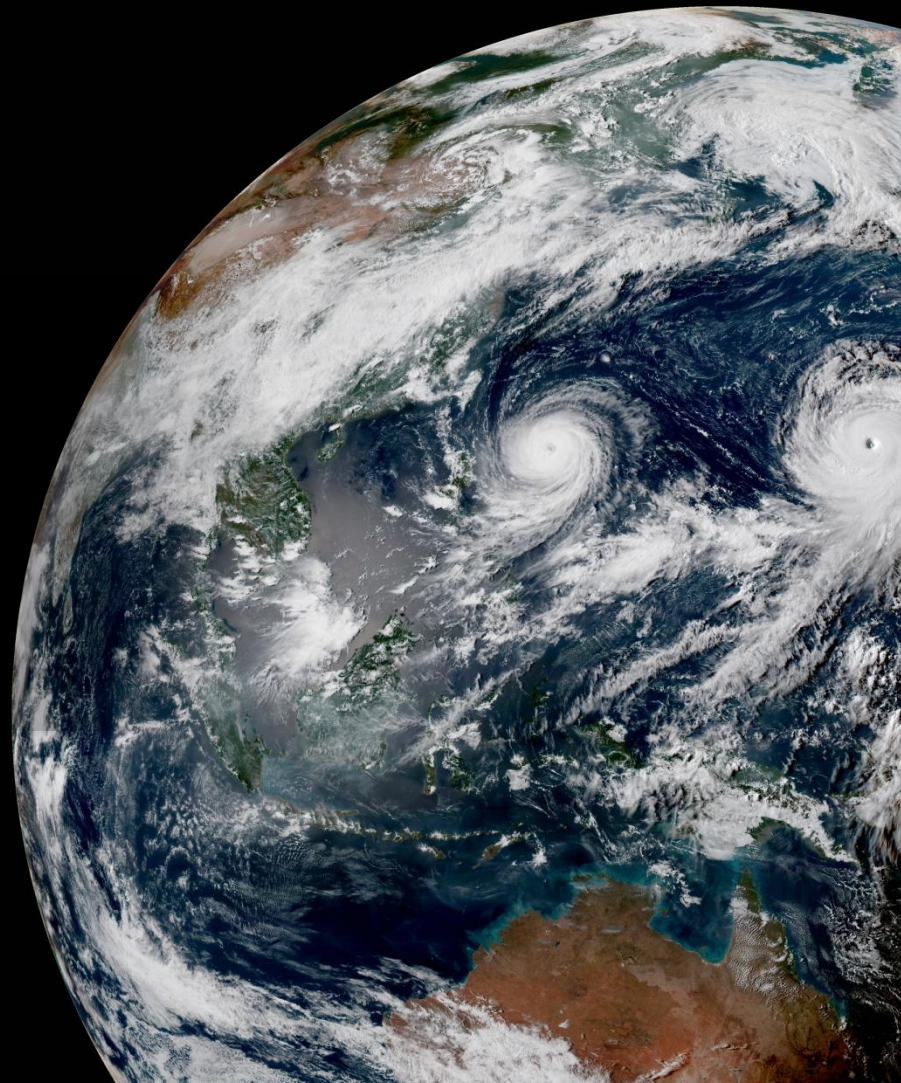
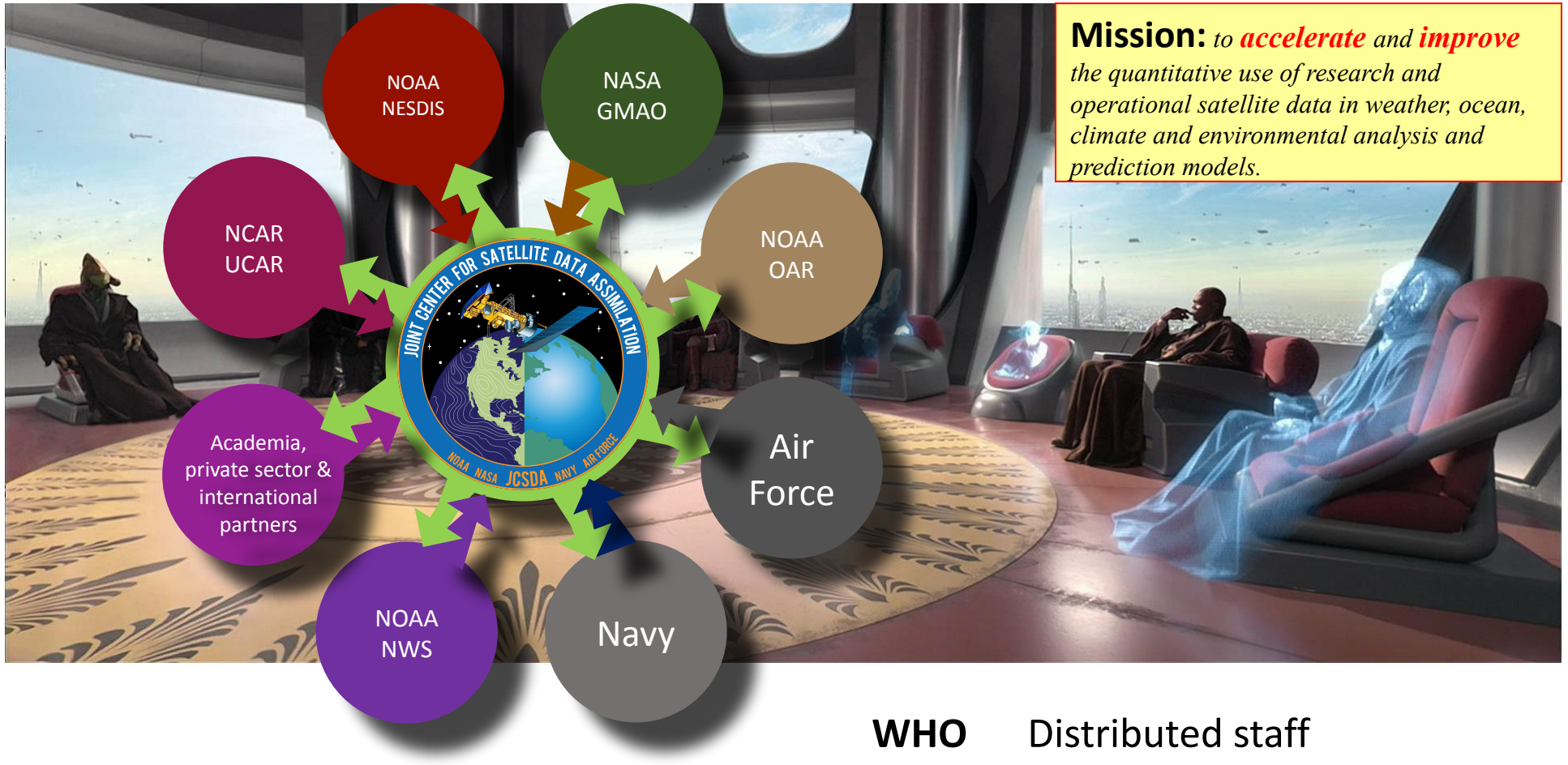
Joint Center for Satellite Data Assimilation

