OSE/OSSEs at NOAA

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NOAA/NESDIS/STAR

OSE/OSSEs at NOAA

- NOAA Leadership view:
  - Relatively inexpensive way to:
    - Assess the impact of potential new observations
    - Refine and redirect current observing strategy and practices to fill critical mission needs
  - OSE/OSSEs are important and powerful tools
    - Fine tune NOAA's observing system to forecast needs
    - Optimize and prioritize expensive infrastructure investments
      - U.S. Integrated Ocean Observing System (U.S. contribution to GOOS)
        - » In-situ networks
        - » Satellite instruments (spectral/spatial/temporal resolution, orbit)
    - Identify observing system problems
  - NOAA should carry out OSSEs:
    - As part of the preparation for certain observation system deployments
      - E.g., new satellite instruments
        - » Ensure operational data processing/assimilation functional
        - » Maximize on-orbit availability

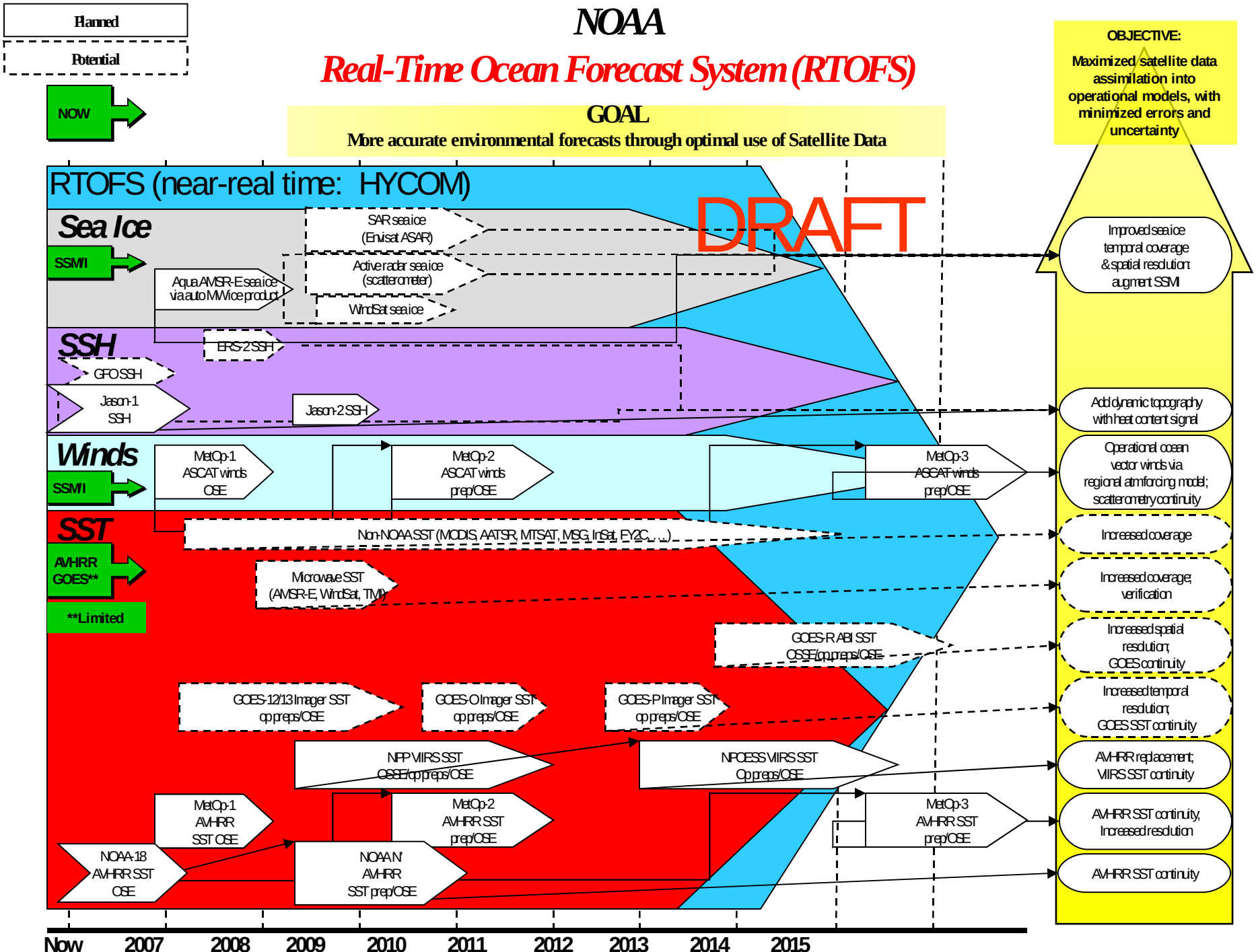
NOAA Experience

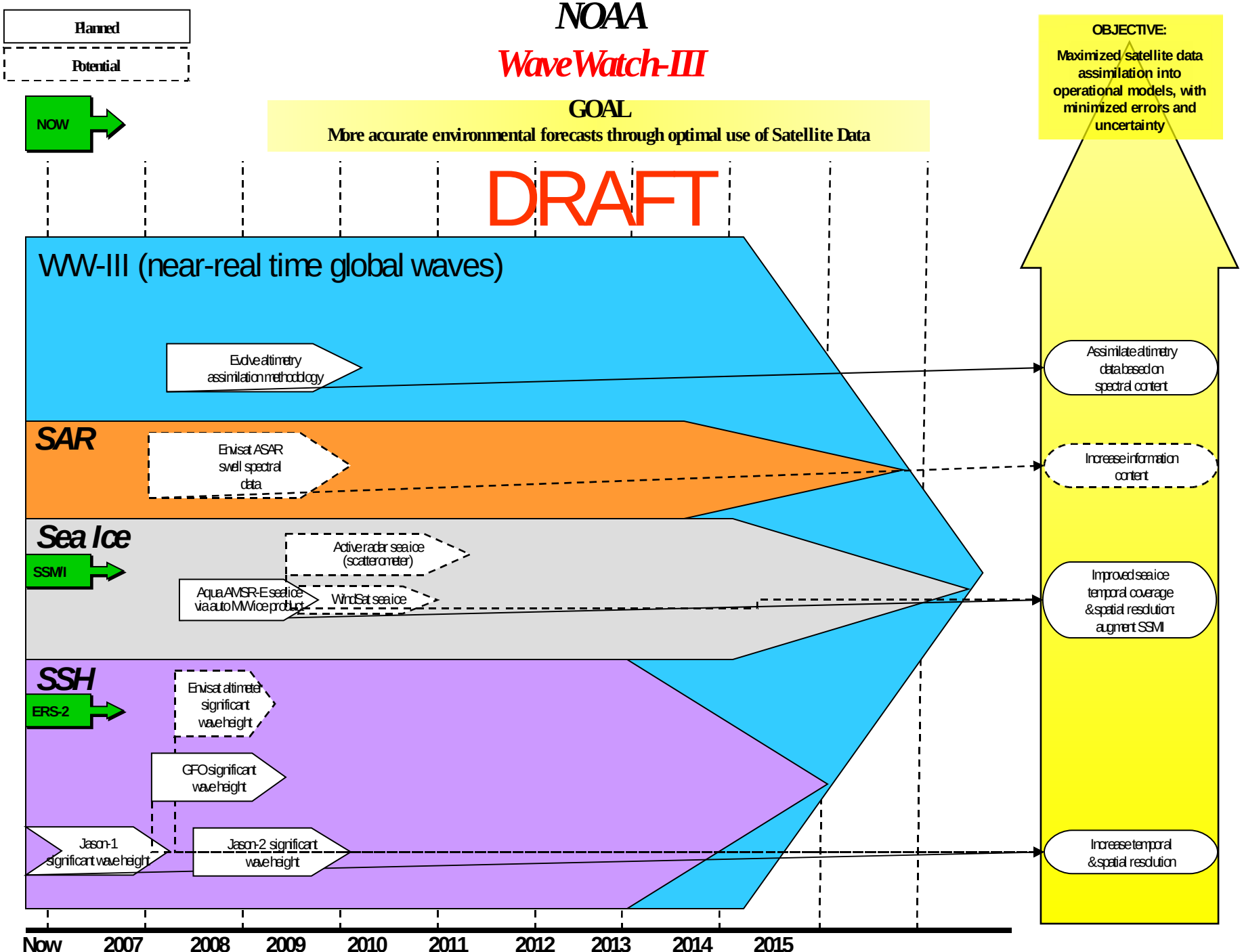
- Atmospheric modeling:
  - Notable experience in both OSEs and OSSEs
    - Example: AIRS (Aqua satellite – Atmospheric InfraRed Sounder) OSSE effort prior to launch permitted rapid incorporation of new instrument data into NOAA's operational system.
- Ocean modeling:
  - National Centers for Environmental Prediction (NCEP)
    - Operational models
      - OSE: In general, not formally done
        - » Some impact assessments
      - OSSE: No experience or capability
  - Research
    - Geophysical Fluid Dynamics Laboratory
      - Exploratory examination of 20th century vs 21st century observation networks with respect to capturing decadal/multi-decadal trends and interannual variability of heat content
        - » Salinity observations (ARGO) were found to be notably significant for global oceanic climate studies, particularly for correctly reconstructing the North Atlantic thermohaline circulation
    - Atlantic Oceanographic and Meteorological Laboratory (AOML)
      - Proposal to establish a national ocean OSSE capability

