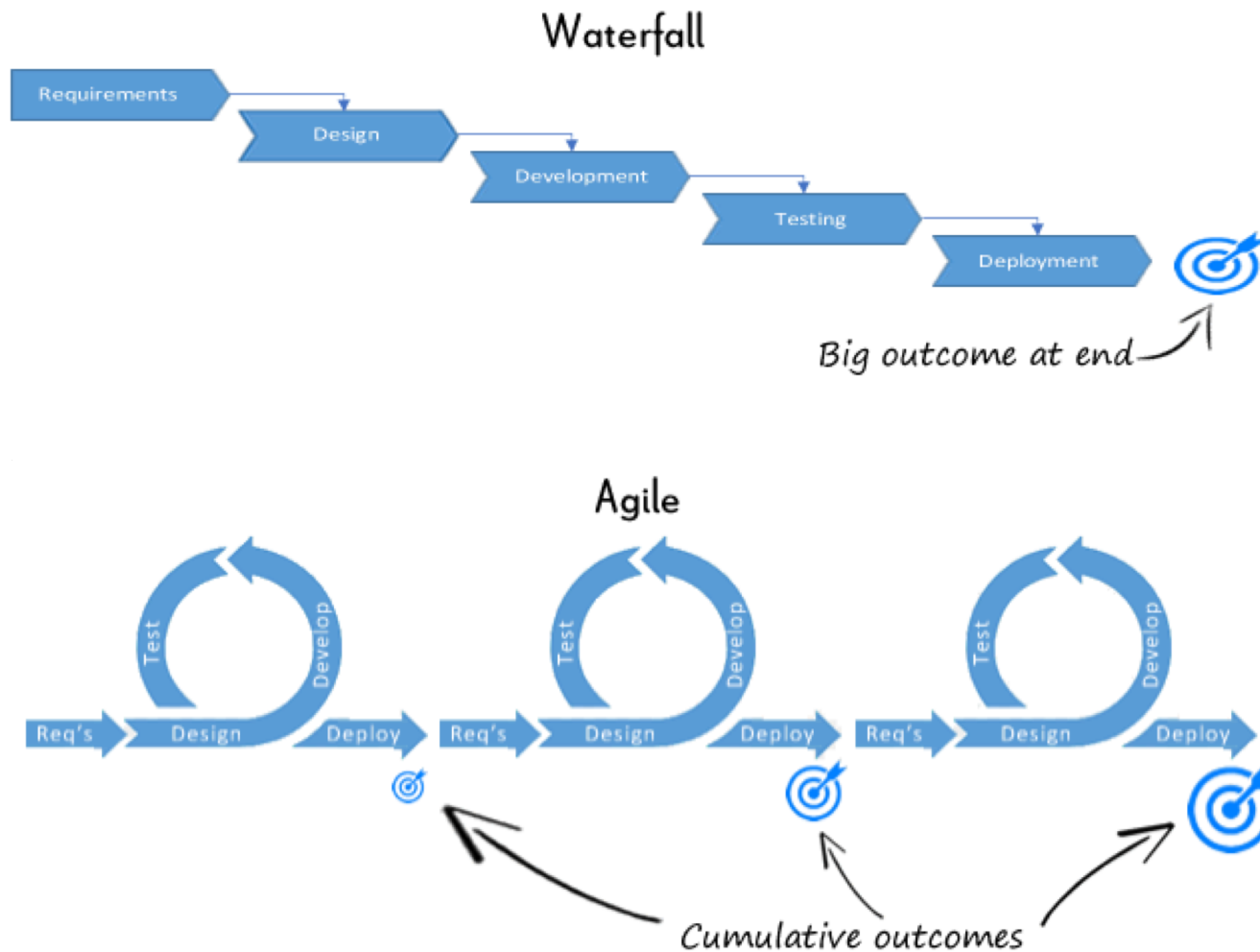


ZenHub



CI/CD server
runs tests

From Waterfall to Agile



Requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customers.

