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GLIMR Updates

Geostationary Littoral Imaging and Monitoring Radiometer (GLIMR):

Background and update

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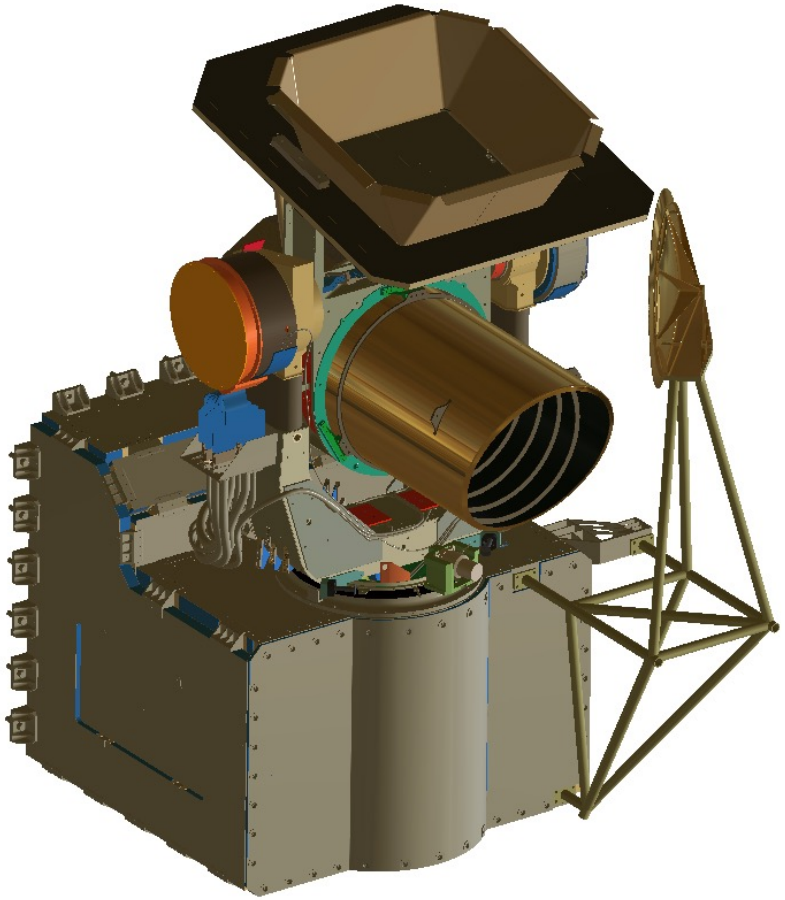
What is GLIMR?

It's NASA's newest Ocean Color instrument: A hyperspectral spectrometer in Geostationary orbit



Geostationary Littoral Imaging and Monitoring Radiometer (GLIMR):

Hyperspectral

- 340-1040 nm
- <10 nm resolution UV-Vis
- <5 nm sampling UV-Vis

High Temporal

- ~hourly scans of Gulf of Mexico (6x/day)
- 2x/day other regions
- 3x/day HAB target sites