Proposed for Funding

	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14
OSE: METOP-A high-density SST		X						
OSE: altimetry (RTFOFS, WaveWatch III)		X	X					
OSSE System development for Ocean observations			X	X				
OSSE: NPP/NPOESS VIIRS ocean color					X		X	
OSE: NPP/NPOESS VIIRS SST				X			X	
OSE: sea-surface salinity (SMOS, Aquarius)				X				
OSSE: wide-swath altimetry				X				
OSSE: IOOS/NOAA observing system				X		X	X	X
OSE: Surface currents (HF radar, feature tracking					X		X	
OSE: NPP/NPOESS VIIRS ocean color						X		X
OSE: IOOS *in-situ* national backbone data					X			
OSE: GEOSS data stream(s)					X	X	X	X
OSSE: synthetic aperture radar OVW					X			
OSSE: GOES-R ABI SST						X	X	
Initiate/expand Ocean OSE capability			X		X		X	
Initiate/expand Ocean OSSE capability				X		X		X

Operational Models


Planned
Potential
NOW
NOAA
Real-Time Ocean Forecast System (RTOFS)
GOAL
More accurate environmental forecasts through optimal use of Satellite Data
OBJECTIVE:
Maximized satellite data assimilation into operational models, with minimized errors and uncertainty
RTOFS (near-real time: HYCOM)
DRAFT
Sea Ice
SSM/I
SAR sea ice (Envisat ASAR)
Active radar sea ice (scatterometer)
WindSat sea ice
Aqua AMSR-E sea ice via auto MW ice product
SSH
ERS-2 SSH
GFO SSH
Jason-1 SSH
Jason-2 SSH
Winds
SSM/I
MetOp-1 ASCAT winds OSE
MetOp-2 ASCAT winds prep/OSE
MetOp-3 ASCAT winds prep/OSE
SST
AVHRR GOES**
**Limited
Non-NOAA SST (MODIS, AATSR, MTSAT, MSG, InSat, FY2C, ...)
Microwave SST (AMSR-E, WindSat, TMI)
GOES-R ABI SST OSSE/opreps/OSE
GOES-12/13 Imager SST opreps/OSE
GOES-O Imager SST opreps/OSE
GOES-P Imager SST opreps/OSE
NPP VIIRS SST OSSE/opreps/OSE
NPOESS VIIRS SST Opreps/OSE
MetOp-1 AVHRR SST OSE
MetOp-2 AVHRR SST prep/OSE
MetOp-3 AVHRR SST prep/OSE
NOAA-18 AVHRR SST OSE
NOAA N' AVHRR SST prep/OSE
Improved sea ice temporal coverage & spatial resolution augment SSMI
Add dynamic topography with heat content signal
Operational ocean vector winds via regional atm forcing model; scatterometry continuity
Increased coverage
Increased coverage; verification
Increased spatial resolution; GOES continuity
Increased temporal resolution; GOES SST continuity
AVHRR replacement; VIIRS SST continuity
AVHRR SST continuity; Increased resolution
AVHRR SST continuity
Now
2007
2008
2009
2010
2011
2012
2013
2014
2015


Planned
Potential
NOW
NOAA
WaveWatch-III
GOAL
More accurate environmental forecasts through optimal use of Satellite Data
DRAFT
OBJECTIVE:
Maximized satellite data assimilation into operational models, with minimized errors and uncertainty
WW-III (near-real time global waves)
Evolve altimetry assimilation methodology
Assimilate altimetry data based on spectral content
SAR
Envisat ASAR swell spectral data
Increase information content
Sea Ice
SSMI
Active radar sea ice (scatterometer)
Aqua AMSR-E sea ice via auto MWice product
WindSat sea ice
Improved sea ice temporal coverage & spatial resolution augment SSMI
SSH
ERS-2
Envisat altimeter significant wave height
GFO significant wave height
Jason-1 significant wave height
Jason-2 significant wave height
Increase temporal & spatial resolution
Now
2007
2008
2009
2010
2011
2012
2013
2014
2015