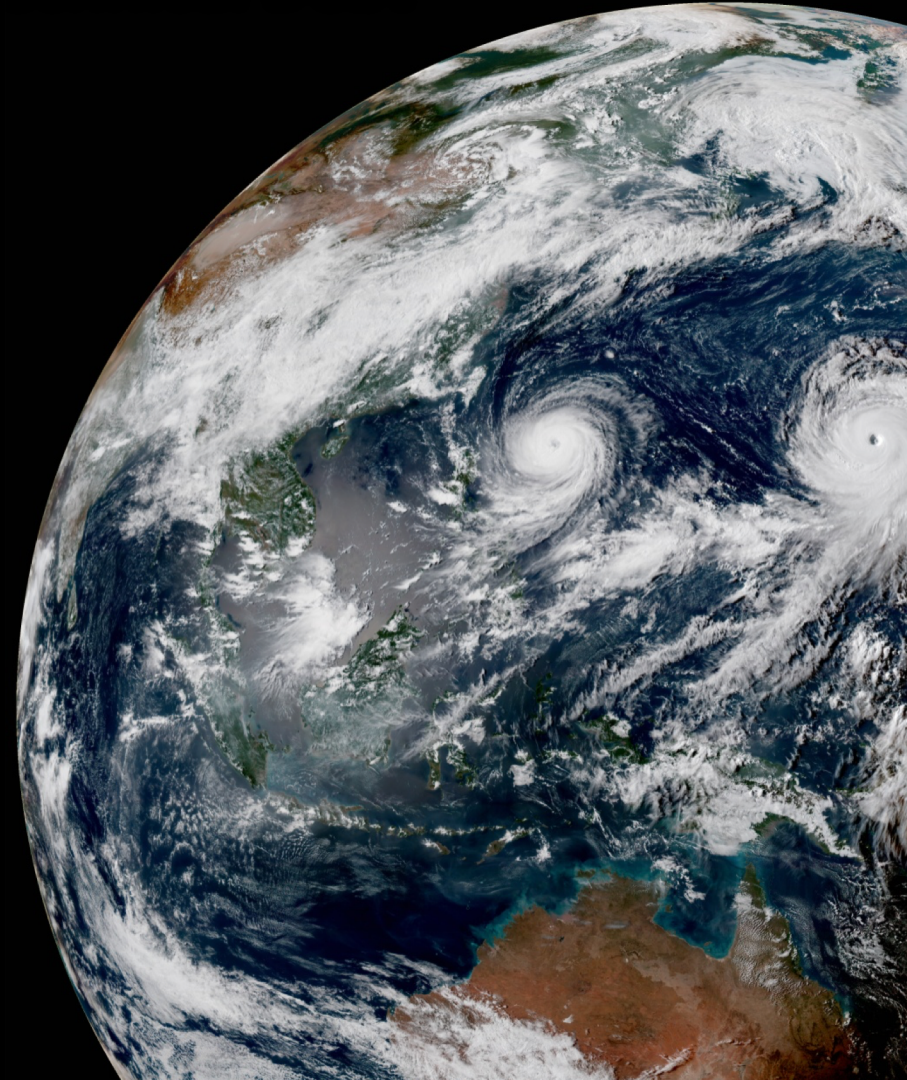
PROCESSES: Evolve from Waterfall to Agile

SOFTWARE: Overcome the Technical Debt



“Software is like entropy. It is difficult to grasp, weighs nothing, and obeys the second law of thermodynamics; i.e. it always increases”.

