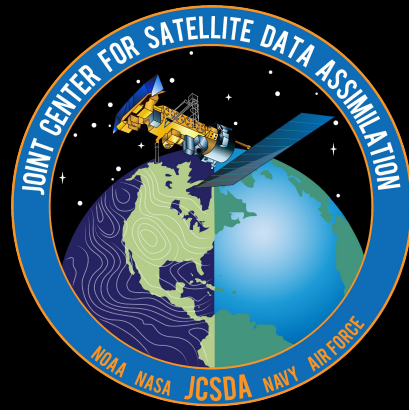
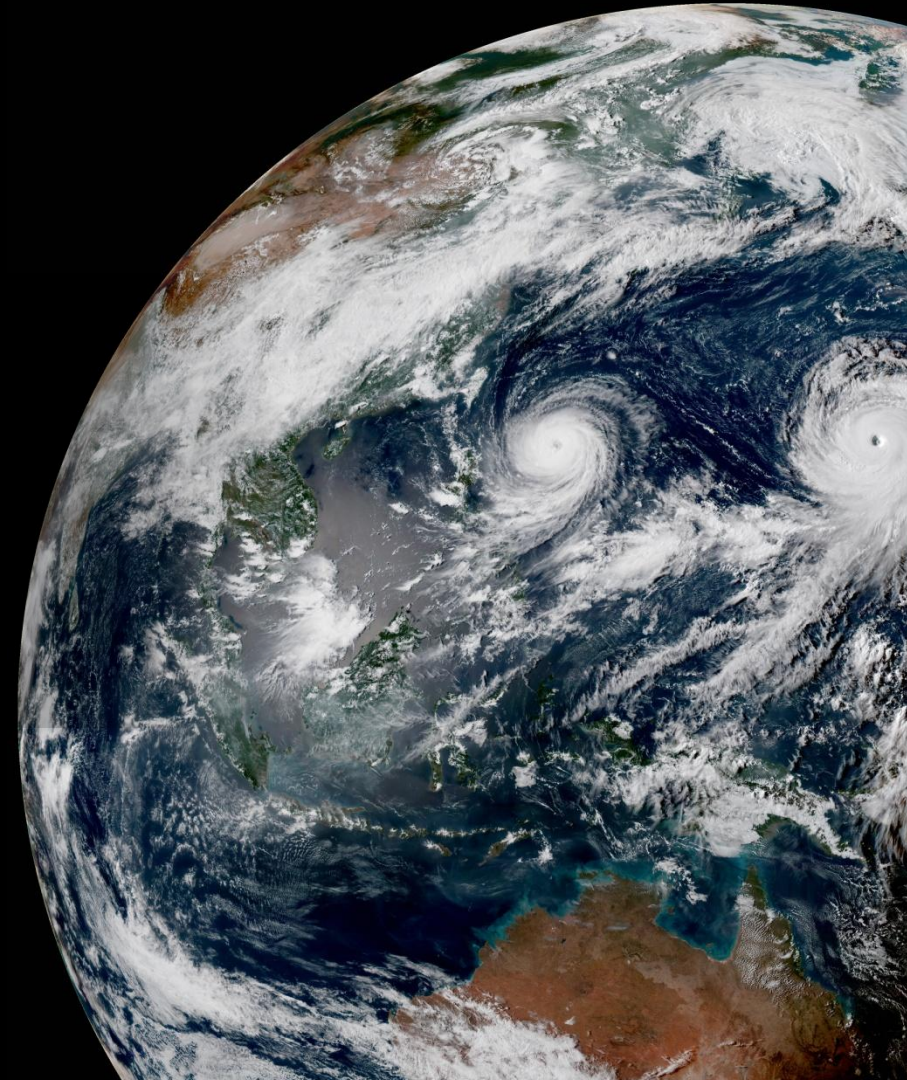




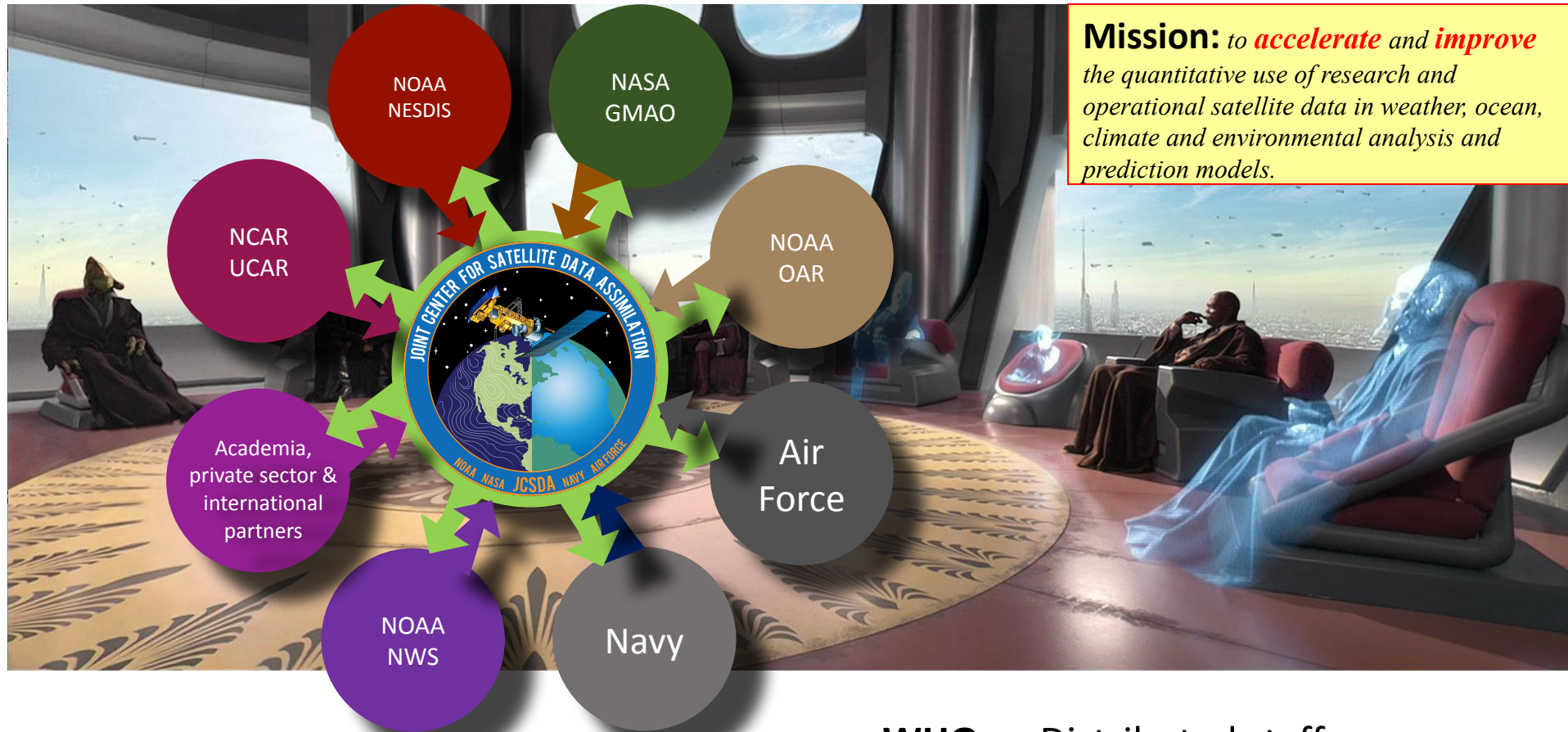
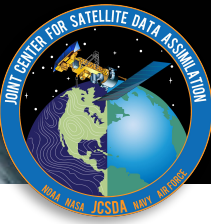
Joint Center for Satellite Data Assimilation