Vision Success Stories

Tom Auligné, Director, JCSDA



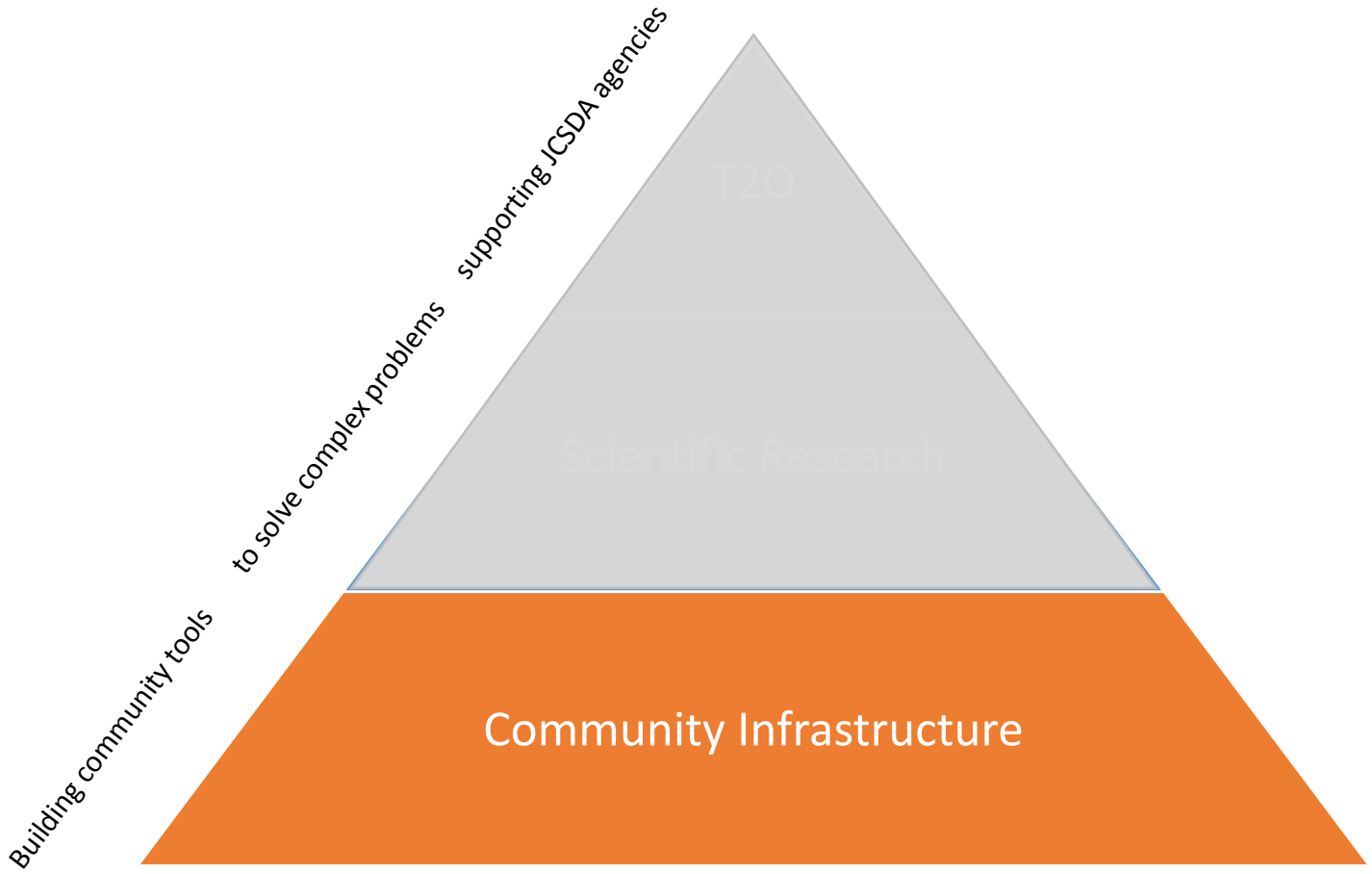
Joint Center for Satellite Data Assimilation



Mission: *to **accelerate** and **improve** the quantitative use of research and operational satellite data in weather, ocean, climate and environmental analysis and prediction models.*

WHO	Distributed staff
HOW	Joint operating plan
WHAT	Critical path to operations

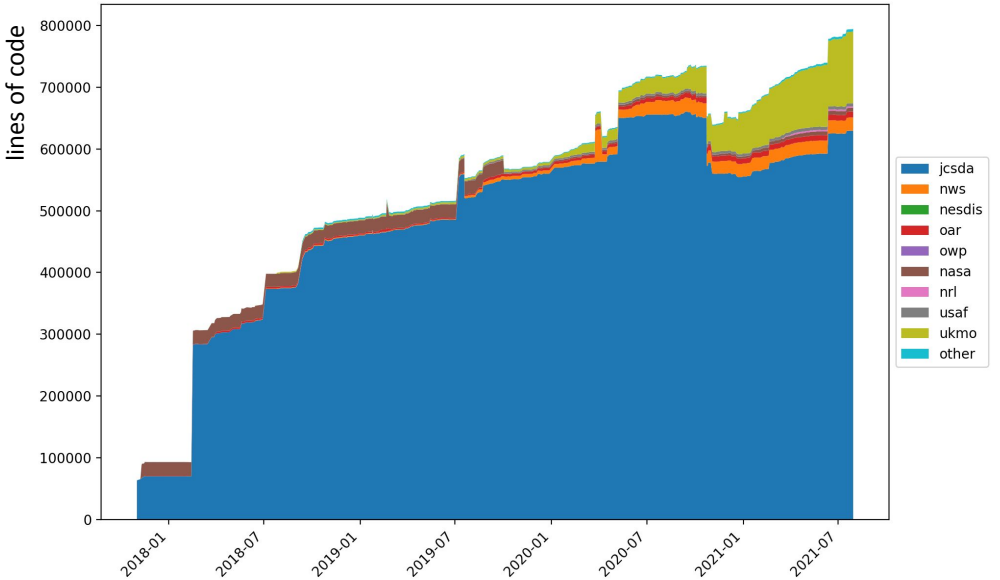
JCSDA Master Plan



Community Software for Improved Productivity

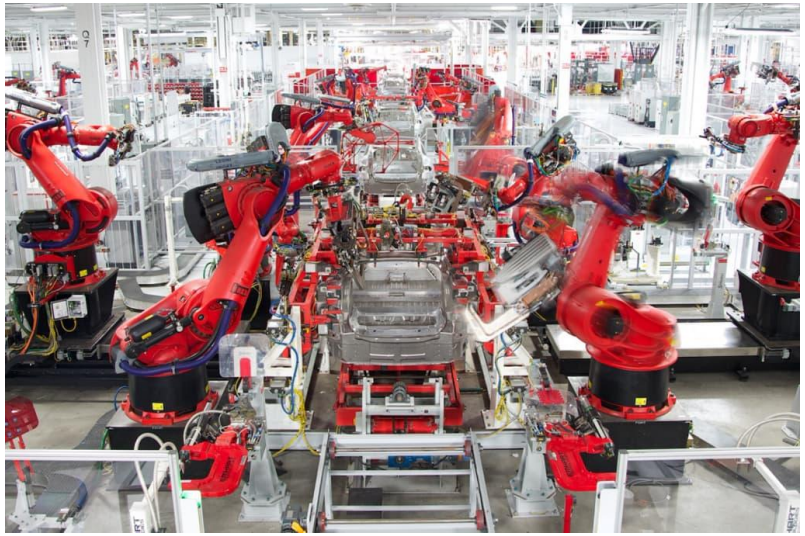
Modern Collaborative Tools

- Open-source code management
- Agile/SCRUM project methodology
- CI/CD using containers and cloud computing



DA systems are complex and require modernized software

- Speed-up future developments
- Increase portability and efficiency
- Ease security and maintenance