N. R. Augustine



From Generic to Specific



Game Changers

CRTM Mutualized software to efficiently simulate radiances

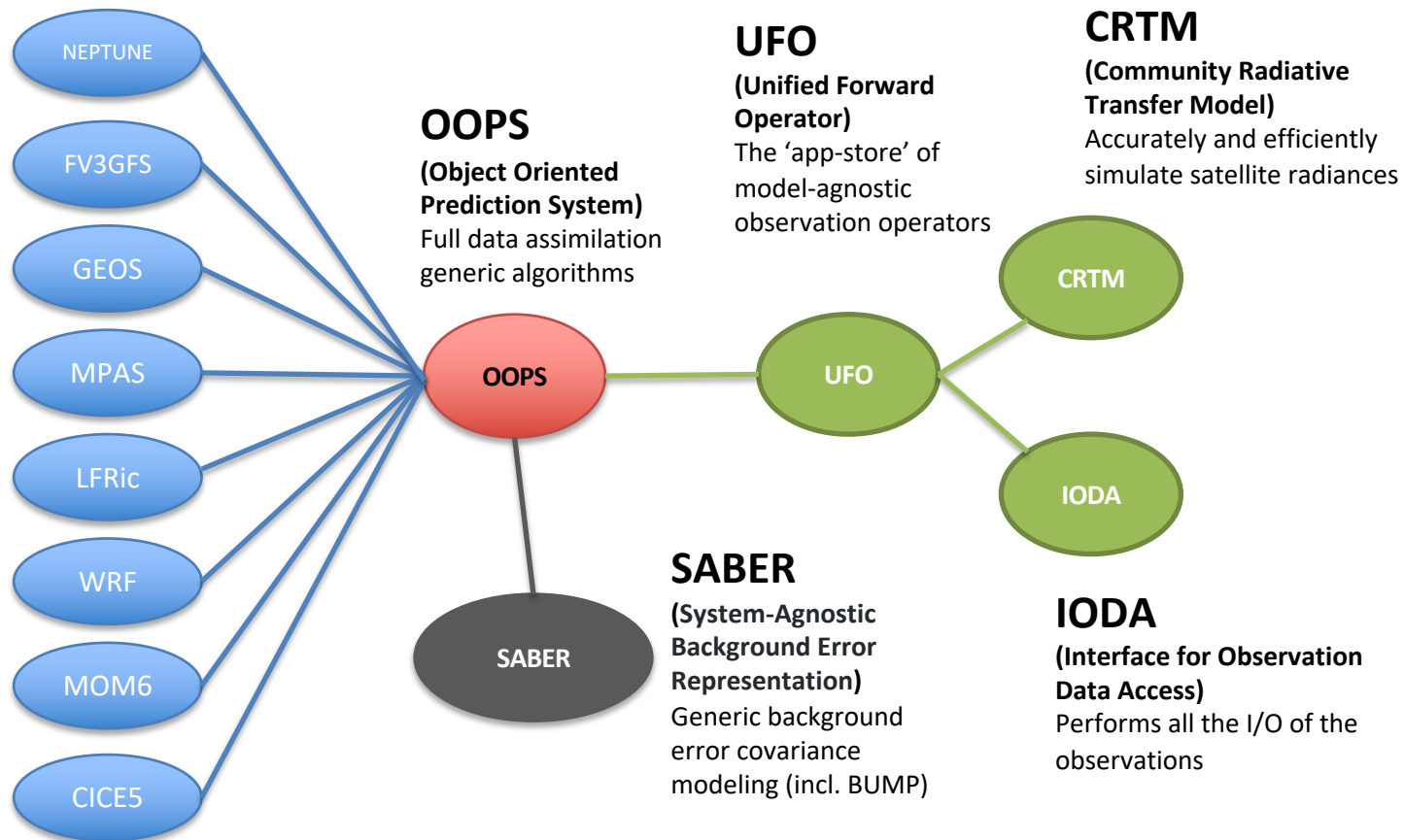
OOPS Generic suite of data assimilation algorithms and interfaces

SABER Generic background error covariance operators on model native geometry

UFO Model-agnostic observation operators that can be shared and compared
Abstract “observation filters” before and after the actual operator

IODA Generic API for observations I/O and in-memory

Separation of Concerns & Flexible Infrastructure



- Abstract interfaces are the most important aspect of the design
- The end of the monolithic gigantic jumble of code