Vision Success Stories

Tom Auligné, Director, JCSDA



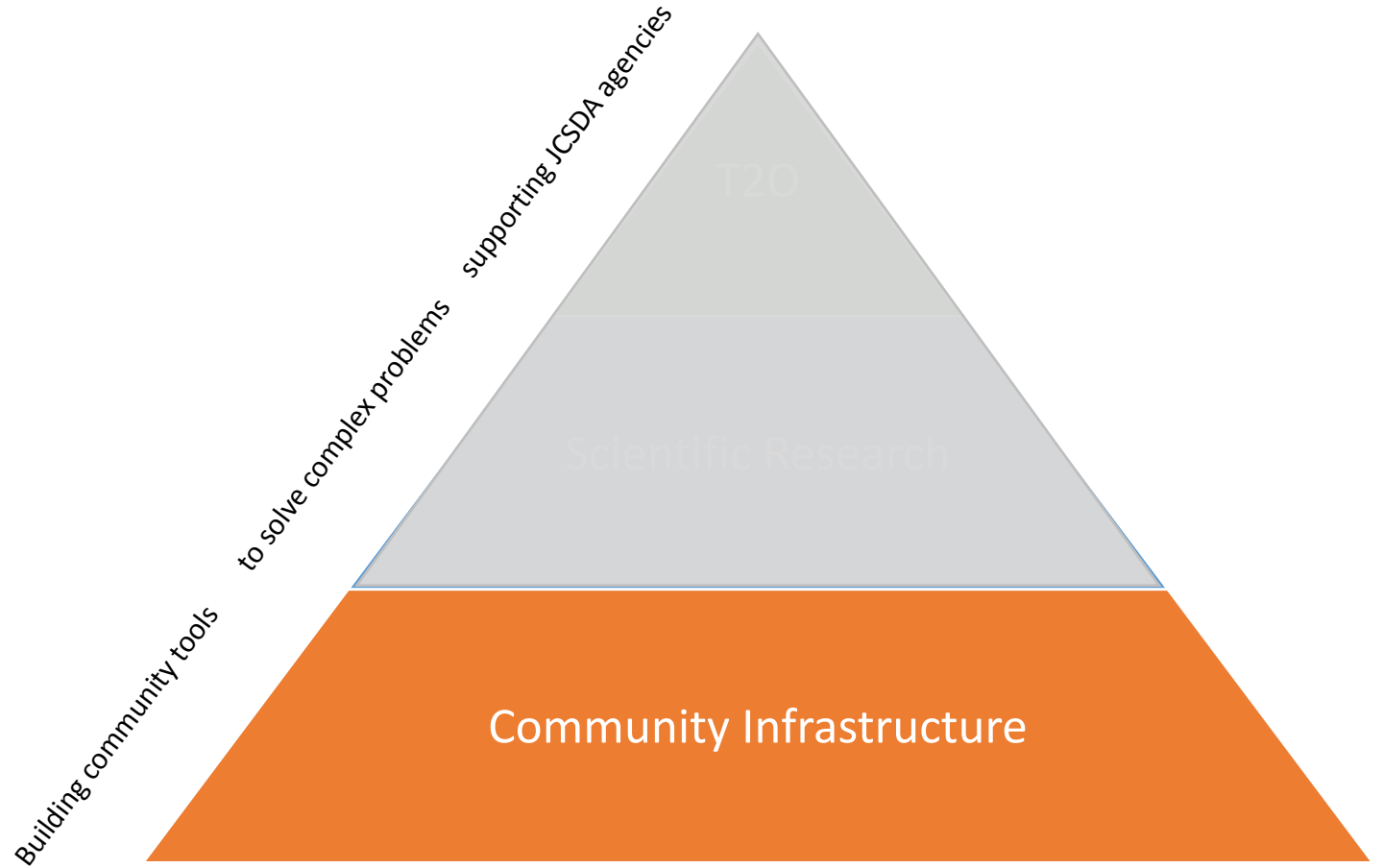
Joint Center for Satellite Data Assimilation



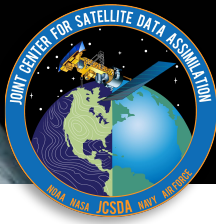
Mission: to *accelerate* and *improve* the quantitative use of research and operational satellite data in weather, ocean, climate and environmental analysis and prediction models.

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

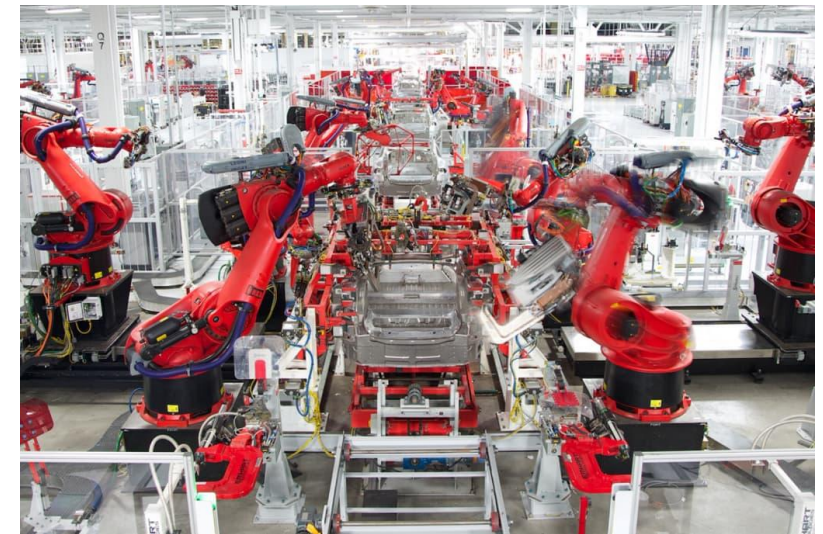
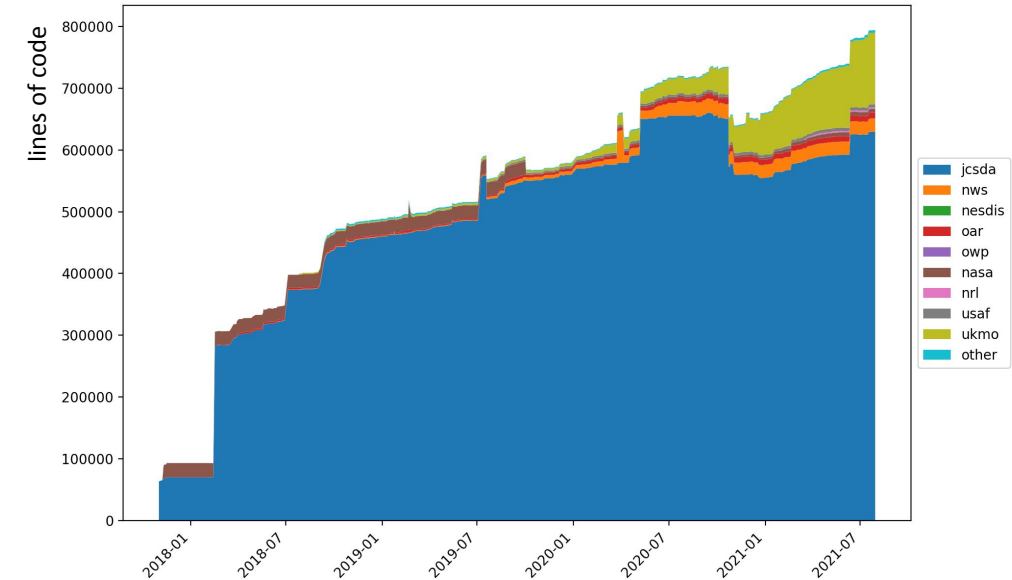
DA systems are complex and require modernized software

