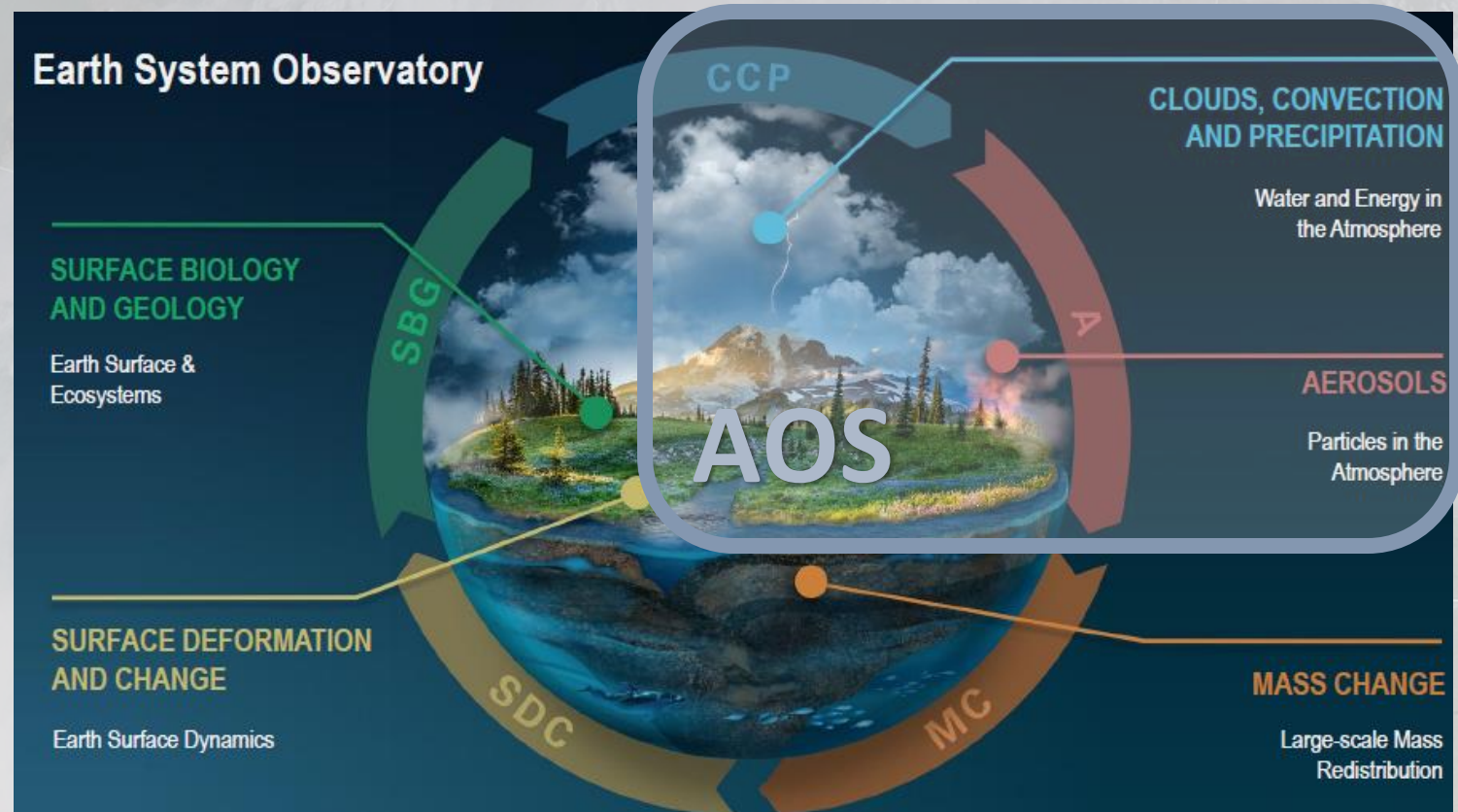


Atmosphere Observing System (AOS) and Applications

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NASA GSFC/SSAI



2017 Decadal Survey



Strong Applications Focus in DS

**Earth Information is
Increasingly Critical
to *Thriving* on our
Planet**

Weather Forecasts,
Modeling, Severe
Weather Outlooks,
Mitigating High
Impact Events

Exposure Estimates,
Pollution Mitigation,
AQ Forecasts

Rainfall + Disease

National Defense,
Mission Planning,
Response

?