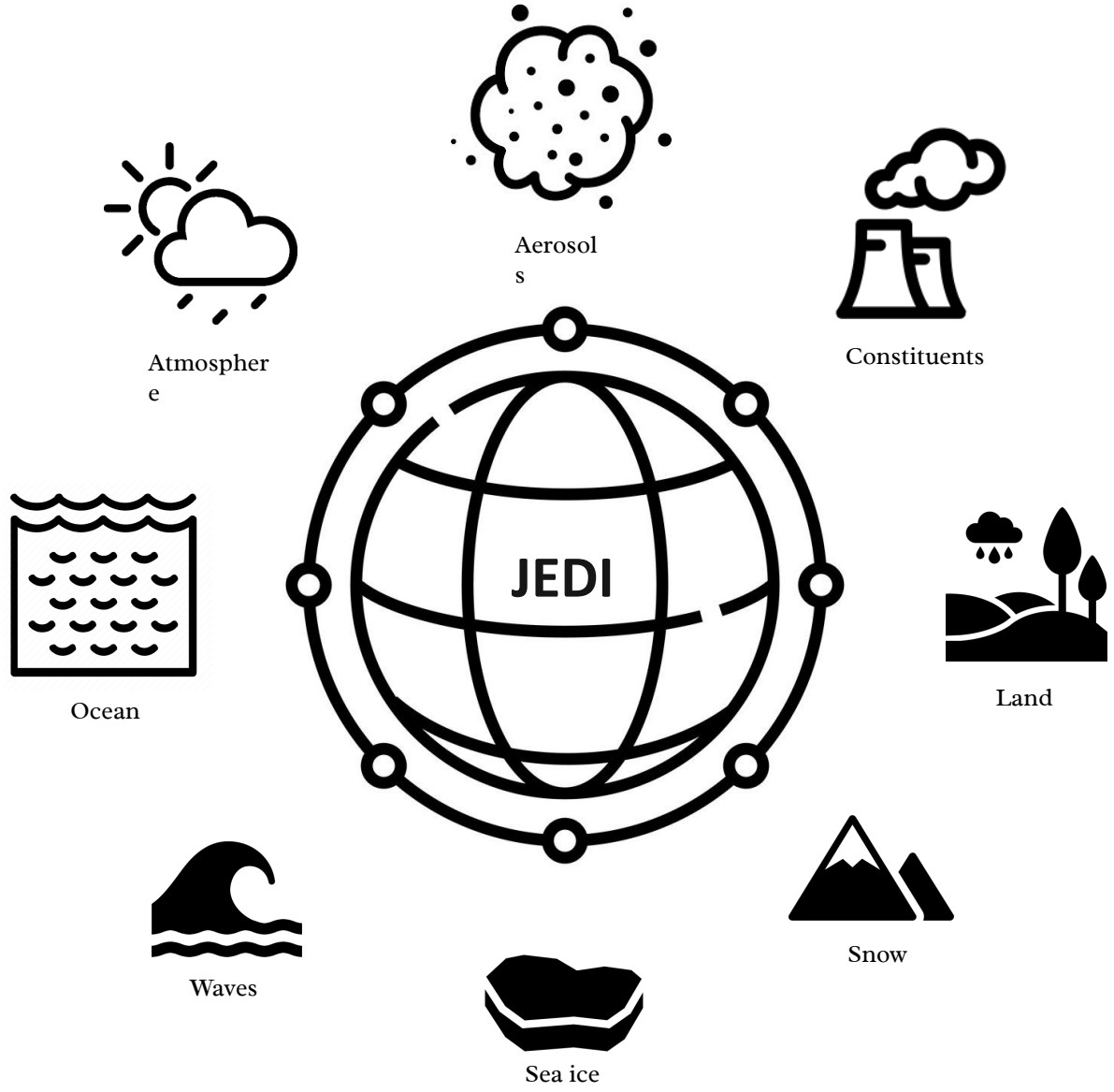


Principles

- Separation of concerns
- Generic programing

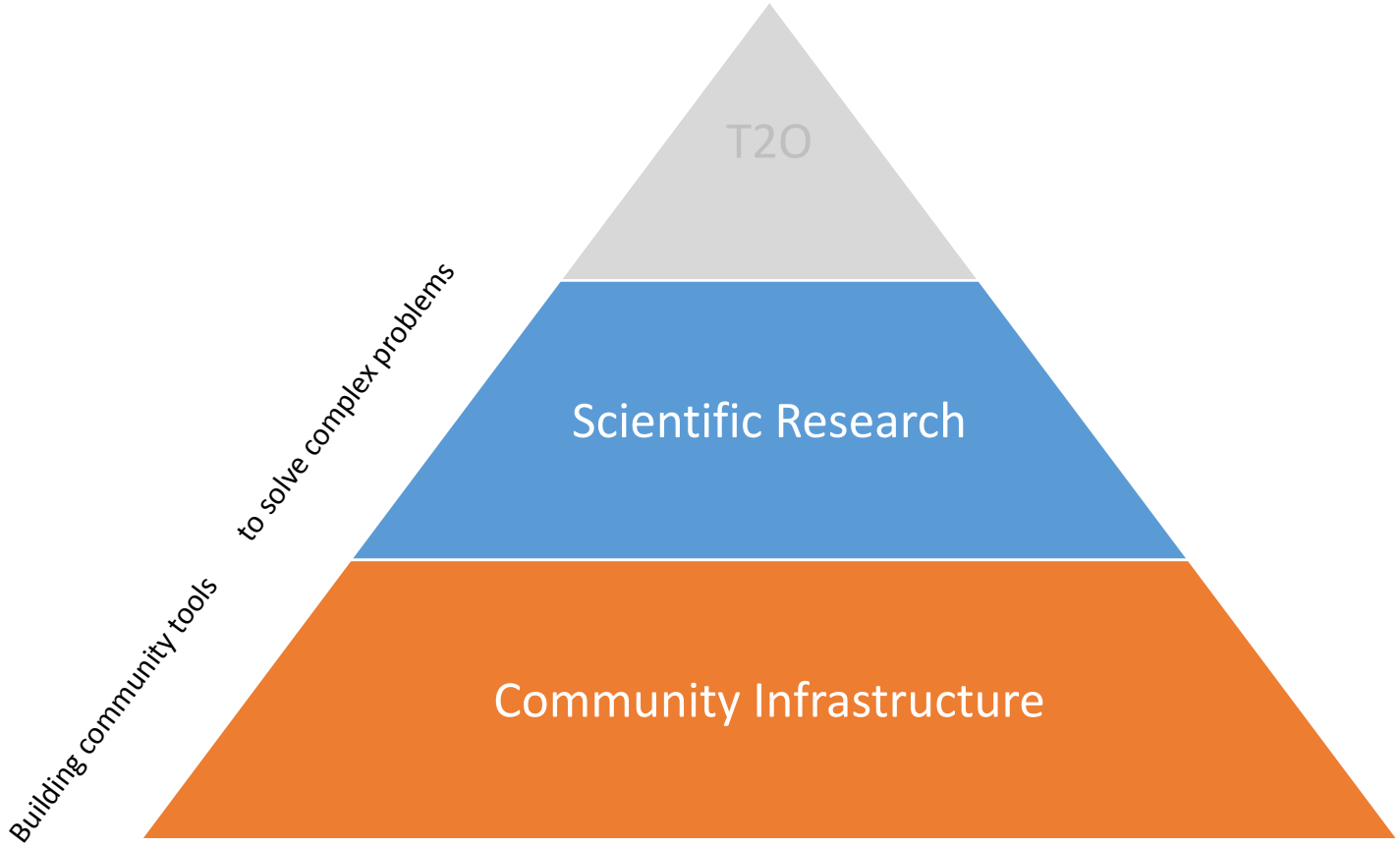
Starting to convert from vision to reality for partners