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

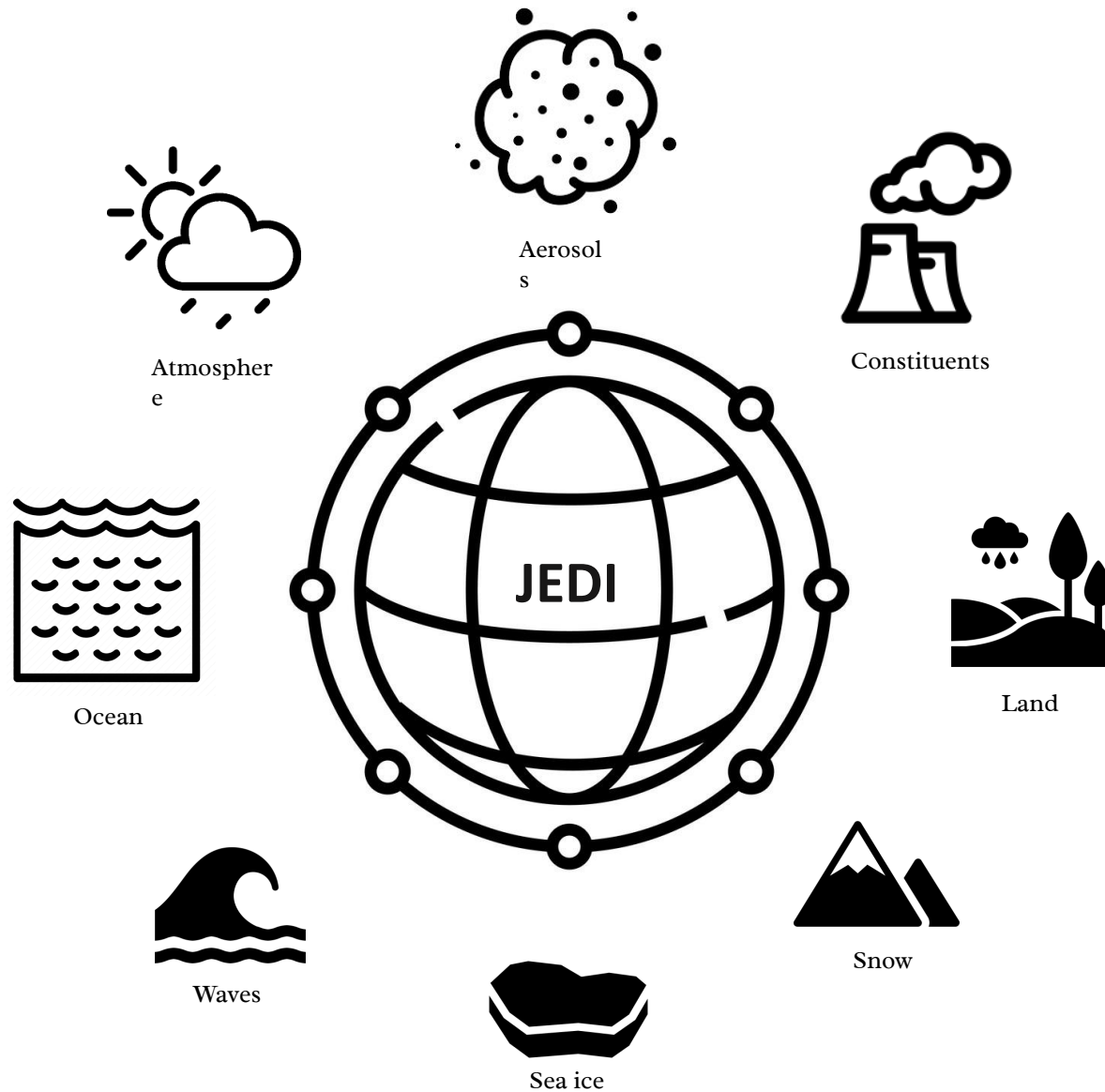
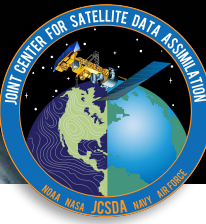
Principles