Floods, Drought,
Wildfires, Volcanos,
Landslides

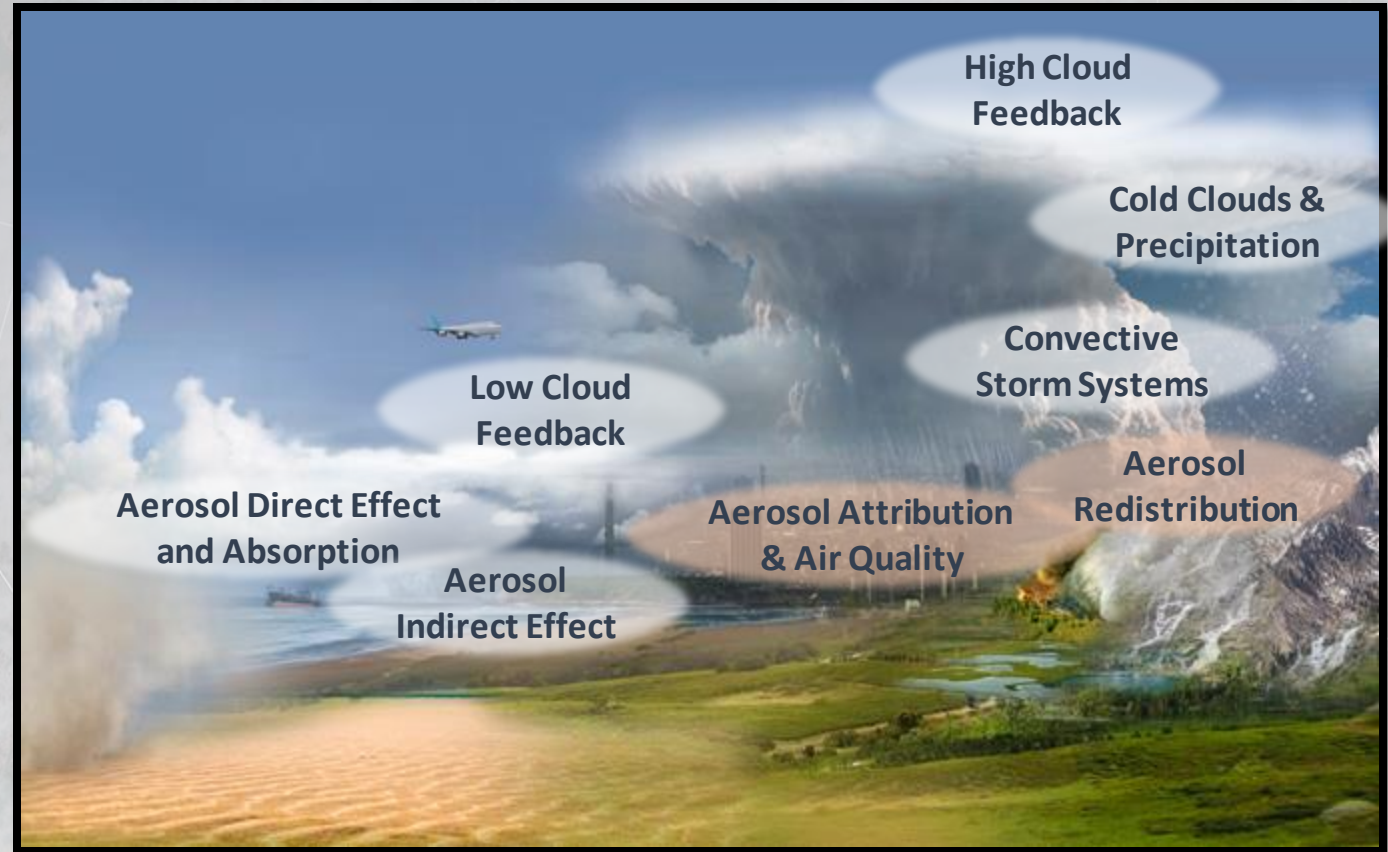
Water Resources,
Solar Energy

From Decadal Survey press conference, January 2018

****Putting thought into applications prior to a mission launching can ultimately amplify societal benefit of NASA missions.**

