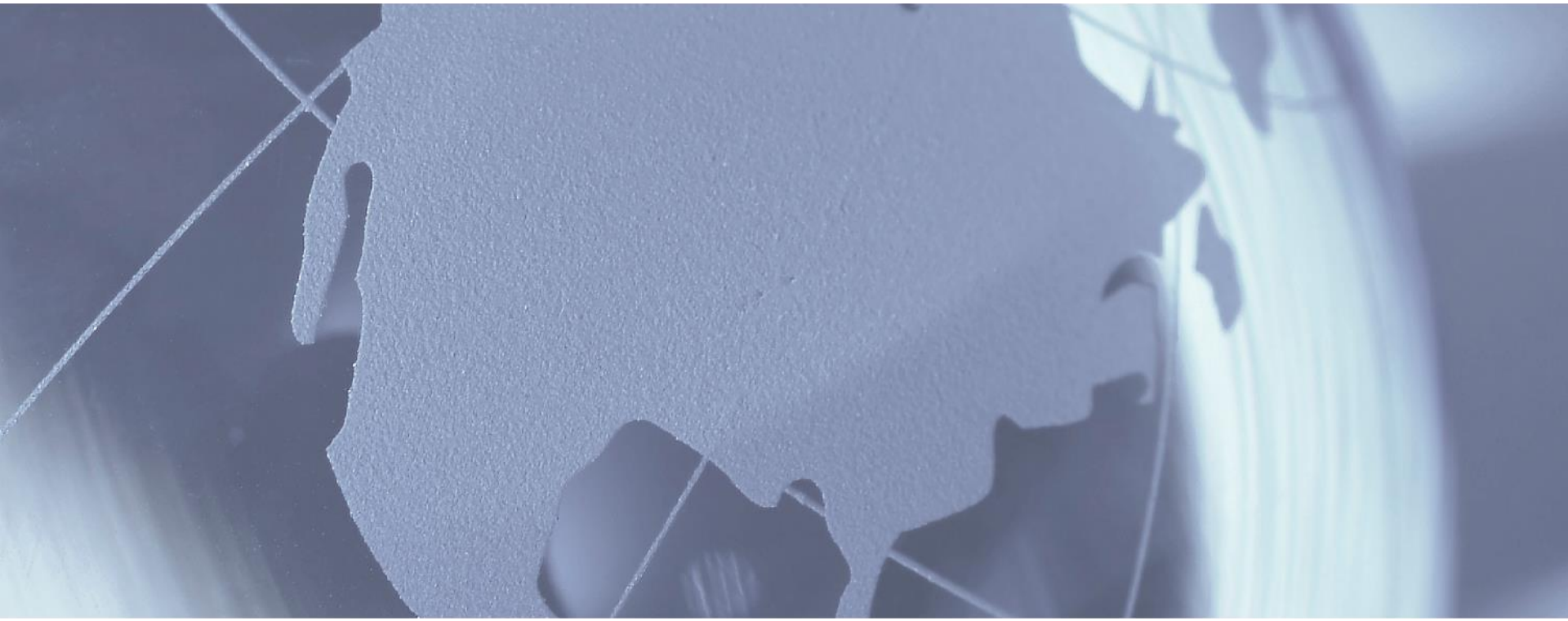

NOAA Observing Requirements, Observing Systems Capabilities and Analysis

Presented to: NOAA/NESDIS Workshop
Consideration of Commercial Data to Address Our Priority Data Needs

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Agenda

- NOAA's Requirements Process
  - Overview
  - Requirements Validation
  - Tools and Databases
  - Analysis
- Establishing Desired User Needs for Next-Generation Satellite Observations

NOAA Requirements Process Overview

1. COLLECT
- Line Offices identify both **research** & **operational** environmental observing requirements (req) – system independent
- Line Offices define minimally accepted Threshold (T) & Objectives (O) attribute values (see orange cells below)

2. VERIFY & VALIDATE
- Line Offices define Priority-1s reqs
- SMEs provide scientific documents to justify need + 5 attributes below*
- Validation docs only needed for Priority-1s reqs (not required for priority 2-3s)
- Line Offices/TPIO access provided docs

3. DOCUMENT
- TPIO creates observing requirement summary document
- Line Offices concur & sign

4. ENDORSE
- OSC approves observing req summary document
- NOSC Endorses

5. ADD TO DATABASE
- TPIO enters endorsed requirements into CORL **

**Snapshot of Consolidated Observation Requirements List (CORL)

(Note: Database contains more fields and information.)