- Separation of concerns
- Generic programming

Starting to convert from vision to reality for partners

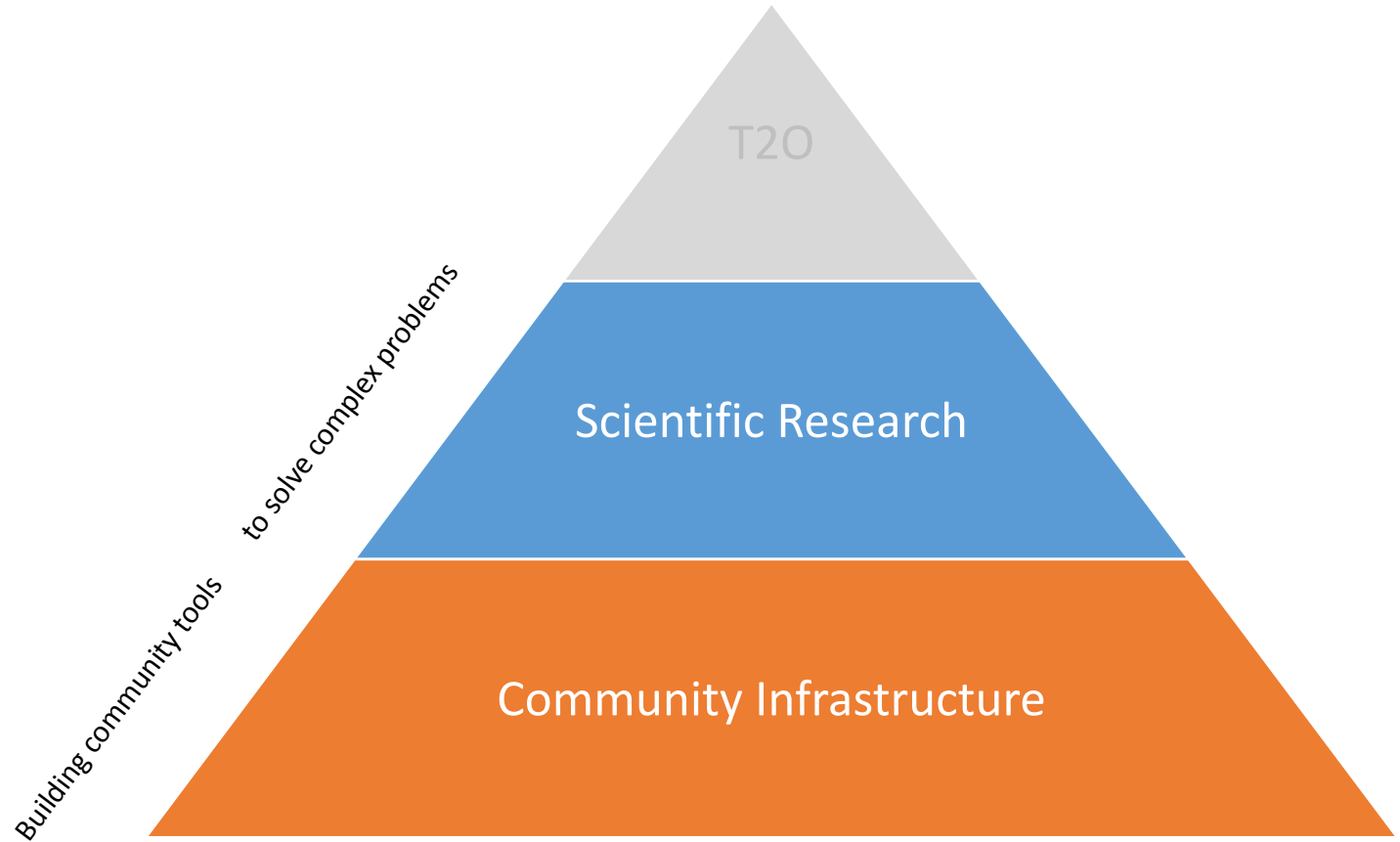


Joint Effort for Earth System DA

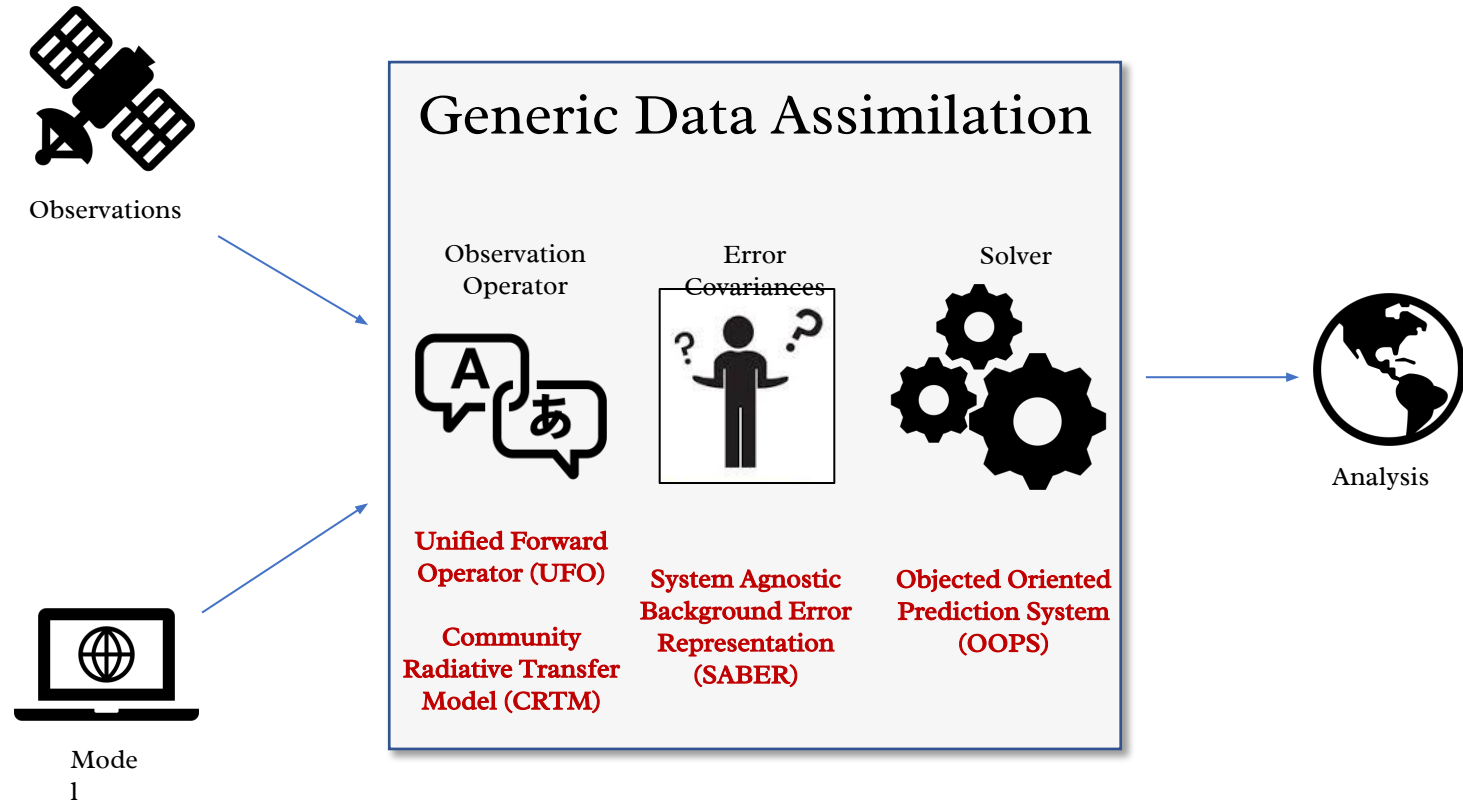
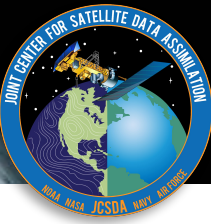


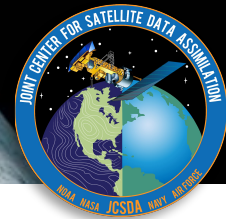
+ 35 universities
+ 11 private companies
+ 9 international

JCSDA Master Plan



JEDI = Generic Data Assimilation





JEDI Observations (notional status)

Marine

Atmosphere

Infrared	Satellite	Microwave	Satellite	Visible	Satellite	GNSS Radio Occultation	Satellite	Satwind/ Scatt. wind	Satellite
ABI (IR)	GOES-16, GOES-17	AMSR-2	GCOM-W	ABI	GOES-16-18	GRAS	MetOp-A-C	Feature tracked wind	
AHI (IR)	Himawari-8	AMSR-E	AQUA	AHI	Himawari-8	IGOR	TerraSAR-X	ABI	GOES-16, GOES-17
AIRS (IR)	AQUA	AMSU-A	NOAA 15-19, Aqua, MetOp A-C	GIIRS	FY-4A	IGOR	TanDEM-X	AHI	Himawari-8
AVHRR-3	NOAA-18-19, Metop-A-C	AMSU-B	NOAA-15-17	GOES Imager	GOES-11-15	IGOR	COSMIC-1	MODIS	AQUA, TERRA
CrIS	SNPP NOAA-20	ATMS	SNPP, NOAA-20	SEVIRI	MeteoSat-8-11	AOPOD	KOMPSAT-5	AVHRR	NOAA 15-19, Metop A-C
GIIRS (IR)	FY-4A	ATMS-NG	N/A	AIRS	AQUA	TGRS	COSMIC-2	VIIRS	SNPP, NOAA-20
GOES Imager (IR)	GOES-11-15	GEMS-1	OMS-1	VIIRS	JPSS-1, JPSS-2	ROHPP	PAZ	SEVIRI	MeteoSat 8-11
GOES Sounder	GOES-11-15	GEMS-2	OMS-2	Ozone	Satellite	GPSRO	Sentinel-6A	GOES Img/Snd	GOES-11-15
HIRS-3	NOAA-15-17	GMI	GPM	GOME	MetOp-A-C	Conventional Data		INSAT	INSAT, KALPANA
HIRS-4	NOAA-15-19, MetOp-A-B	MHS	NOAA-18-19, MetOp-A-C	MLS	AURA	Aircraft	ACARs, MDCRS, AIREPs	Scatterometer	
IASI	MetOp-A-C	SAPHIR	Megha-Tropiques	OMI	AURA	Sonde	+dropsonde	ASCAT	Metop-Series
IASI-NG	MetOp-SG-A	SSMI	DMSP-F14-F15	OMPS-nadir (OMPSNP)	Suomi NPP (SNPP)	Surface (land)	SYNOP, METAR	OSCAT	various
SEVIRI (IR)	MeteoSat-8-11	SSMI/S	DMSP-F16-F17-F19	OMPS-limb (OMPSTC8)	Suomi NPP (SNPP)	Surface (marine)	Buoy, ship, CMAN	GNSS Ground	
VIIRS (IR)	SNPP NOAA-20	TROPICS	Pathfinder	SBUV	NOAA-16-19	VAD-wind	Not used in GDAS	IGS	GNSS
ABI (IR)	GOES-T	AMR-C	Sentinel-6A			RASS-temp	Not used in GDAS		

completed in progress upcoming

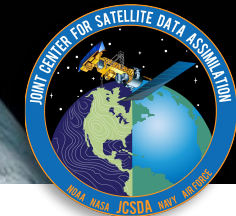
Progressing toward initial goal to match skills of operational systems

Microwave	Satellite	Altimeter	Satellite
Aquarius L-band	SAC-D	SIRAL	Cryosat-2
AMSR-2	GCOM-W	RA Ku band	ERS-1
GMI	GPM	RA Ku band	ERS-2
SAR L-band	SMAP	ASAR	Envisat
MIRAS	SMOS	RA	Geosat
SSMI	F14-F15	GLAS	ICESat
SSMI/S	F16-F17-F18	ATLAS	ICESat-2
WINDSAT	Coriolis	Poseidon-2	Jason-1
Infrared	Satellite	Poseidon-3	Jason-2
ABI	GOES-16-17	Poseidon-3B	Jason-3
AHI	Himawari-8	AltiKa	Saral
AVHRR	NOAA-18-19 METOP-A-C	SRAL	Sentinel-3A
VIIRS	SNPP NOAA-20	Topex/Poseidon	Topex/Poseidon

Insitu platform	
Moorings	TAO, PIRATA, RAMA
Profiling floats	Argo
gliders	
saildrone	
Ships	
drifters	
HF Radar	
US East-West coast	
Gulf of Mexico	