AOS Science

- The Atmosphere Observing System (AOS) will provide transformative three-dimensional space-based and suborbital observations of essential collocated cloud, dynamic, precipitation and aerosol processes, leading to improved predictions of weather, air quality and climate for the benefit of society



AOS Architecture



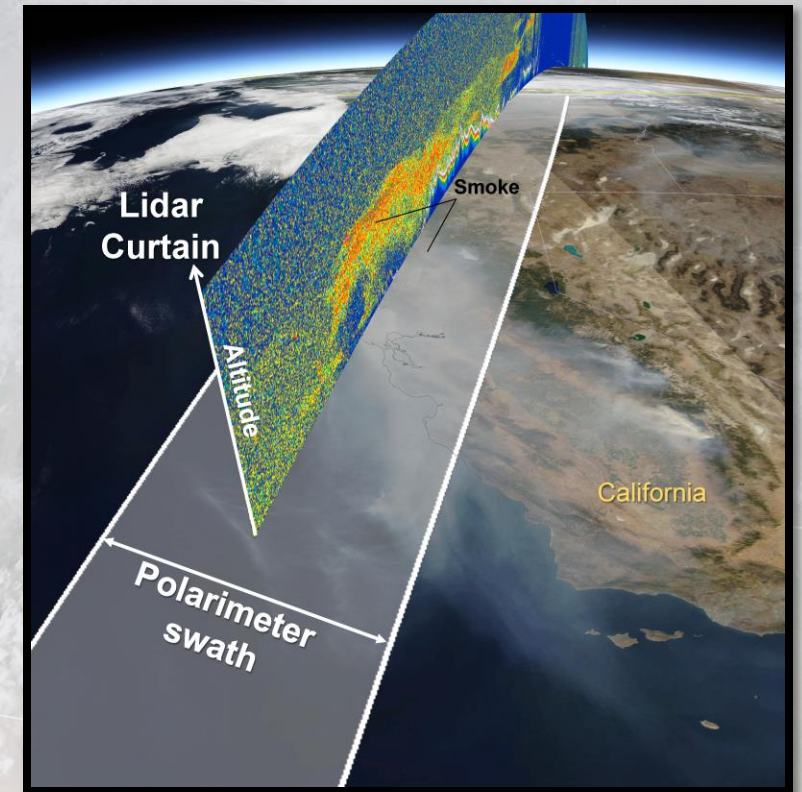
* AOS architecture not final

- Two orbits
- AOS-P
 - Polar orbit
 - Sun synchronous, passes over a given location at the same time every day
 - Global coverage
- AOS-I
 - Inclined Orbit
 - Observes diurnal variability
 - 55°S - 55°N
 - Earlier launch

AOS Instruments for AQ

AOS-I1	
Backscatter Lidar	532nm, 1064nm Polarization at 532 nm and 1064 nm
AOS-P1	
HSRL Lidar	532nm HSRL, 1064nm Polarization at 532 nm and 1064 nm
Polarimeter	UV/VIS, VNIR/SWIR Narrow Swath