Joint Effort for Earth System DA

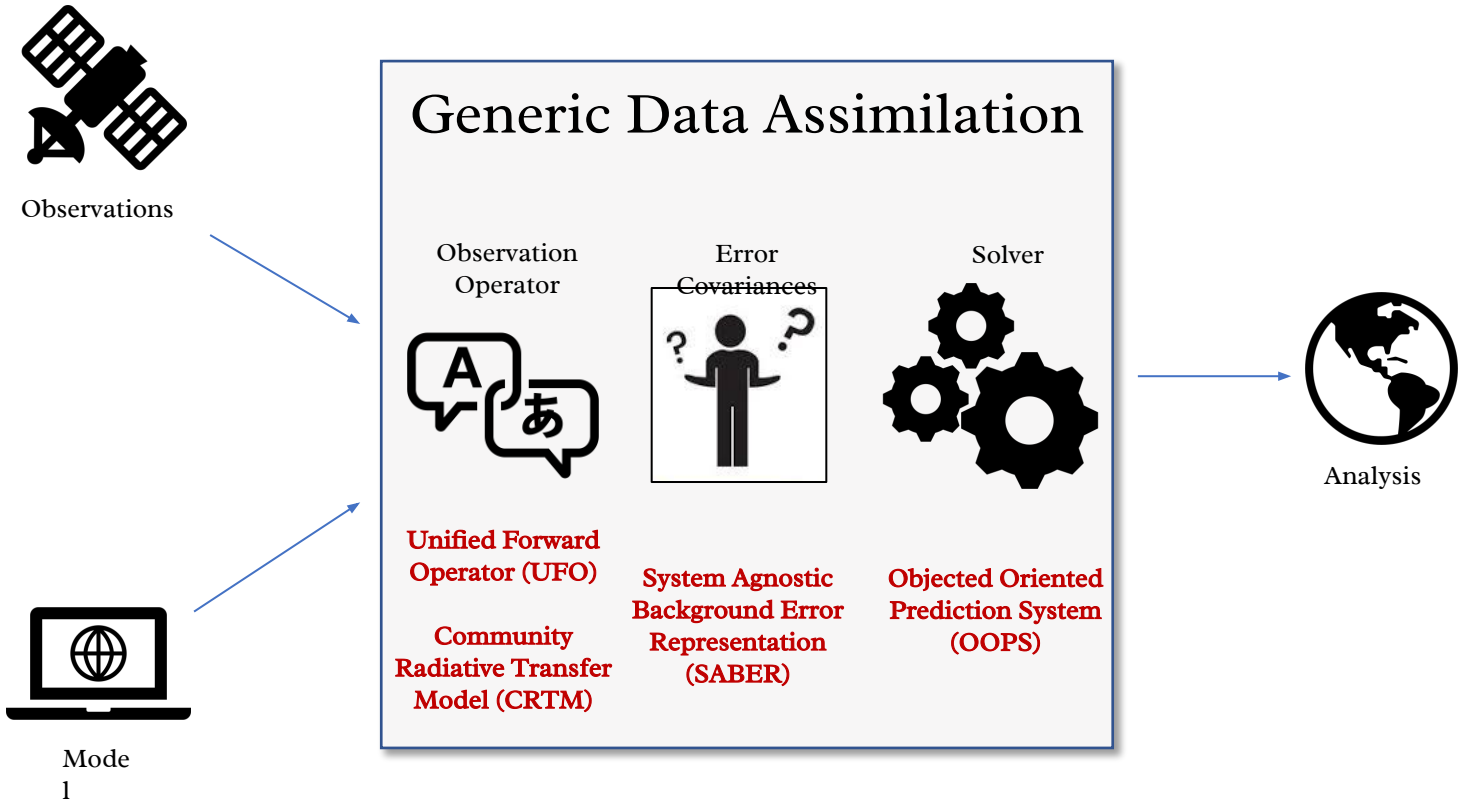


+ 35 universities
+ 11 private companies
+ 9 international

JCSDA Master Plan



JEDI = Generic Data Assimilation



JEDI Observations (notional status)

Marine

Microwave	Satellite
Aquarius L-band	SAC-D
AMSR-2	GCOM-W
GMI	GPM
SAR L-band	SMAP
MIRAS	SMOS
SSMI	F14-F15
SSMI/S	F16-F17-F18
WINDSAT	Coriolis

Infrared	Satellite
ABI	GOES-16-17
AHI	Himawari-8
AVHRR	NOAA-18-19 METOP-A-C
VIIRS	SNPP NOAA-20

Insitu platform	
Moorings	TAO, PIRATA, RAMA
Profiling floats	Argo
gliders	
saildrone	
Ships	
drifters	

HF Radar	
US East-West coast	
Gulf of Mexico	

Altimeter	Satellite
SIRAL	Cryosat-2
RA Ku band	ERS-1
RA Ku band	ERS-2
ASAR	Envisat
RA	Geosat
GLAS	ICESat
ATLAS	ICESat-2
Poseidon-2	Jason-1
Poseidon-3	Jason-2
Poseidon-3B	Jason-3
ALtiKa	Saral
SRAL	Sentinel-3A
Topex/Poseidon	Topex/Poseidon

Land

Observation	
Conventional	
Snow depth (SYNOP)	
Snow depth (GHCN)	
Snow water equivalent (from OWP - AWIPSSBN, MADIS)	
Snow Retrievals	
IMS snow cover fraction	
AFWA snow depth	
Soil Moisture Retrievals	
SMAP	
SMOS	
ASCAT	

Atmosphere

Infrared	Satellite
ABI (IR)	GOES-16, GOES-17
AHI (IR)	Himawari-8
AIRS (IR)	AQUA
AVHRR-3	NOAA-18-19, Metop-A-C
CrIS	SNPP NOAA-20
GIIRS (IR)	FY-4A
GOES Imager (IR)	GOES-11-15
GOES Sounder	GOES-11-15
HIRS-3	NOAA-15-17
HIRS-4	NOAA-15-19, MetOp-A-B
IASI	MetOp-A-C
IASI-NG	MetOp-SG-A
SEVIRI (IR)	MeteoSat-8-11
VIIRS (IR)	SNPP NOAA-20
ABI (IR)	GOES-T

Microwave	Satellite
AMSR-2	GCOM-W
AMSR-E	AQUA
AMSU-A	NOAA 15-19, Aqua, MetOp A-C
AMSU-B	NOAA-15-17
ATMS	SNPP, NOAA-20
ATMS-NG	N/A
GEMS-1	OMS-1
GEMS-2	OMS-2
GMI	GPM
MHS	NOAA-18-19, MetOp-A-C
SAPHIR	Megha-Tropiques
SSMI	DMSP-F14-F15
SSMI/S	DMSP-F16-F17-F19
TROPICS	Pathfinder
AMR-C	Sentinel-6A

Visible	Satellite
ABI	GOES-16-18
AHI	Himawari-8
GIIRS	FY-4A
GOES Imager	GOES-11-15
SEVIRI	MeteoSat-8-11
AIRS	AQUA
VIIRS	JPSS-1, JPSS-2

Ozone	Satellite
GOME	MetOp-A-C
MLS	AURA
OMI	AURA
OMPS-nadir (OMPSNP)	Suomi NPP (SNPP)
OMPS-limb (OMPSTC8)	Suomi NPP (SNPP)
SBUV	NOAA-16-19

GNSS Radio Occultation	Satellite
GRAS	MetOp-A-C
IGOR	TerraSAR-X
IGOR	TanDEM-X
IGOR	COSMIC-1
AOPOD	KOMPSAT-5
TGRS	COSMIC-2
ROHPP	PAZ
GPSRO	Sentinel-6A

Conventional Data	
Aircraft	ACARs, MDCRS, AIREPs
Sonde	+dropsonde
Surface (land)	SYNOP, METAR
Surface (marine)	Buoy, ship, CMAN
VAD-wind	Not used in GDAS
RASS-temp	Not used in GDAS

Satwind/ Scatt. wind	Satellite
Feature tracked wind	
ABI	GOES-16, GOES-17
AHI	Himawari-8
MODIS	AQUA, TERRA
AVHRR	NOAA 15-19, Metop A-C
VIIRS	SNPP, NOAA-20
SEVIRI	MeteoSat 8-11
GOES Img/Snd	GOES-11-15
INSAT	INSAT, KALPANA