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	

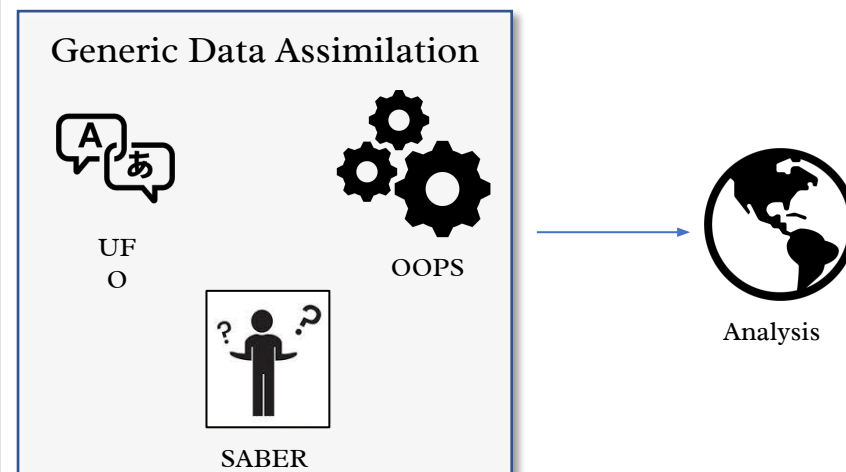
JEDI Model Interfaces



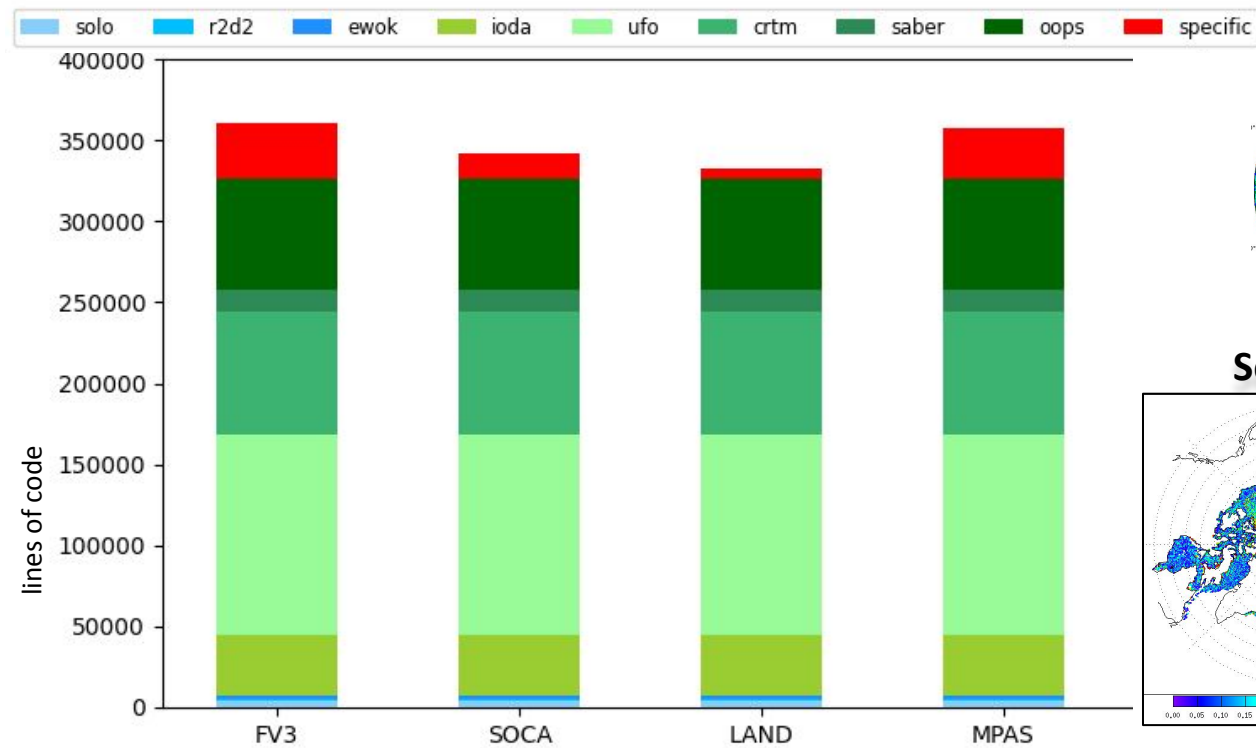
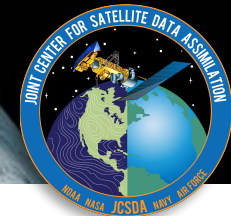
MODEL	TYPE	CENTER
UFS	Global Atmosphere	NOAA
GEOS	Global Atmosphere	NASA
NEPTUNE	Global atmosphere	Navy
MPAS	Global atmosphere	NCAR
LFRic	Global atmosphere	Met Office
Unified Model	Global atmosphere	Met Office
UFS CAM	Regional atmosphere	NOAA
MPAS-Regional	Regional atmosphere	NCAR
WRF	Regional atmosphere	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



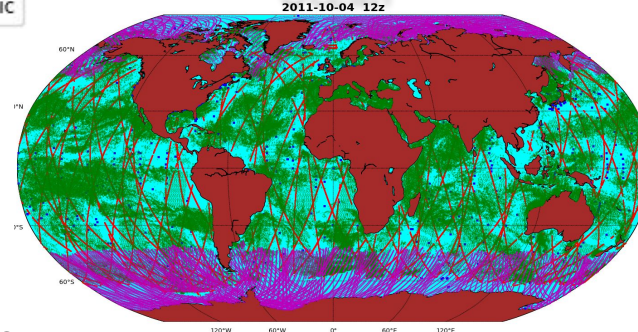
Mode
1



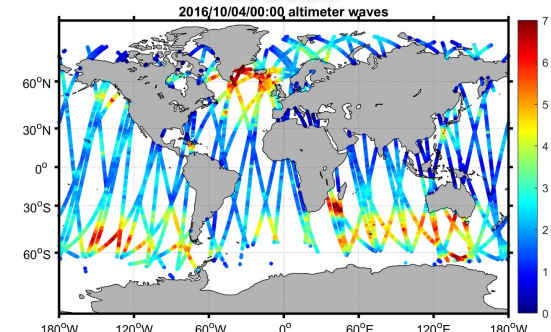
JEDI for Earth System DA



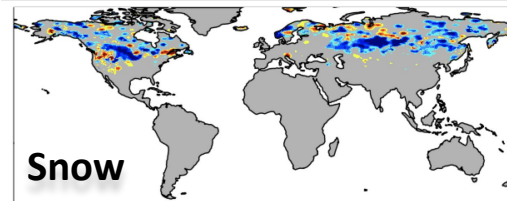
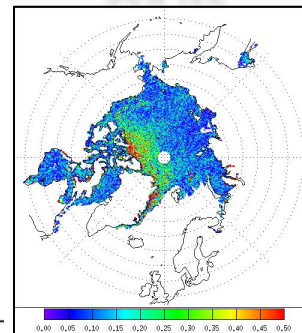
Ocean
2011-10-04 12z



Waves
2016/10/04/00:00 altimeter waves

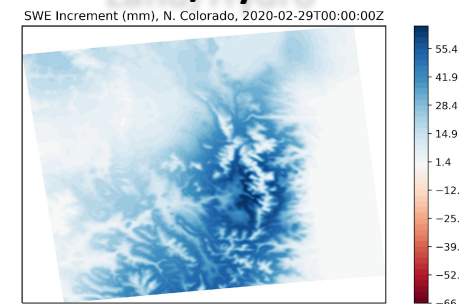


Sea Ice

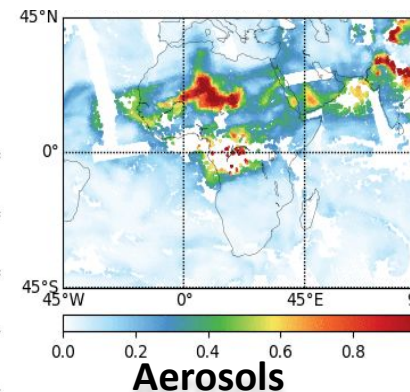
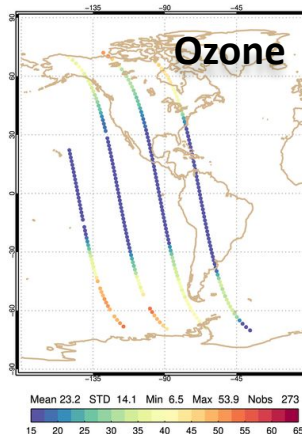