* AOS architecture not final



AOS Timeline

AOS is in the early stages of mission design

↑
We are
here

↑
TEMPO

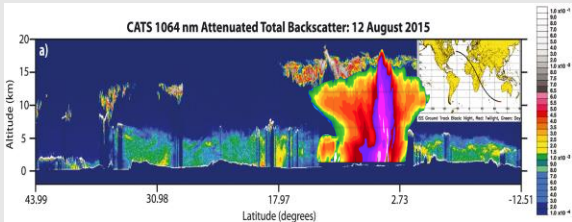
↑
PACE
MAIA

↑
AOS-I
Launch

↑
AOS-P
Launch

Inclined Orbit

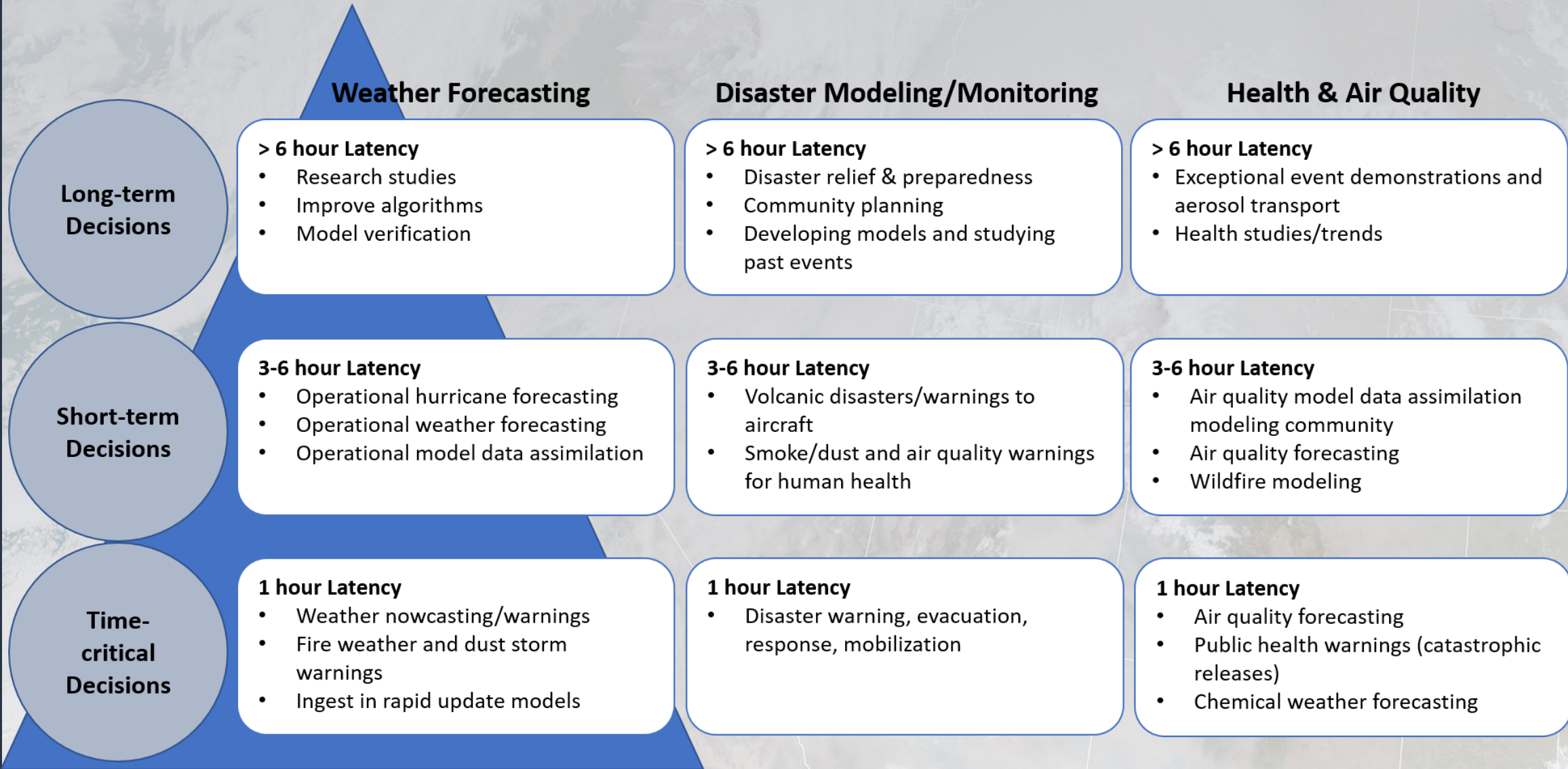
Instrument	AQ Relevant Variables	AQ Applications	How AOS observations can help
Backscatter lidar	- Vertical profiles of aerosol backscatter and extinction - Plume and cloud heights, vertical distribution of plumes - Cloud and aerosol feature masks - Aerosol type (e.g., dust vs. smoke), size - Other lidar sensors: CALIPSO, CATS	AQ modeling, monitoring, and forecasting	Diurnally varying aerosol and cloud heights improve AQ forecasting, NWP
		Public health	Aerosol extinction and types for modeling and PM2.5 estimation
		Wildfire smoke modelling	Vertical profiles improves tracking of smoke transport
		Volcanic ash advisories	Volcanic ash/sulfate discrimination and plume height supports hazard warnings