Scatterometer	
ASCAT	Metop-Series
OSCAT WindSat, ...	various

GNSS Ground	
IGS	GNSS

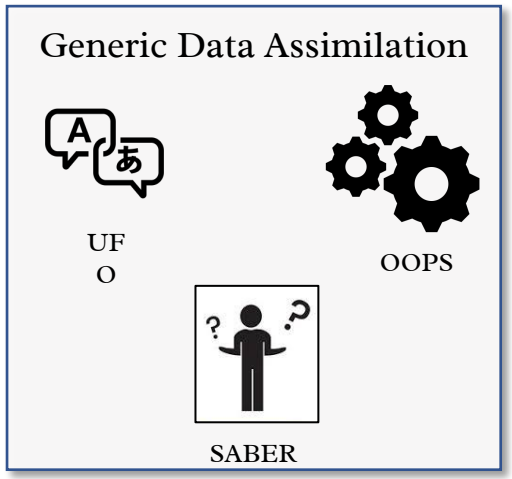
completed | in progress | upcoming

Progressing toward initial goal to match skills of operational systems

JEDI Model Interfaces

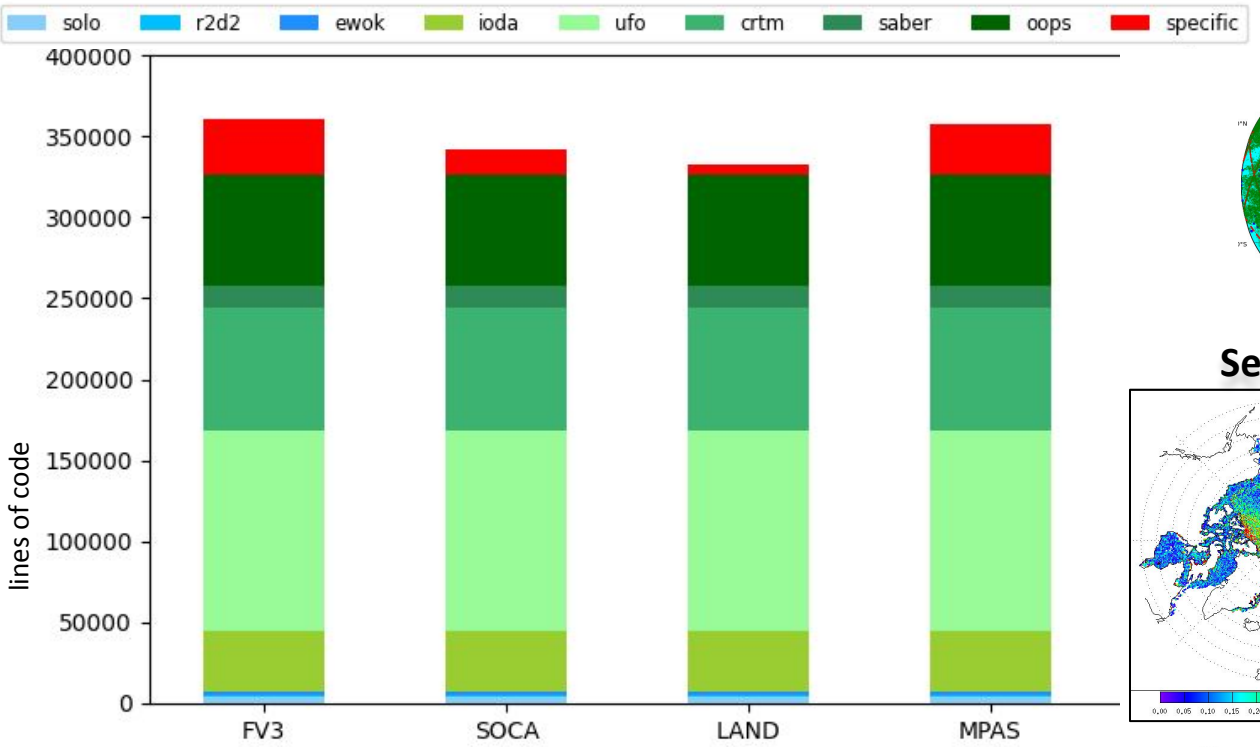
MODEL	TYPE	CENTER
UFS	Global Atmosphere	NOAA
GEOS	Global Atmosphere	NASA
NEPTUNE	Global atmosphere	Navy
MPAS	Global atmosphere	NCAR
LFRic	Global atmosphere	Met Office
Unified Model	Global atmosphere	Met Office
UFS CAM	Regional atmosphere	NOAA
MPAS-Regional	Regional atmosphere	NCAR
WRF	Regional atmosphere	NCAR
UFS GSDChem	Global constituents	NOAA
GEOS-AERO	Global aerosols	NASA
UFS CAM-CMAQ	Regional air quality	NOAA
MOM6	Global ocean	NOAA
ROMS	Regional ocean	NOAA
SIS2	Sea-ice	NOAA
CICE6	Sea-ice	NOAA
WW-III	Wave	NOAA
NOAH-MP	Land and Snow	NOAA
QG	Toy model	ECMWF
Lorenz 95	Toy model	ECMWF
Shallow Water	Toy model	NOAA