Types of Requirements	Observation Requirement	Line Office	*Threshold (T) Objective (O)	*Geographic Coverage	*Vertical Resolution	*Horizontal Resolution	*Measurement Accuracy	*Sampling Interval	Data Latency
Operational Priority -1s	Atmospheric Pressure: Surface	NWS	T	Global	NA	100 km	1 hPa	6 hr	3 min
	Cloud Top Height	NWS	T	Global	NA	15 km	0.5 km	3 hr	3 min
	Lightning	NWS	T	Global	NA	4 km	30%	10 sec	1 min
Operational Prioirty-1 with Objective	Air Temperature: Boundary Layer	NWS	T	CONUS+AK+HI	150 m	10 km	1 K	1 hr	3 min
			O			5 km	0.5 K	15 min	
** Note: Threshold (T) is minimally acceptable attribute values with the Objective (O) being the goal; not all reqs have Objective attribute values and validation docs not required for Objective attributes									
Research Prioirty-1	Mercury Studies: Reactive Nitrogen	OAR	T	CONUS+AK+HI	10 m	100 m	10%	Seasonal (Summer, Biennial)	Unavailable
Note: Black Text – Operational Req; Blue Text – Research Req									
Operational Prioirty-2	Cloud Particle Size	NWS	T	North America + US Territories	150 m	2 km	1 mm	1 hr	3 min

CORL contains 1800+ observational requirements

NOAA Requirements Process Overview Validation Example

1. COLLECT → **2. VERIFY & VALIDATE** → 3. DOCUMENT → 4. ENDORSE → 5. ADD TO DATABASE **

**Snapshot of Consolidated Observing System List (CORL)

(Note: Database contains more fields and information.)

Types of Requirements	Observation Requirement	Line Office	*Threshold (T) Objective (O)	*Geographic Coverage	*Vertical Resolution	*Horizontal Resolution	*Measurement Accuracy	*Sampling Interval	Data Latency
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Operational Prioirty-2	Cloud Particle Size	NWS	T	North America + US Territories	150 m	2 km	1 mm	1 hr	3 min
Note: Validation documents not required for prioirity-2 (mission optimal) requirements									