Snow

Land/Hydro
SWE Increment (mm), N. Colorado, 2020-02-29T00:00:00Z

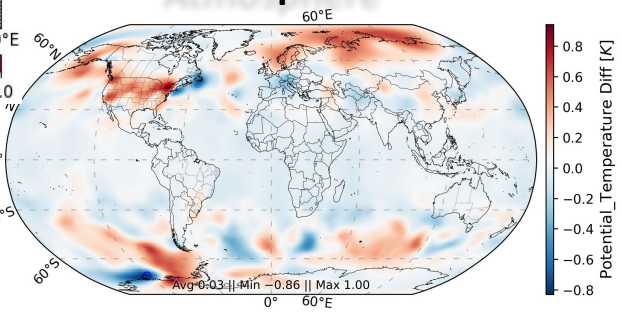


Ozone



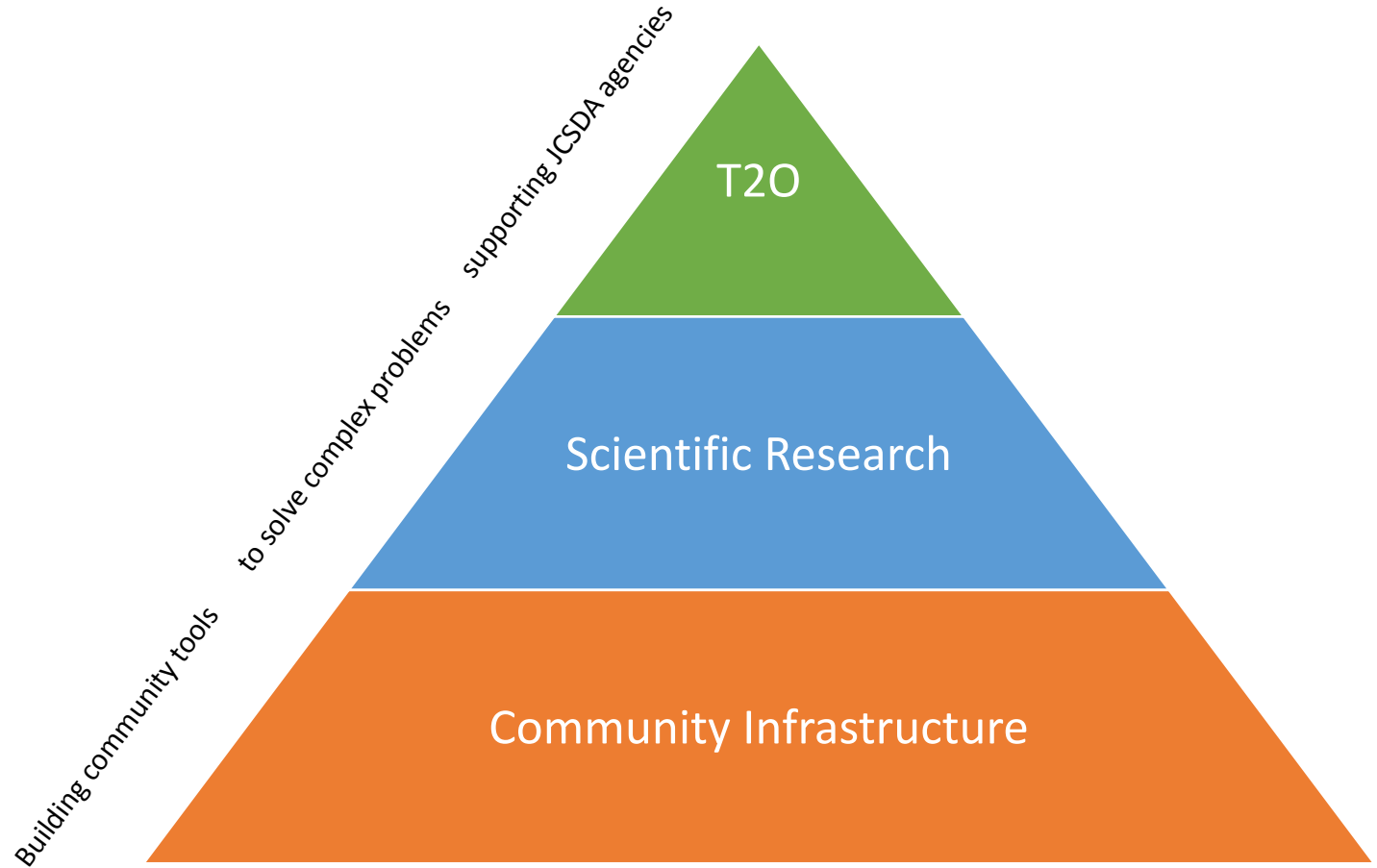
Aerosols

Atmosphere
Potential_Temperature Diff [K]

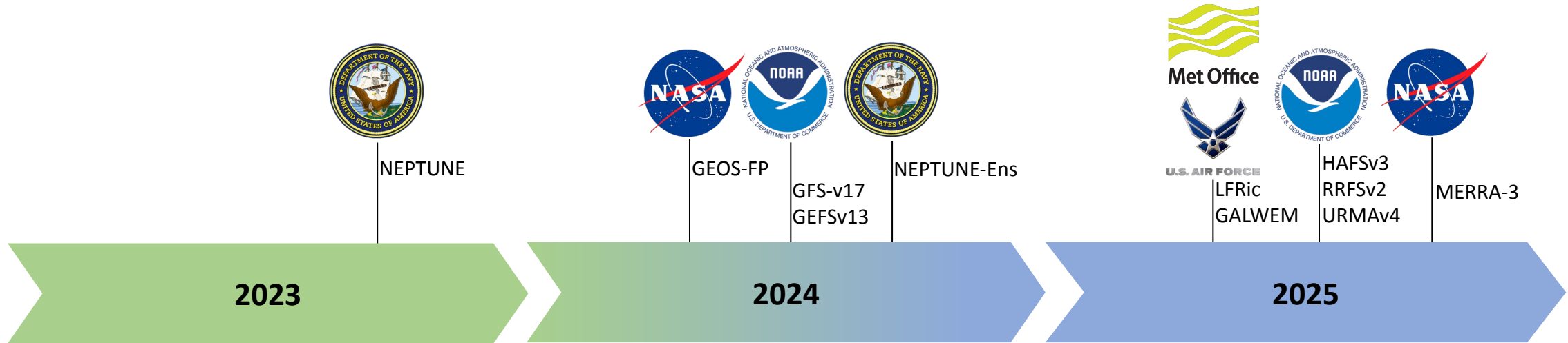
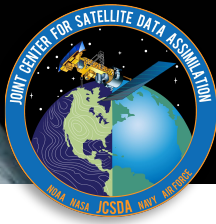


JEDI = Single DA system
with multiple configurations

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



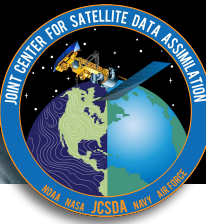
QUARTERLY NEWSLETTERS
AND REGULAR BLOGS

JCSDA Vision for SkyLab

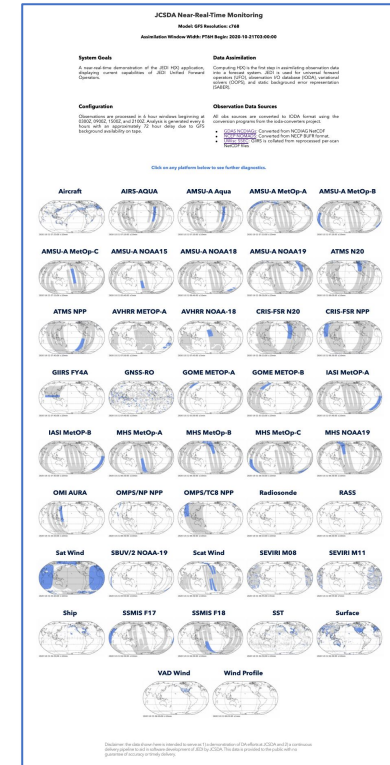
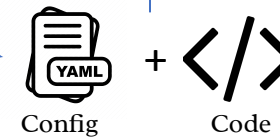
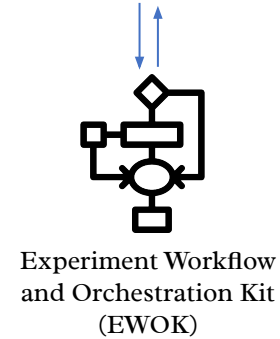
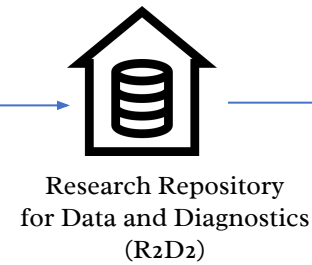
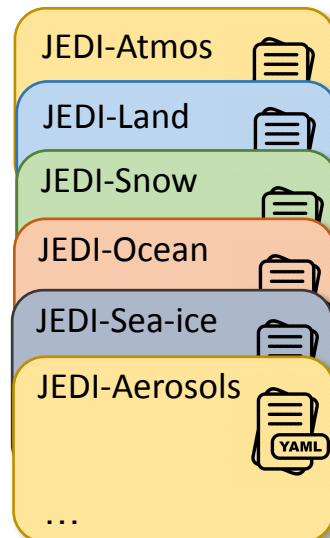
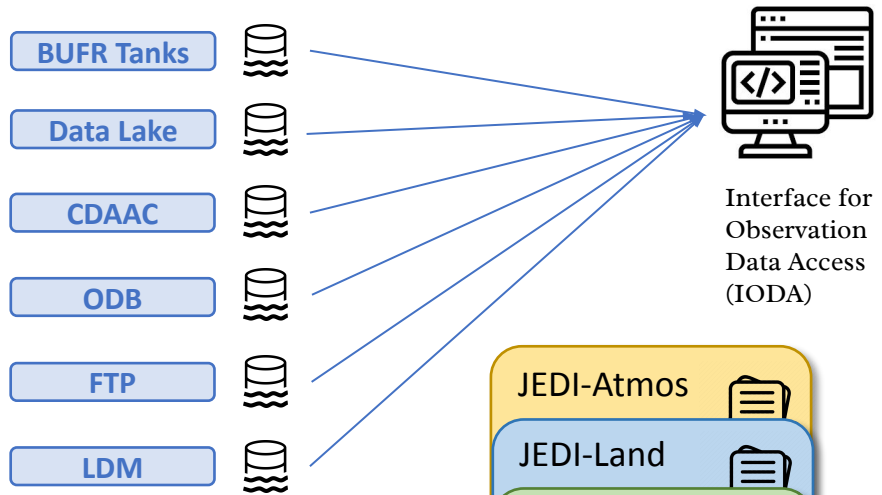
- **Demonstrator** and **point of convergence** for **joint** science and tech. achievements
- Community access to *real-world* experimental testbed + rapid validation (e.g. obs. impact, new algo., performance)
- Provide default configuration for downstream operational applications