Mode
l

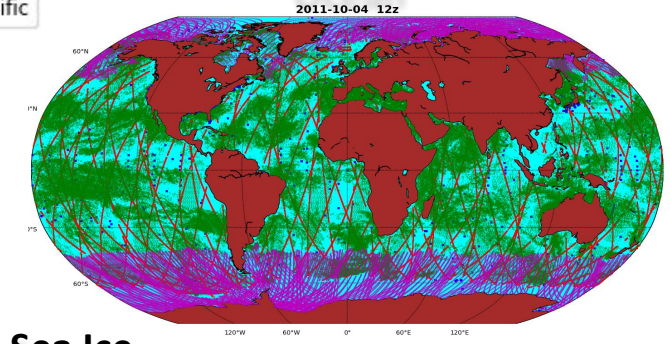


Analysis

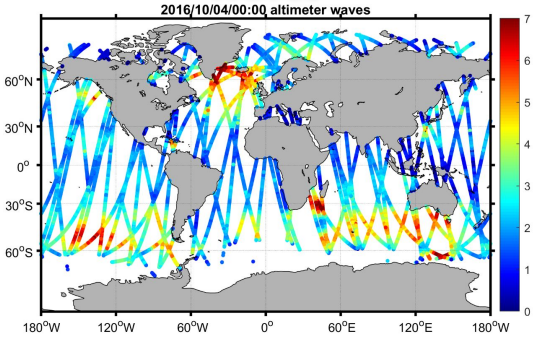
JEDI for Earth System DA



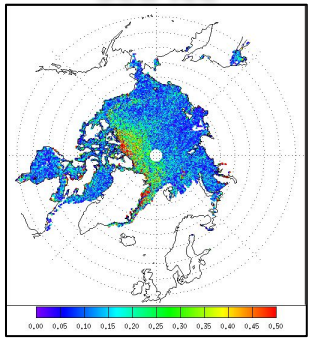
Ocean



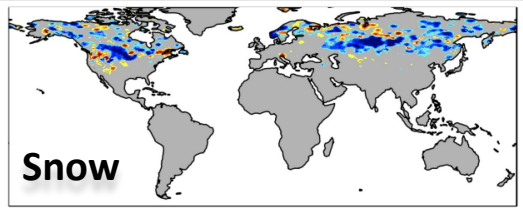
Waves



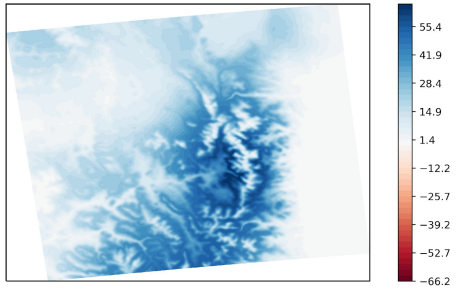
Sea Ice

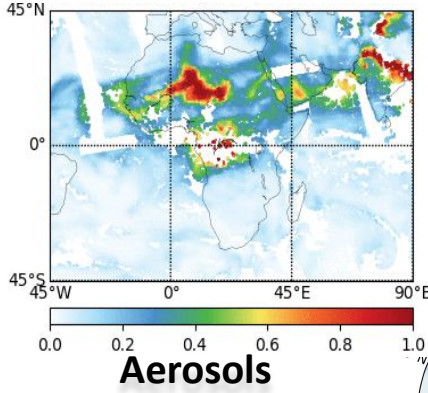


Snow



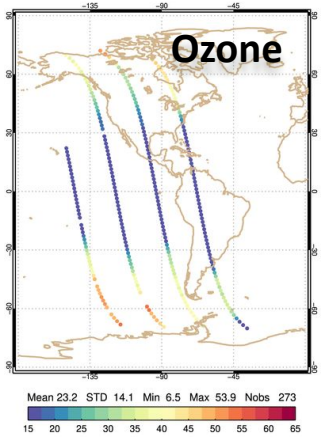
Land/Hydro



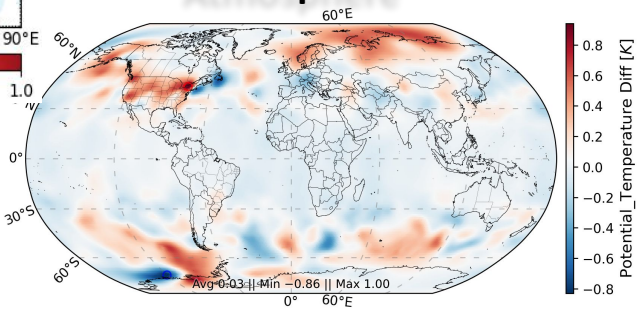


Aerosols

Ozone

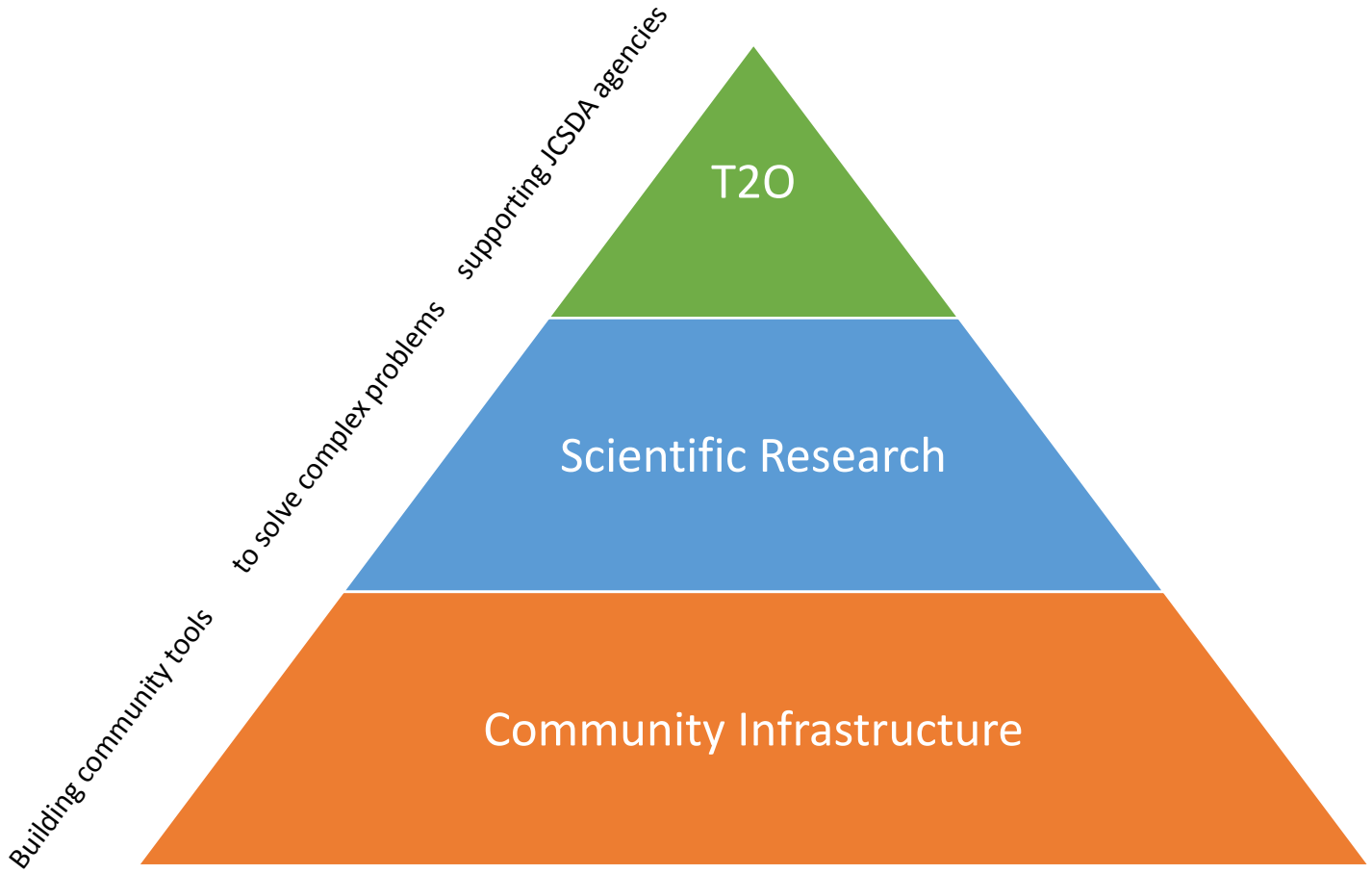


Atmosphere

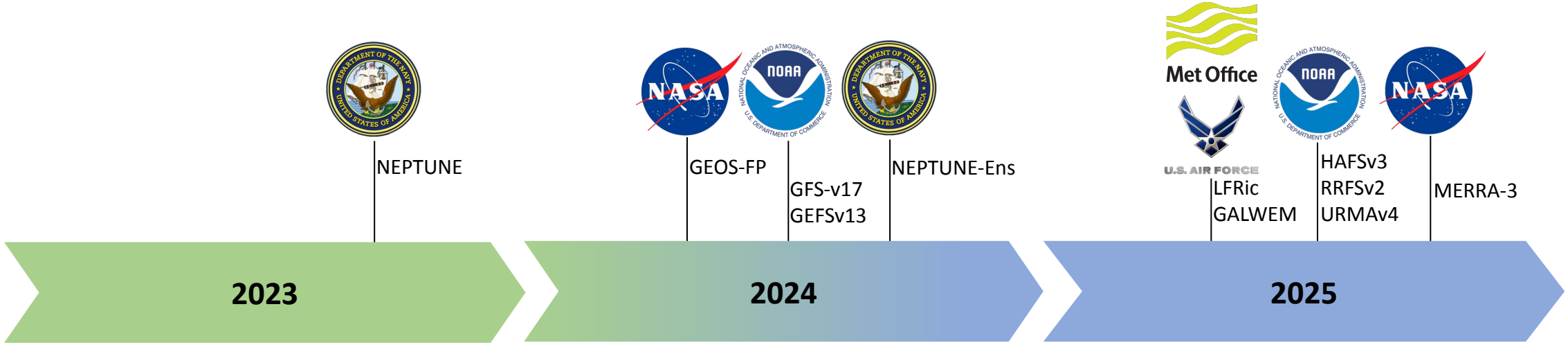


JEDI = Single DA system
with multiple configurations

JCSDA Master Plan



Transition to Operations & Community Engagement



Public Releases

2021-6-11	JEDI-FV3 v1.1
2021-9-24	JEDI-MPAS
2021-11-4	JEDI-SOCA
2022-07-18	JEDI-SKYLAB

Training

500+ JEDI Academy padawans

Tutorials and **videos** available online

Events

JCSDA Workshops

12+ Code sprints

Communications

JCSDA.ORG

33K VISITORS FROM 99 COUNTRIES

NEWS

QUARTERLY NEWSLETTERS AND REGULAR BLOGS

JCSDA Vision for SkyLab

- **Demonstrator** and **point of convergence** for **joint** science and tech. achievements
- Community access to *real-world* experimental testbed + rapid validation
  (e.g. obs. impact, new algo., performance)
- Provide default configuration for downstream operational applications

SkyLab Ecosystem Design

Observations

BUFR Tanks

Data Lake

CDAAC

ODB

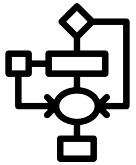
FTP

LDM

Interface for Observation Data Access (IODA)