Efficient Software Development



Aug 01, 2017



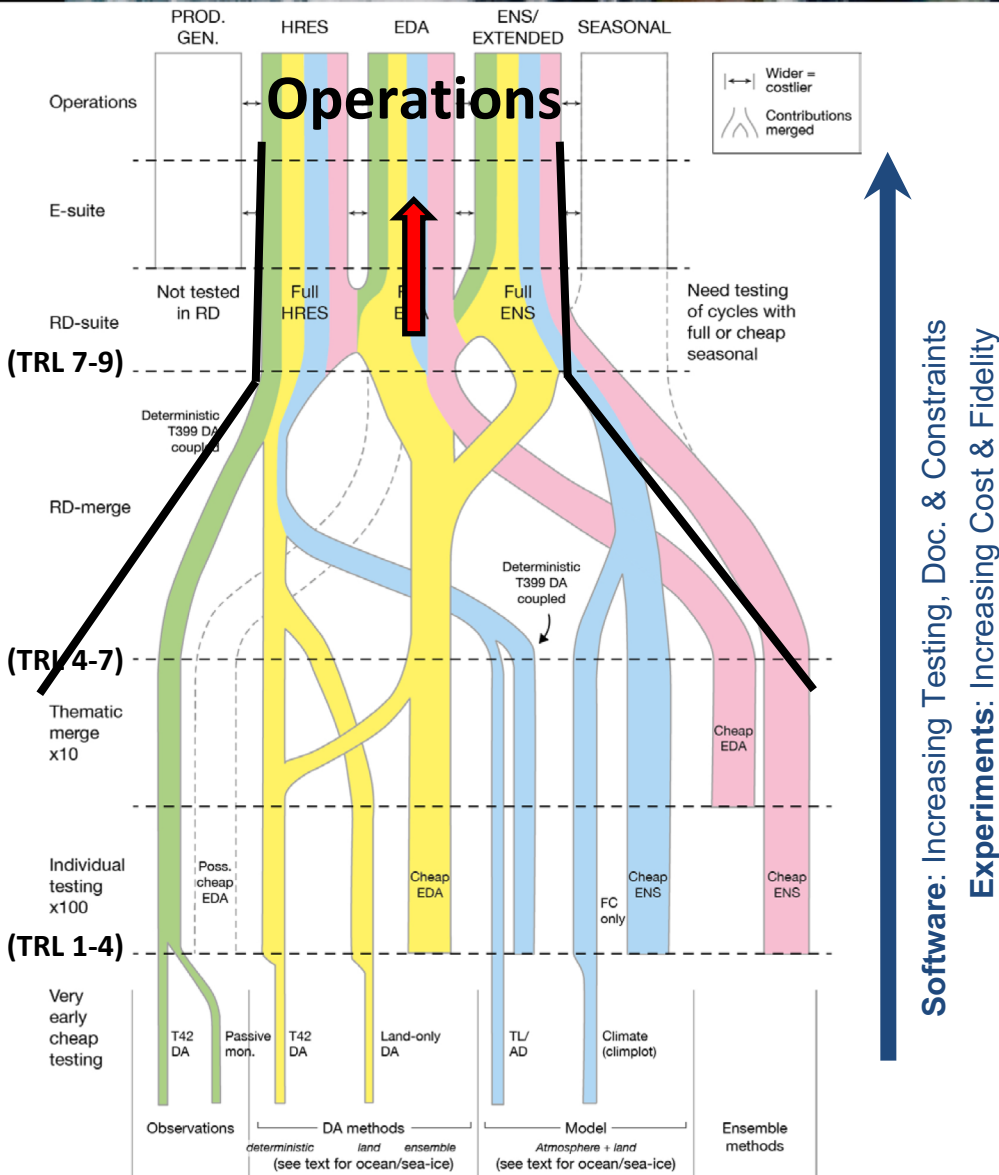
PROCESSES: Evolve from Waterfall to Agile