Polar Orbit

Instrument	AQ Relevant Variables	AQ Applications	How AOS observations can help
HSRL Lidar	- Vertical profiles of aerosol backscatter and extinction - Plume and cloud heights, vertical distribution of plumes - Cloud and aerosol feature masks - Aerosol type (e.g., dust vs. smoke), size, - Other lidar sensors: CALIPSO, CATS	AQ modeling, monitoring, and forecasting	Aerosol and cloud heights improve AQ forecasting, NWP
		Public health	Aerosol extinction and types for modeling and PM2.5 estimation
		Wildfire smoke modelling	Vertical profiles improves tracking of smoke transport
		Volcanic ash advisories	Volcanic ash/sulfate discrimination and plume height supports hazard warnings
Polarimeter	- AOD - Plume heights - Aerosol absorbing optical depth (AAOD) - Aerosol fine mode optical depth - Other sensors: MAIA, PACE	Air quality monitoring, modeling, and hazardous plume warning	Plume heights inform hazardous plume forecasts, and aerosol type information improve AQ modeling and forecasting
		Public health	Provides larger swath and wider context for the lidar footprint to enable estimates of extinction and aerosol emissions, aerosol type, and PM2.5 estimates

Latency





**AOS explores how aerosols,
clouds and precipitation
interact to impact our
weather and climate,
addressing real-world
challenges to benefit society.**

air quality
forecasting

climate
modeling

aerosol &
precipitation
interactions

numerical
weather
prediction

weather
forecasting
& modeling

health &
ecological
forecasting &
monitoring

operational air
quality forecasting

air quality rule &
regulation
making

health
insurance &
reinsurance

estimating air
pollution

transportation &
logistics

solar & wind
energy
planning

hydropower
assessment &
modeling

agricultural
modeling &
monitoring

water resource
management

hydrologic
modeling for
drought

disaster modeling
for volcanos &
smoke

disaster risk
for insurance

disaster
monitoring &
modeling for
floods &
landslides

How can I get involved with AOS?



We are
here

AOS-I
Launch

AOS-P
Launch

<https://aos.gsfc.nasa.gov/>

- Attend AOS events
 - AOS Community Forums
 - AOS Application Seminars
 - Thematic Workshops
- Email the Applications Coordinator: andrea.m.portier@nasa.gov to get on our mailing list