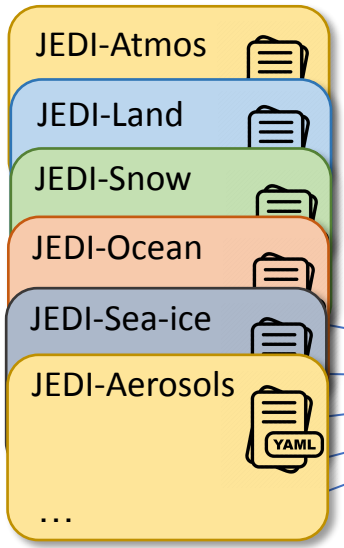
Research Repository for Data and Diagnostics (R2D2)

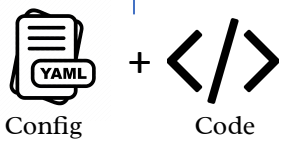
Diagnostics



Experiment Workflow and Orchestration Kit (EWOK)

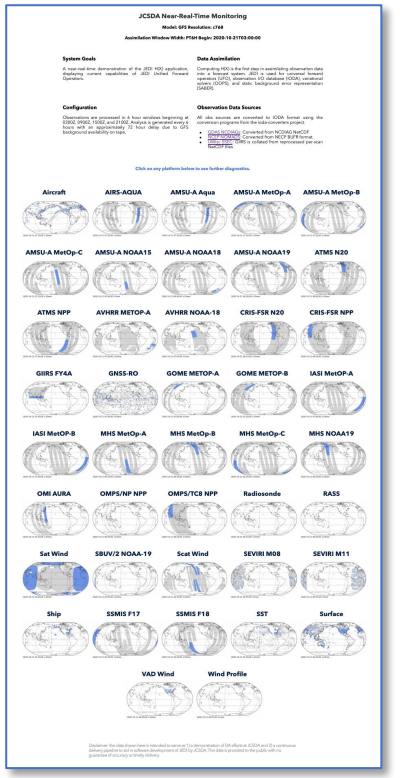
Agile



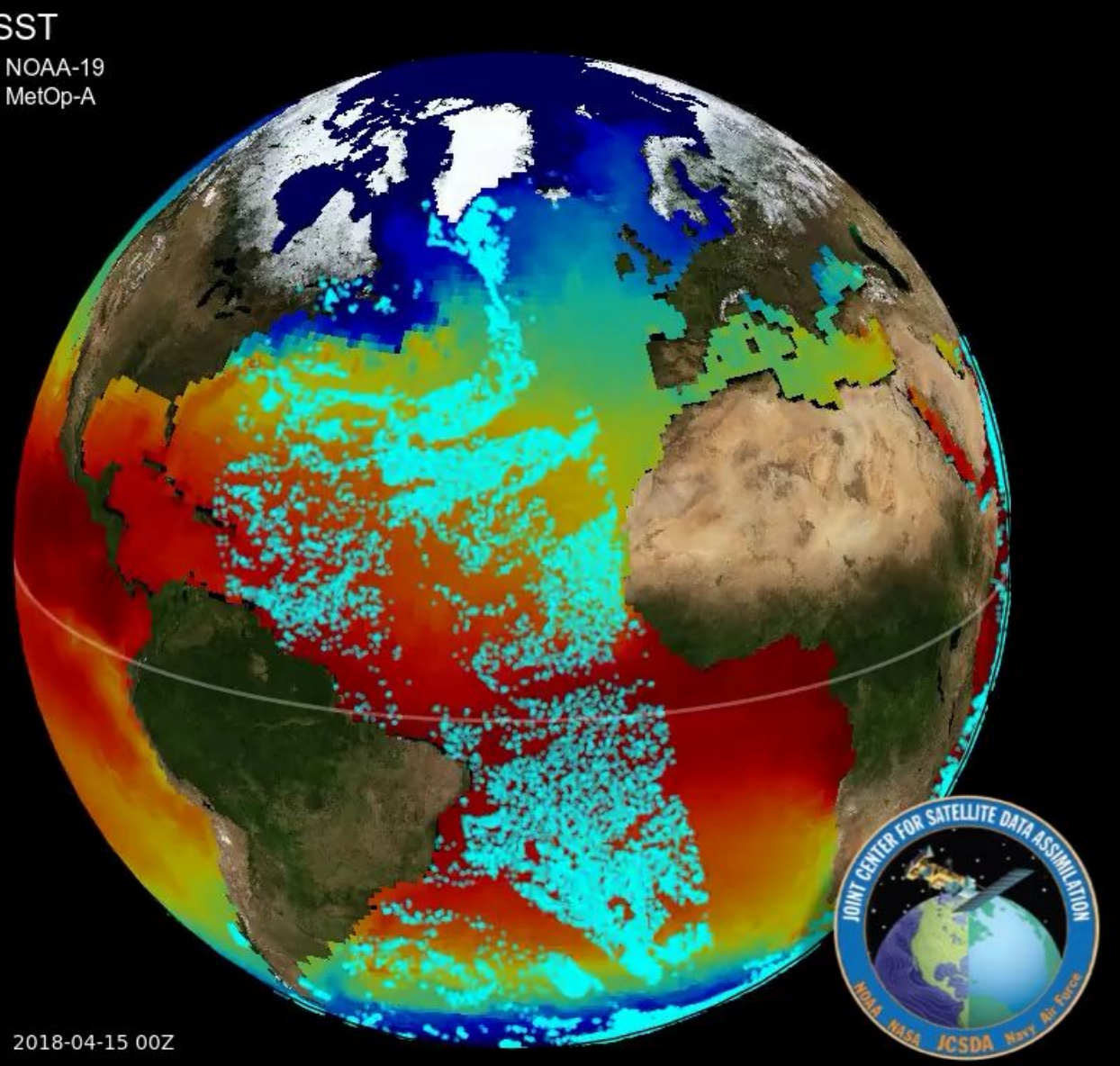


Config

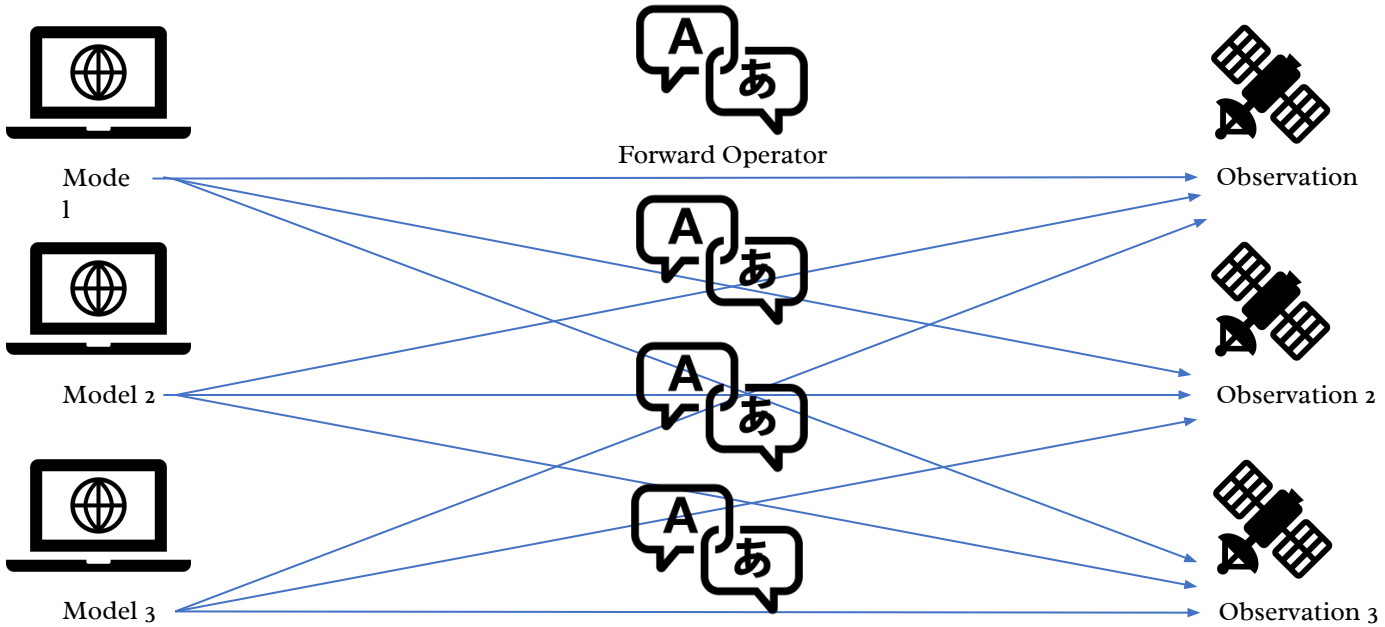
Code



Discussion

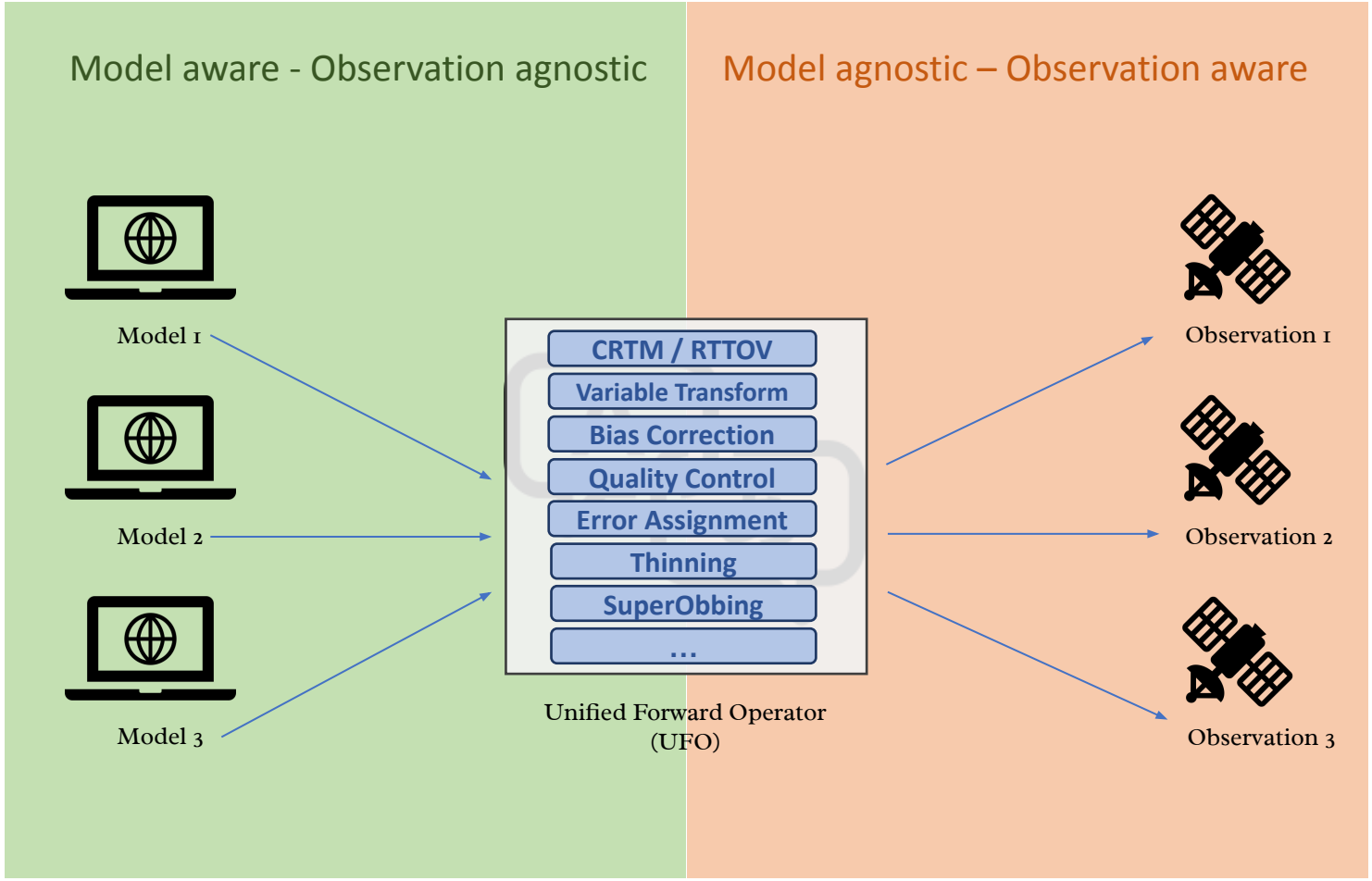


Forward Operators (Traditional Approach)



Duplication of effort

Unified Forward Operator (UFO)



The App Store of observation operators!!

JCSDA Coordination, Collaboration, and Accountability

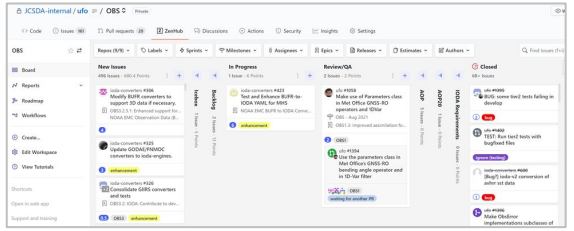
Collective Plan
Core: 40 FTE (42 staff)