Levels of Submitted Validation Documents

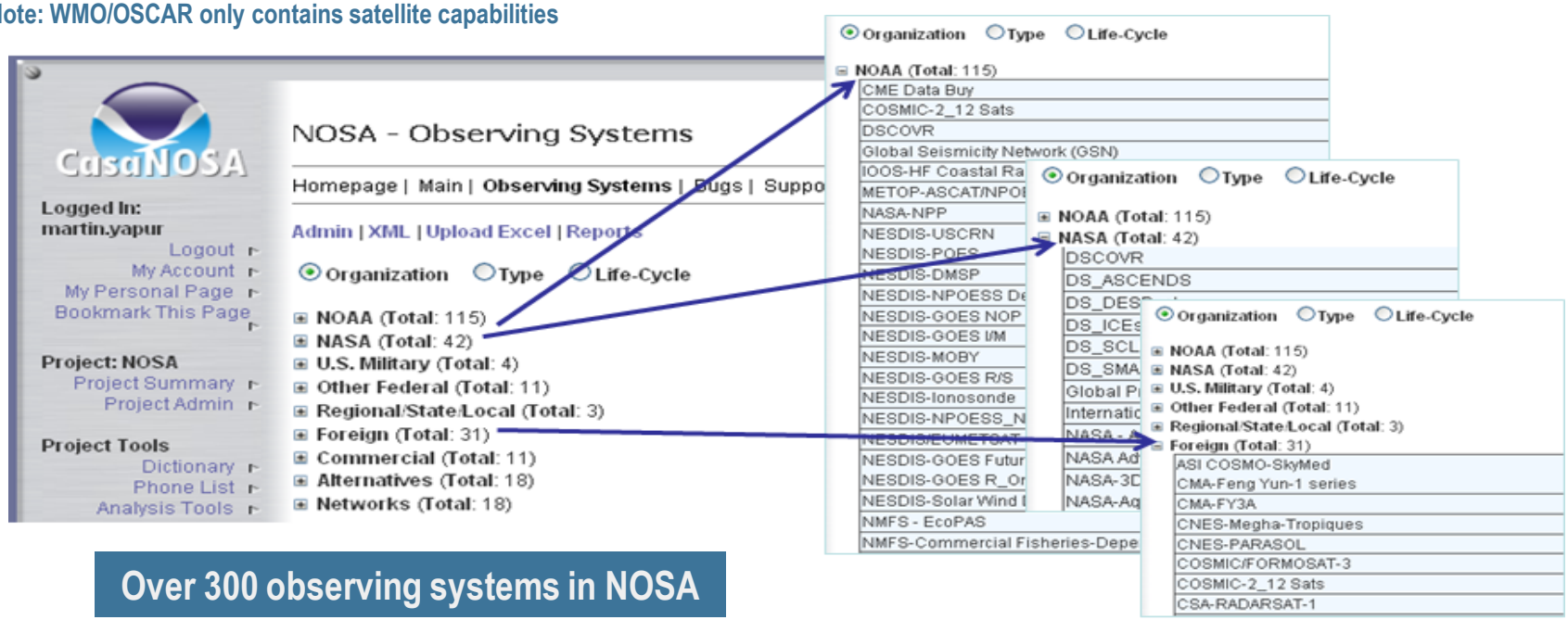
1 - Dark Green: Highest Level - Data Denials, Model Studies, OSE, OSSE, etc. (none depicted on slide)	2 - Light Green: Operational Procedures; Interagency or International Agreements; Congressional Mandates; Peer-reviewed Journal articles; Requirements reviewed by higher level bodies (Government Advisory Boards, NRC, or interagency/international bodies/agreements, e.g., WMO)	3 - Yellow: Subject Matter Expert (SME) Statements	4 - Red: Unable to validate at the specified attribute level. (none depicted on slide)

NOAA Observing Systems and Capabilities

NOAA Observing System Architecture (NOSA)

- A comprehensive database containing NOAA and external observing system metadata
- Information was built with the assistance of NOAA observing system managers, research and operational, within and outside of NOAA (leverages WMO/OSCAR*)
- Includes observing system metadata provided by Program Managers and System Owners - capabilities, cost, availability

* Note: WMO/OSCAR only contains satellite capabilities



Over 300 observing systems in NOSA

Analysis Capabilities:
CasaNOSA Requirements Tool (CASrT)

How well to do observing systems meet observing requirements?

Observing Requirement GCMD Variable	Line Office User		Geographic Coverage	Horizontal Resolution	Measurement Accuracy	Sampling Frequency	Data Latency
Sea Surface Temperature	NWS - NHC		TC/Marine/Surface Analysis AOR	5 km	0.5 K	6 hr	Not Provided

Partial Listing of NOAA and External Observing Systems Sensing Sea Surface Temperature	Observing System	Sensing Element	Geographic Coverage	Horizontal Resolution	Measurement Accuracy	Sampling Frequency	Data Latency	RGA	Type
	S-NPP	VIIRS	Global Ocean	0.75 km	0.1 K	12 hr	2.3 hr	92	Satellite, Polar
	Aqua	MODIS	Global Ocean	1 km	0.2 K	12 hr	1.5 hr	91	Satellite, Polar
	Terra	MODIS	Global Ocean	1 km	0.2 K	12 hr	1.5 hr	91	Satellite, Polar
	MetOp	AVHRR/3	Global Ocean	1 km	0.5 K	12 hr	6 hr	90	Satellite, Polar
	POES Series	AVHRR/3	Global Ocean	1 km	0.5 K	12 hr	6 hr	90	Satellite, Polar
	GOES 12-15	NOP Imager	Hemispheric US	6 km	0.6 K	1 hr	1 hr	71	Satellite, Geo
	GOOS ORS	Floating SST	Global Ocean	3530 km	0.002 K	5 min	5 min	62	Buoy
	SOOP	SEAS	Global Ocean	1000 km	0.15 K	0.1 hr	6 hr	61	Ship
	OCO Drifting Buoy	SST	Global Ocean	308 km	0.15 K	0.1 hr	6 hr	61	Buoy
	VOS	Bucket	Global Ocean	600 km	0.15 K	3 hr	6 hr	60	Ship
	GCOM-W	AMSR-2	Global Ocean	40 km	0.5 K	20 hr	2.2 hr	58	Satellite, Polar
	TAO	AMOD	Equatorial Ocean	1420 km	0.01 K	.17 hr	.17 hr	54	Buoy