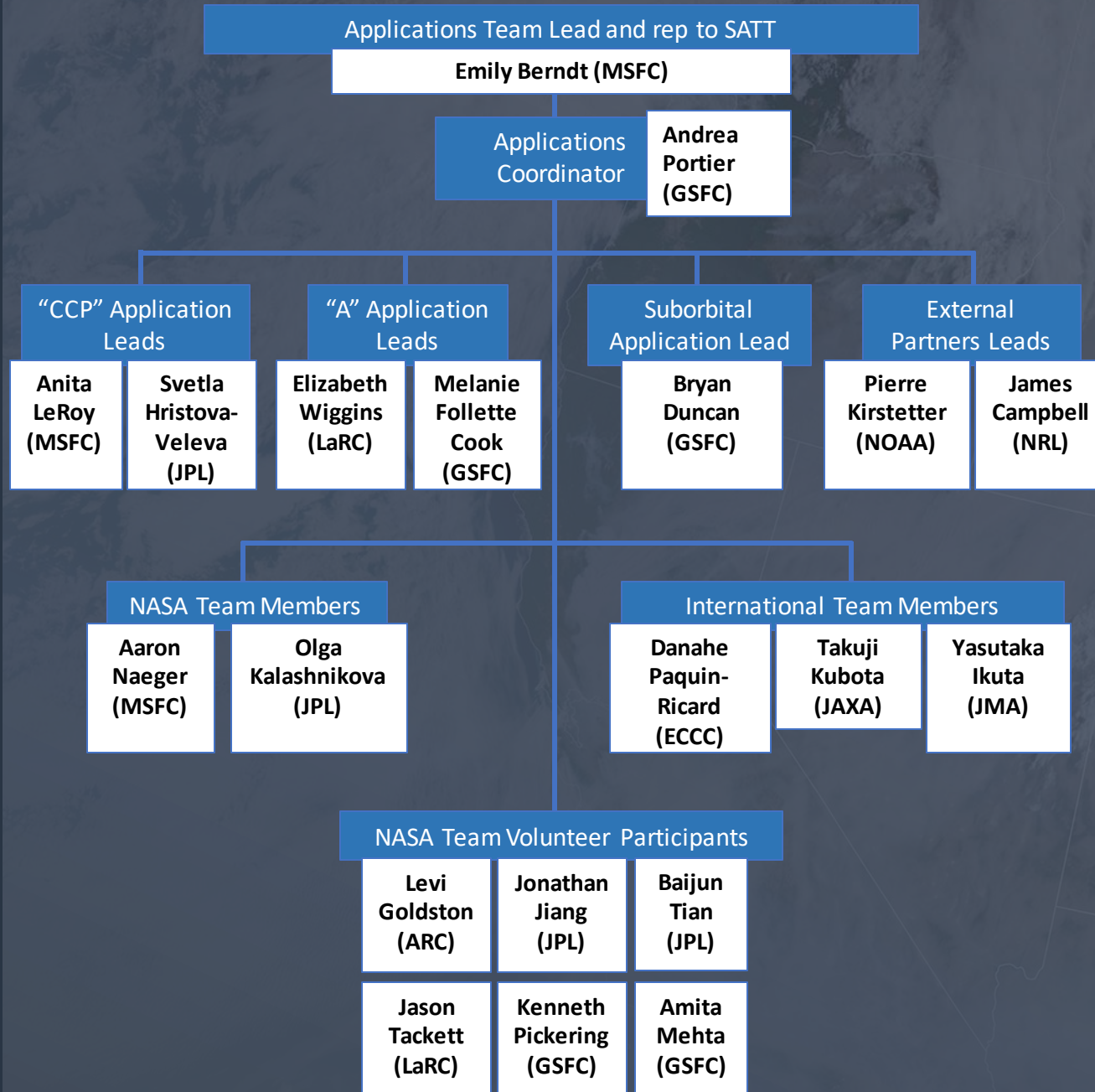
Thank you!



<https://aos.gsfc.nasa.gov/>

Extra





The Applications Impact Team (AIT) is charged with **ensuring that applications are considered to the greatest extent possible in mission design.**

Activities

- Project Studies: applications-oriented studies on latency, instruments needs, etc.) that would impact applications value
- Phase A Working Groups: Participate in Science Team discussions and report out (e.g., L1-L4 algorithm development and needs to inform L1 science requirements)
- Stakeholder outreach: Engage applications communities through workshops, thematic discussions, focus groups, newsletters, etc.
- Coordinate/Collaborate with other DO projects + HQ

Deliverables

- Project Applications Plan (Phase A Requirement)
- Community contact list
- Application needs white papers

Goals

Introduce topics to the community to foster a dialogue on:

- Opportunities to leverage AOS data products in stakeholder applications and research
- Existing gaps in data needs that may present future opportunities for ESO and AOS
- Engagement of communities to increase awareness of and participation in AOS
- Expand breadth of thematic areas covered in preparation for future activities, including Early Adopter Program

Community Assessment Report

- Deliverable: Pre-Phase A Requirement
- CAR serves to document and synthesize applications communities relevant to AOS, including communities of practice and potential
- CAR makes recommendations and provides suggested guidelines for how components of the AOS mission may be optimized for enhanced applications value