NOAA

Global Ocean Data Assimilation System (GODAS) / Climate Forecast System (CFS)

Planned

Potential

NOW

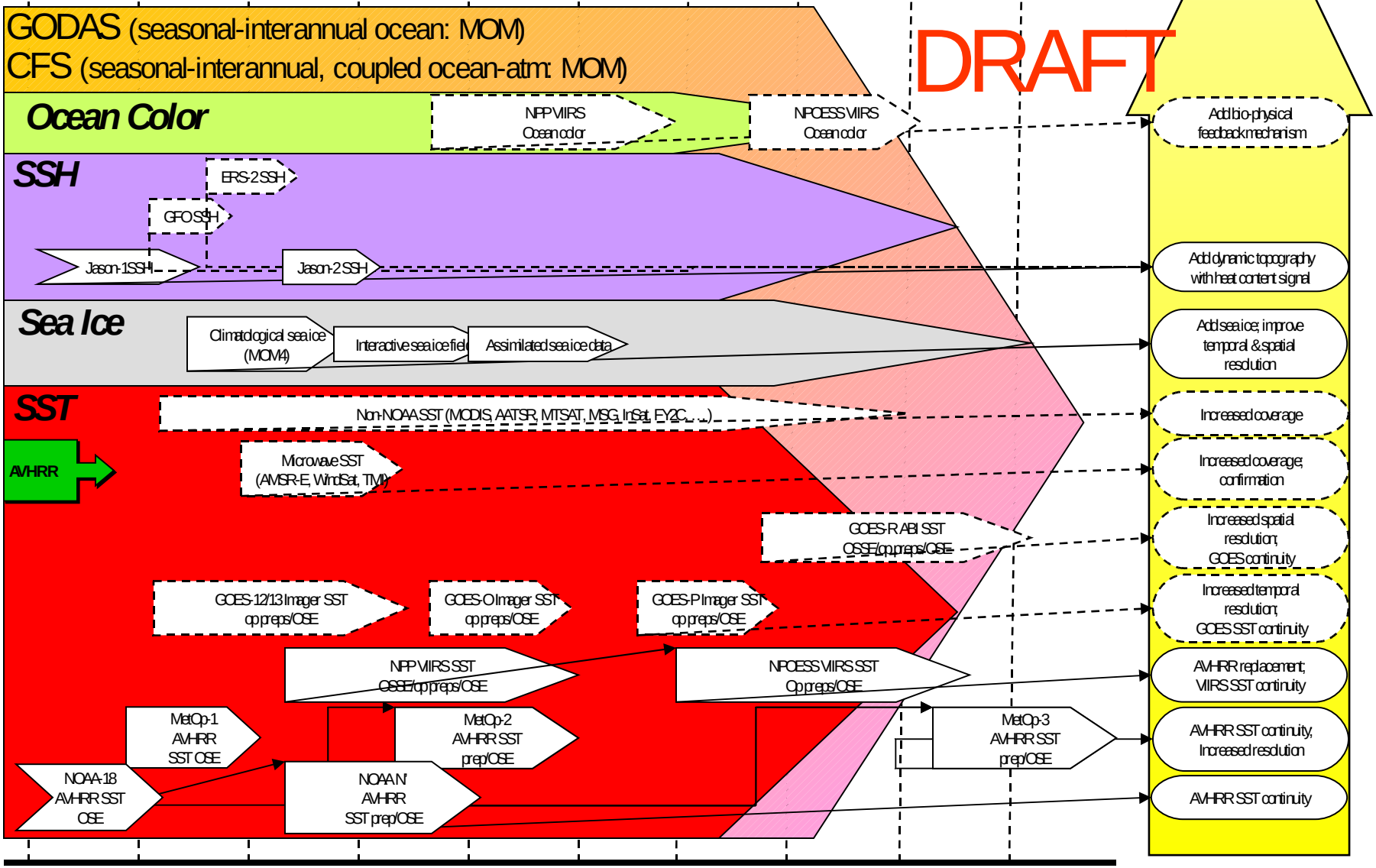
GOAL

More accurate environmental forecasts through optimal use of Satellite Data

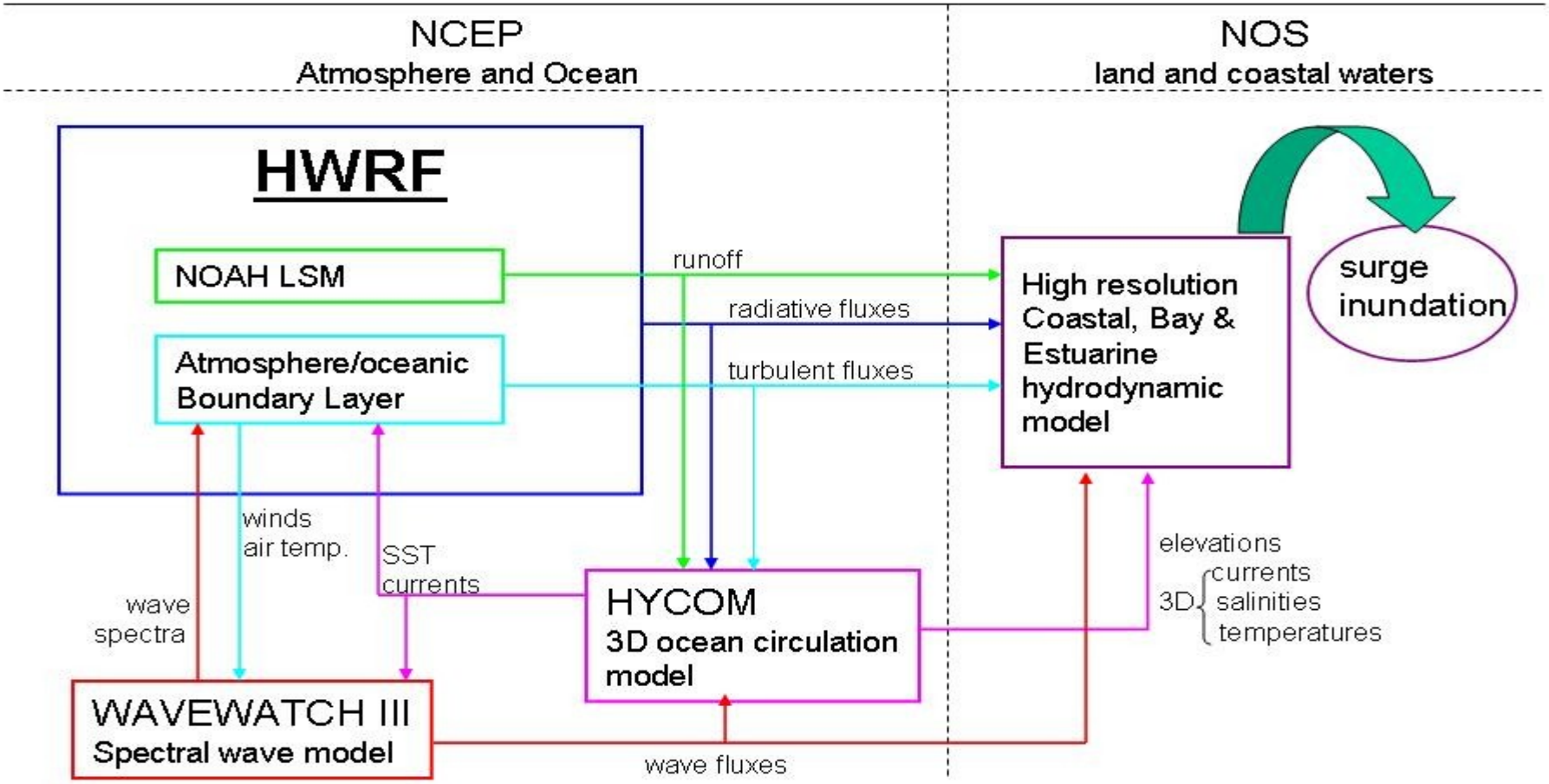
OBJECTIVE:

Maximized satellite data assimilation into operational models, with minimized errors and uncertainty

DRAFT



Hurricane-Wave-Ocean-Surge-Inundation Coupled Models *(Planned for 2007)*



OSE/OSSE Challenges

- Assimilation techniques
- Nested models
  - Downscaling issues
- Coastal / estuarine
  - Modeling
  - Observing system design
- Ecosystem modeling
  - Biogeochemical parameters
  - Modeling
  - Observing system design