NOAA Requirement Gap Assessment (RGA) Assessment Color Scheme					
Exceeds Requirements RGA ≥ 92	Meets Requirements 85 ≤ RGA < 92	Substantially Meets Requirements 75 ≤ RGA < 85	Some Degradation 65 ≤ RGA < 75	Moderate Degradation 55 ≤ RGA < 65	Does Not Meet Requirements RGA < 55

Analysis Capabilities:
NOAA Observing Systems Integrated Analysis (NOSIA)

How well to do observing systems meet user needs?

- NOSIA is a analytical capability estimating the impact of observing systems upon NOAA's diverse services (climate, weather, fisheries, ocean and coastal communities)
- Supports analysis of observing system architecture impacts and return-on-investment to current product and services, incorporates organizational priorities, and observing system investment planning

Heat Map Table

	NOAA Ships	GOES NOP Platform/Program	Commercial Fisheries Dependent Data Surveys
	Impact Category	Impact Category	Impact Category
NOAA Missions	Very High	Very High	Very High
Climate	Very High	High	Low
Assessments of Climate Changes and Its Impacts	Very High	High	
Climate Mitigation and Adaptation Strategies	Very High	Low	Low
Climate Prediction and Projections	High	High	
Climate Science and Improved Understanding	Very High	Very High	
Healthy Oceans	Very High	Low	Very High
Ecosystem Monitoring, Assessment and Forecast	Very High	Low	Very High
Fisheries Monitoring, Assessment and Forecast	High	Low	Very High
Habitat Monitoring and Assessment	Very High	Low	High
Protected Species Monitoring	Very High	Low	High
Science, Services, and Stewardship	Very High	Low	Low
Resilient Coastal Communities & Economies	Very High	Low	Moderate
Coastal Water Quality	Very High	Moderate	Low
Marine Transportation	High		
Resilience to Coastal hazards and Climate Change	High	Low	Low
Planning and Management	Very High	Low	High
Science, Services and Stewardship	Very High	Supplemental	
Weather Ready Nation	Supplemental	Very High	
Aviation Weather and Volcanic Ash		Very High	
Fire Weather		Very High	
Hurricane/Tropical Storms		Very High	
Hydrology and Water Resources		Very High	
Marine Weather and Coastal Events		Very High	
Routine Weather		Very High	
Severe Weather		Very High	
Space Weather		Very High	
Tsunami	Moderate		
Science, Services, and Stewardship	Low	Very High	
Winter Weather		Very High	

Rank Impact
Very High
High
Moderate
Low
Supplemental
No Impact

Establishing User Needs for Next-Generation Satellite Observations

- NESDIS will need a prioritized set of observational user needs on which the Next Generation Architecture will be based
- NESDIS plans to establish a satellite observation requirements working group to prioritize the user needs
  - Participants to be drawn from the remote sensing community and the NOAA Line Offices
  - WG will organize tiger teams as to explore key topic areas
  - TPIO will have lead role on WG and on Architecture Team for identifying satellite observational requirements
- Execution Plan:
  - Starting point is the requirements in CORL
  - Will use NOSA, CASrT, and NOSIA-2 tools
  - Architecture Team will work with requirements WG to establish instrument measurement requirements for architecture alternatives
- We want the architecture and requirements processes to be fully transparent to the remote sensing community—need your ideas on how to best engage.

Questions and Discussion