In-Kind: 39 FTE (106)

Annual Operating Plan

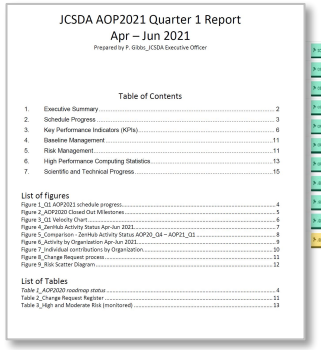
- Partner Agency Plans
- JCSDA Strategic Goals
- 5-Year Operating Plan

- Executive Retreat
- Budget planning
- Roadmap (schedule)
- MOB review/approval

Work Breakdown Structure (WBS)



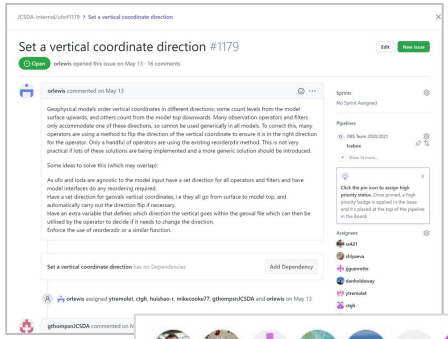
Agile Board



Quarterly reporting against WBS activity

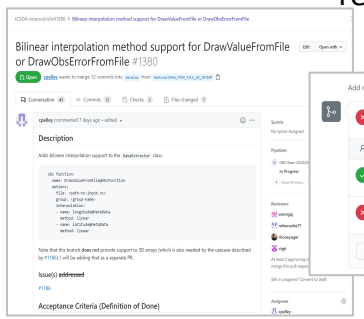
Reporting

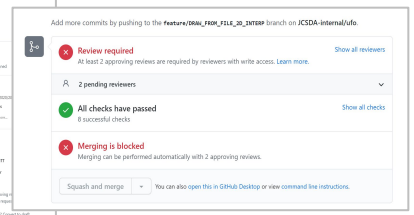
Coordinated Development Cycle



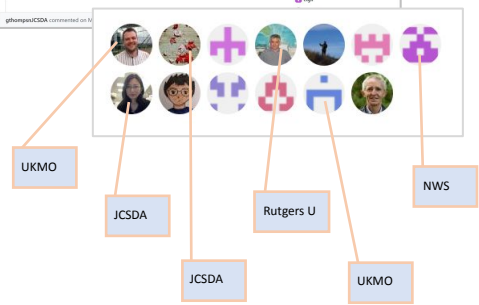
Issue (Ticket)

Pull Request review





Automated and collaborative QC through multi-agency reviews



Working-level collaboration