SkyLab Ecosystem Design



Observations

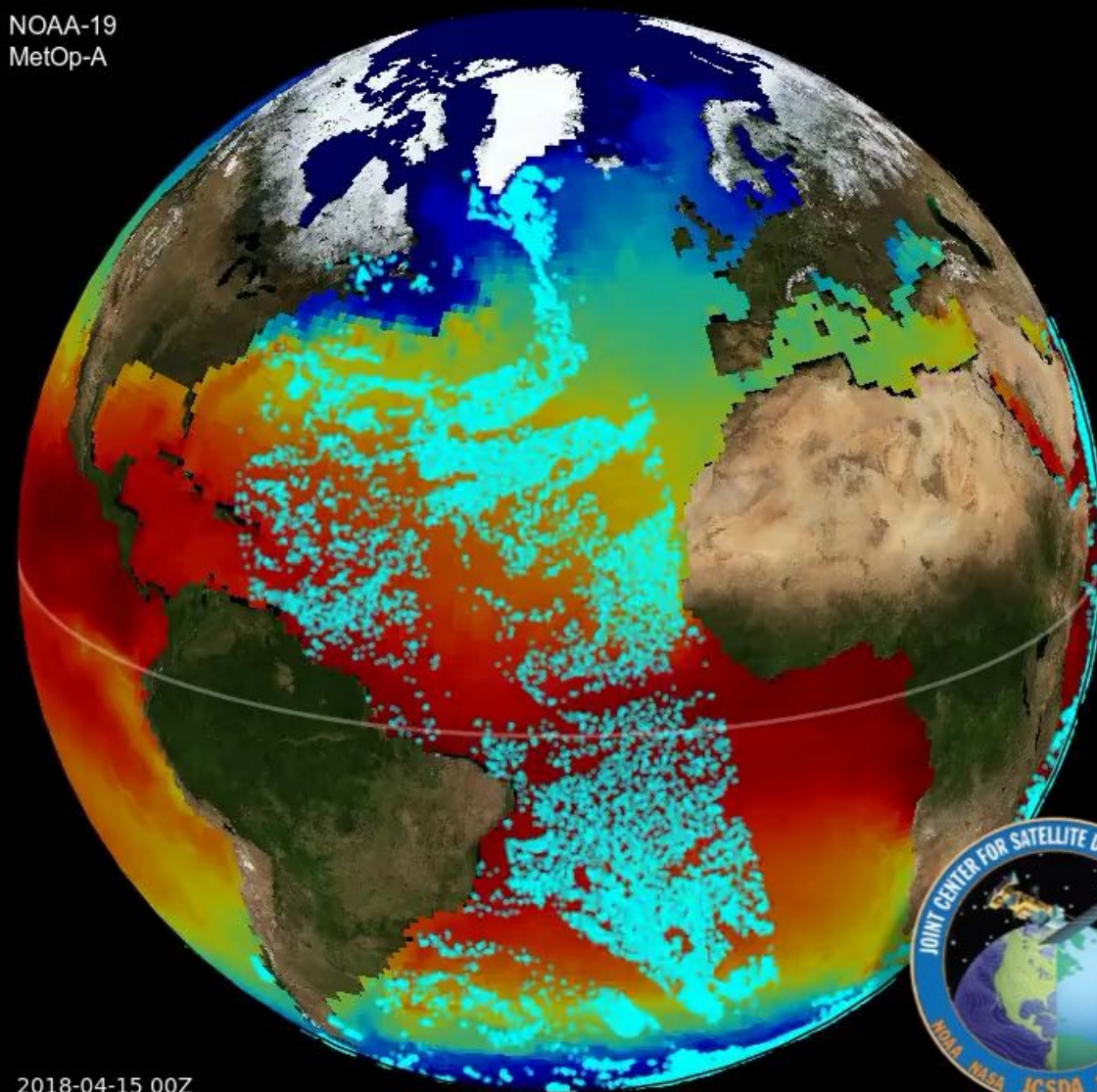




U.S. AIR FORCE

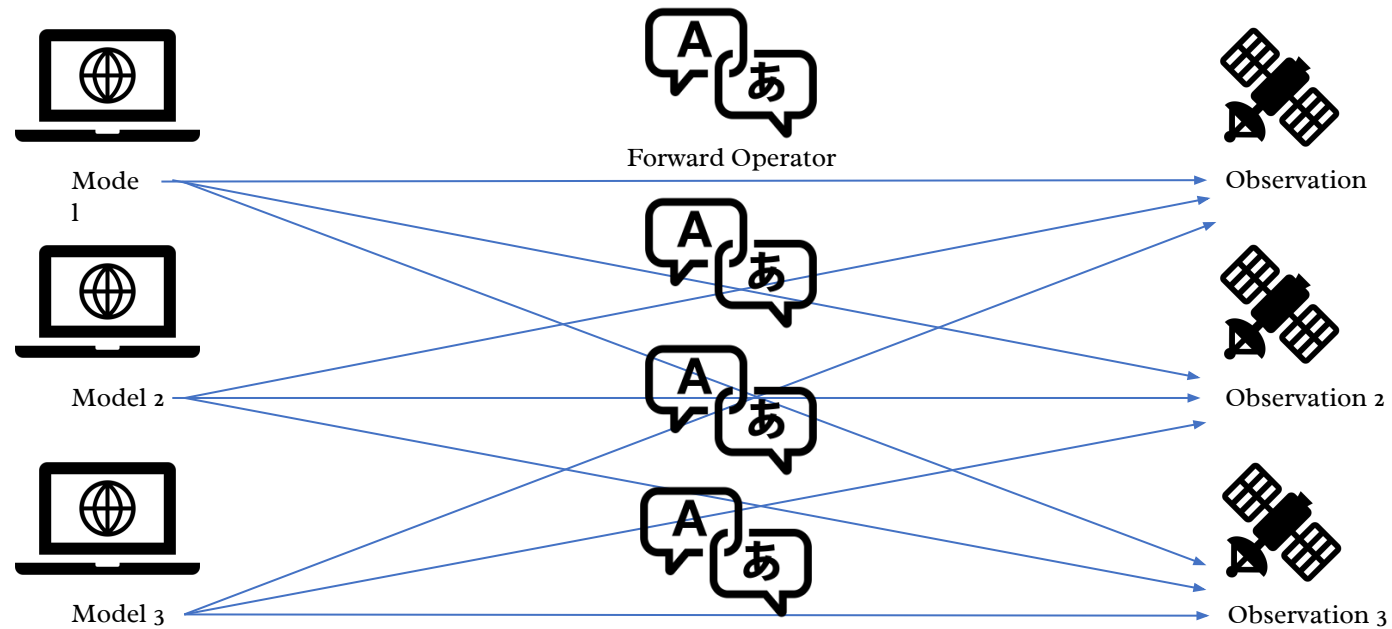
Discussion

SST
NOAA-19
MetOp-A



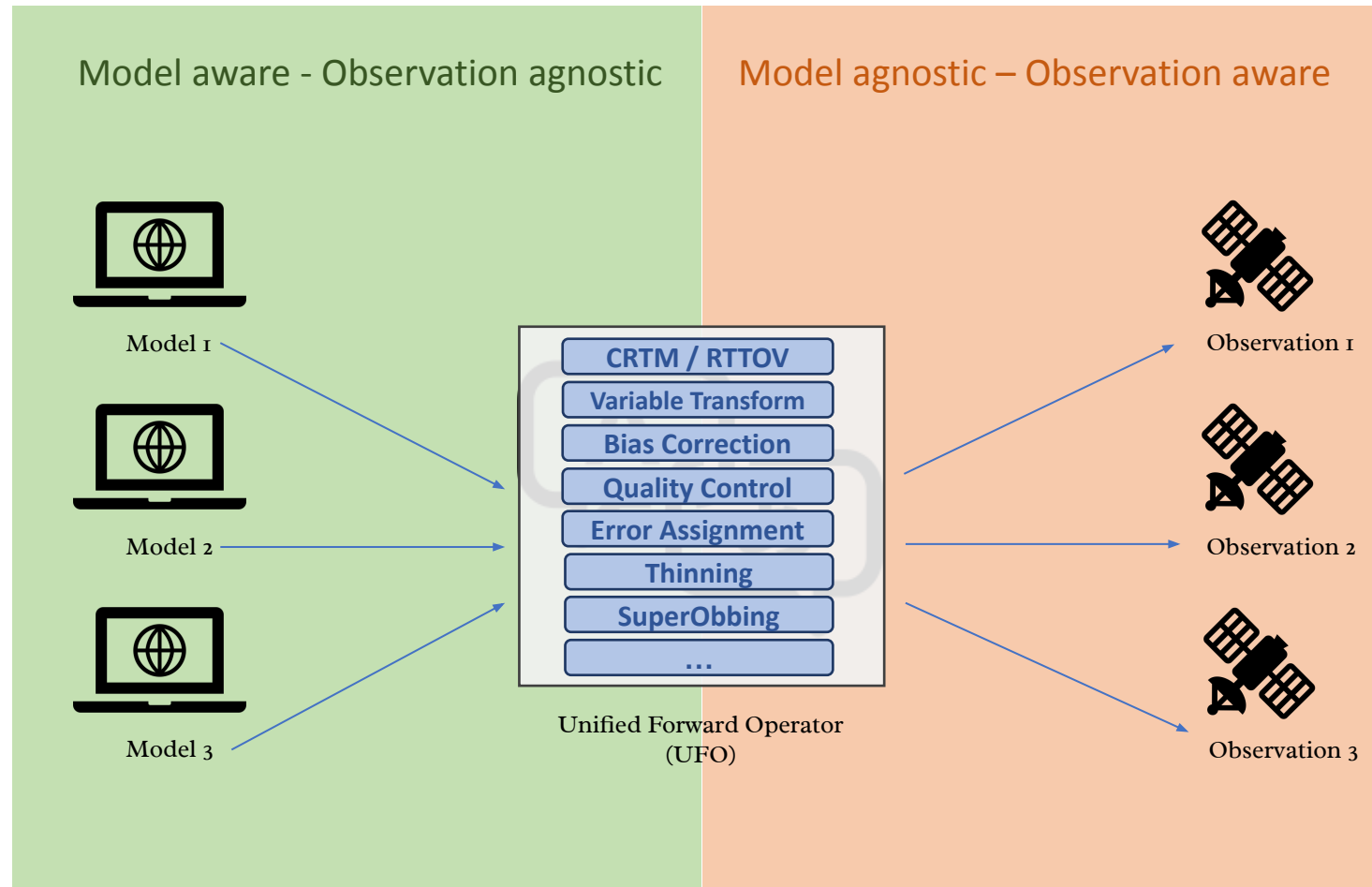
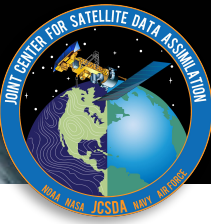
2018-04-15 00Z

Forward Operators (Traditional Approach)



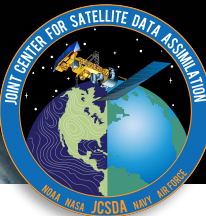
Duplication of effort

Unified Forward Operator (UFO)



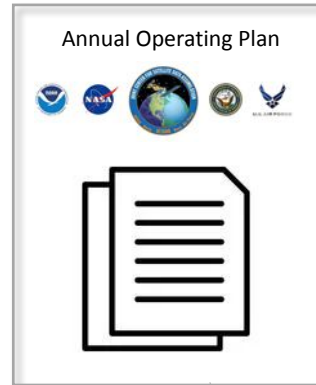
The App Store of observation operators!!

JCSDA Coordination, Collaboration, and Accountability



Collective Plan

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



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

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

JCSDA AOP2021 Quarter 1 Report
Prepared by F. Gburek, JCSDA Executive Officer

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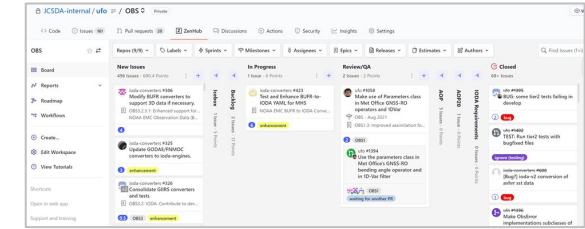
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QBS1-UPO				ASPD01-Q4	ASPD01-Q1	ASPD01-Q2	ASPD01-Q3	ASPD01-Q4	Team Lead: Hai Zhao	FTE					
Report	WBS #	Task	Deliverable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
UPO	QBS1.1	Improved constituent parameter estimation including periods	UPO improvements for constituent data products Use of R parameters for constituent assimilation MCCSI annual optical depth												
		Use of R parameters for constituent assimilation													
		MCCSI annual optical depth													
Report	WBS #	CTSM Model and Application Development	Deliverable	ASPD01-Q4	ASPD01-Q1	ASPD01-Q2	ASPD01-Q3	ASPD01-Q4	Team Lead: B. J. Bennett	FTE					
ASPD01-Q4	QBS1.1	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.2	Improved model integration in CTM	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.3	Code optimization	Code for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.4	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.5	