SOFTWARE: Overcome the Technical Debt

RESOURCES: Plant the Hierarchical Tree

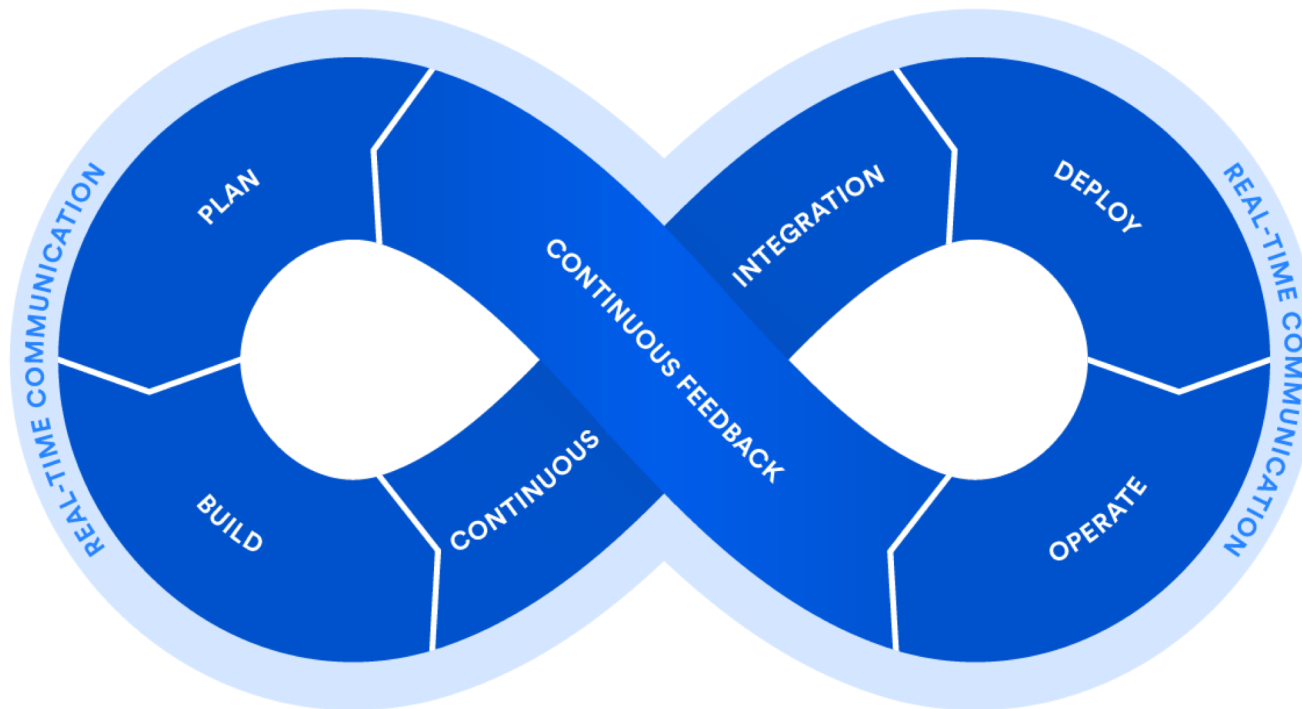


The Hierarchical Tree



Accelerating R2O2R transition requires turn-key environment, evaluation metrics, expert decision, dedicated support, and optimized turnaround for **hierarchical development and testing**.

DevOps is our Goal



Infrastructure as Code
Configuration management,
workflow, data acquisition and
processing, archive, etc



Monitoring and Logging
Performance, scalability,
optimization, Verification &V,
compliance and security



Communication and Collaboration

Community Engagement and Support



Outreach

- Workshops, seminars, newsletter

Planning

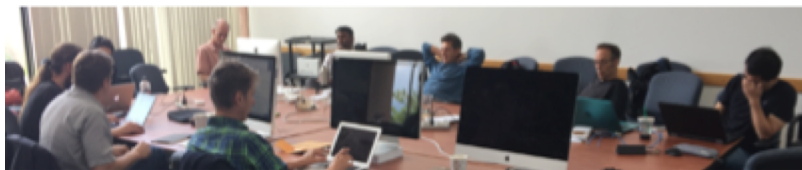
- Thematic planning meetings

Training

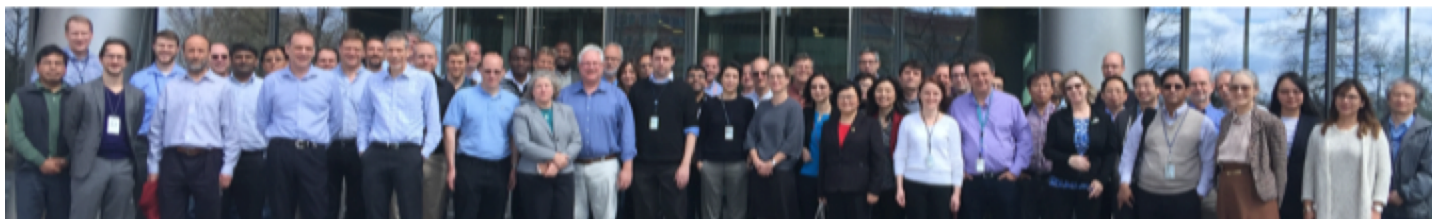
- Summer schools and tutorials

Development

- Visiting scientists and Code Sprints



www.jcsda.org



PROCESSES: Evolve from Waterfall to Agile

SOFTWARE: Overcome the Technical Debt

RESOURCES: Plant the Hierarchical Tree

INNOVATION: Explore new Pathways



Promising Development Avenues



Commercial Cloud Computing

- Tutorials
- Continuous Integration
- Data lake and dynamic web interface
- Realistic data assimilation and model forecasts

Artificial Intelligence and Machine Learning

- Predict observation bias correction to optimize impact
- Emulate CRTM for GOES-16 all-sky radiances
- Ultra-fast physics in TL/AD model

New Instruments and Algorithms

- Wind Lidar, Hyperspectral GEO, GNSS-R, small satellites
- Block-Lanczos ensemble update
- Toward in-core DA/forecast

Earth System Coupled Data Assimilation

- Study coupling in UFO, BUMP, and OOPS

Final Remarks about the JCSDA

Conceptual leap: More unified approach to algorithm development, observation processing, and maintenance of software.

Streamlined processes and operations

Unprecedented level of scientific/technical collaboration, coordination and accountability.

Center of excellence for R2O/O2R

Highly skilled staff committed to the success of JCSDA projects and return on investment for all partners.





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Discussion