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.6	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.7	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.34	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.36	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.37	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.38	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.39	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.54	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.66	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.68	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.69	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.71	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.77	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.78	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.87	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.88	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.89	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.90	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.93	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.95	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
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ASPD01-Q4	QBS1.97	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.98	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.99	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												
ASPD01-Q4	QBS1.100	General improvements and model validation	CTSM v3.5.2 Code with improved constituent parameters for assimilation and improved QBS1.1 model												

Work Breakdown
Structure (WBS)

Agile Board

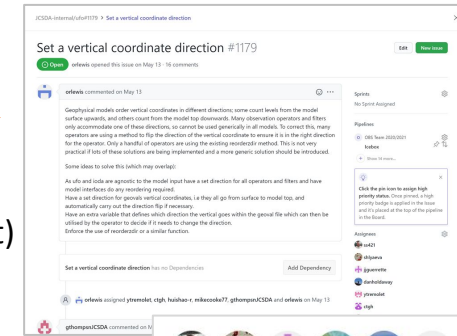


Quarterly reporting
against WBS activity

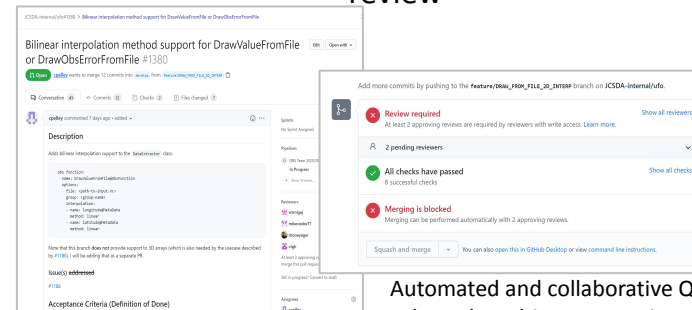
Reporting

Coordinated
Development Cycle

Issue
(Ticket)



Pull
Request
review



Automated and collaborative QC
through multi-agency reviews

Working-level collaboration