High Spatial

- 300 m GSD nadir
- ~328 m Gulf of Mexico
- <500 m over coastal CONUS

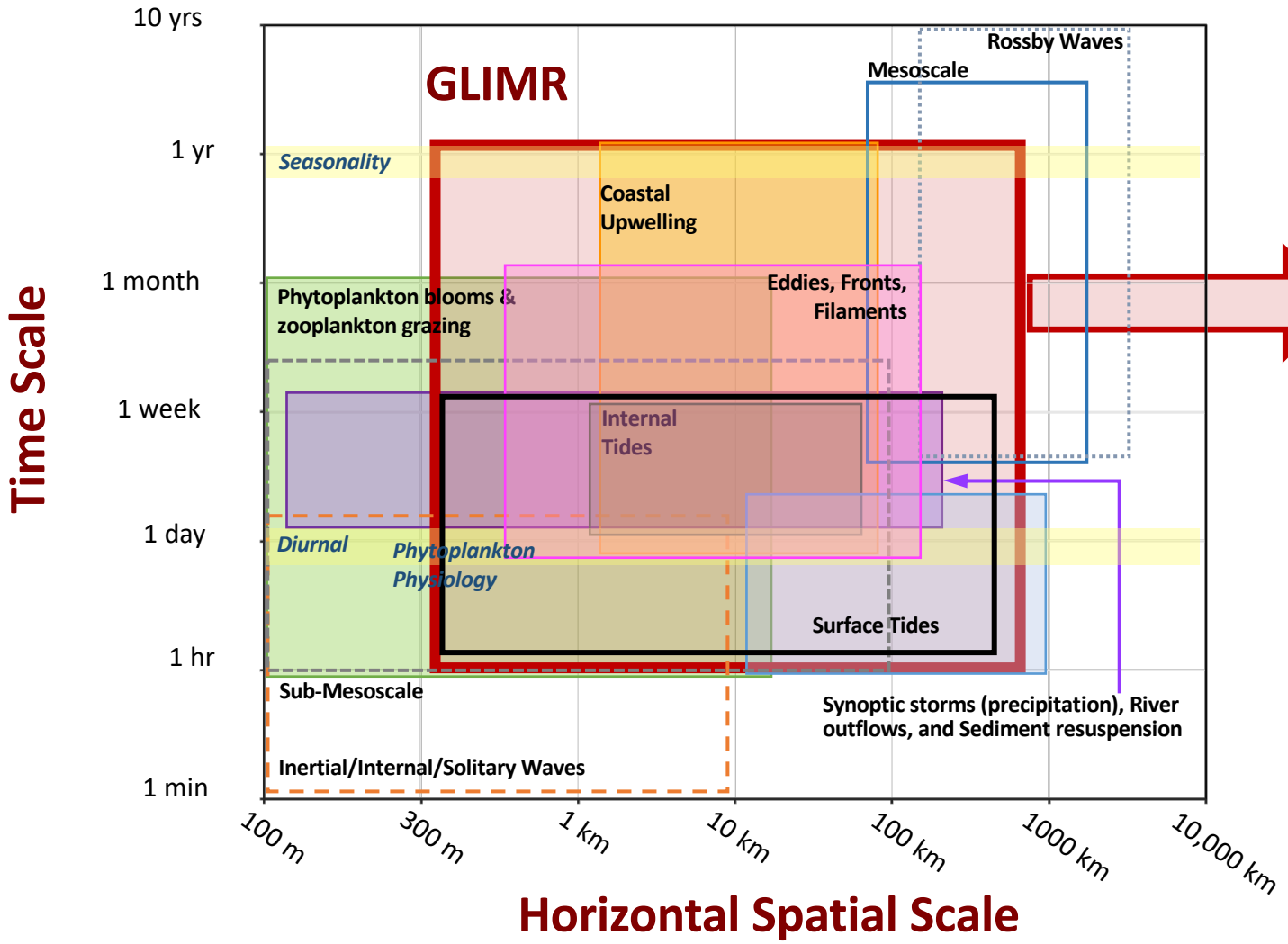
High SNR

Requirements at Ocean Ltyp

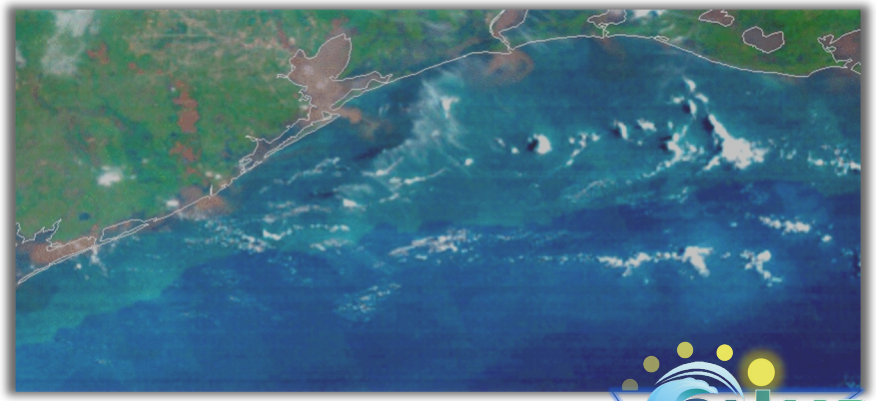
- > 420, UV
- > 1000, 400-580 nm
- > 750, 580-650 nm
- > 580, 650-712 nm
- > 500, 713-880

GLIMR's unprecedented measurement capabilities (*in toto*)

Does GLIMR hit the sweet spot for enabling new science?



The temporal cadence of GLIMR will enable the observation of physical processes that regulate the spatial-temporal dynamics of biological and biogeochemical processes and constituent distributions.



GOES-R ABI data

Who is GLIMR?

GLIMR

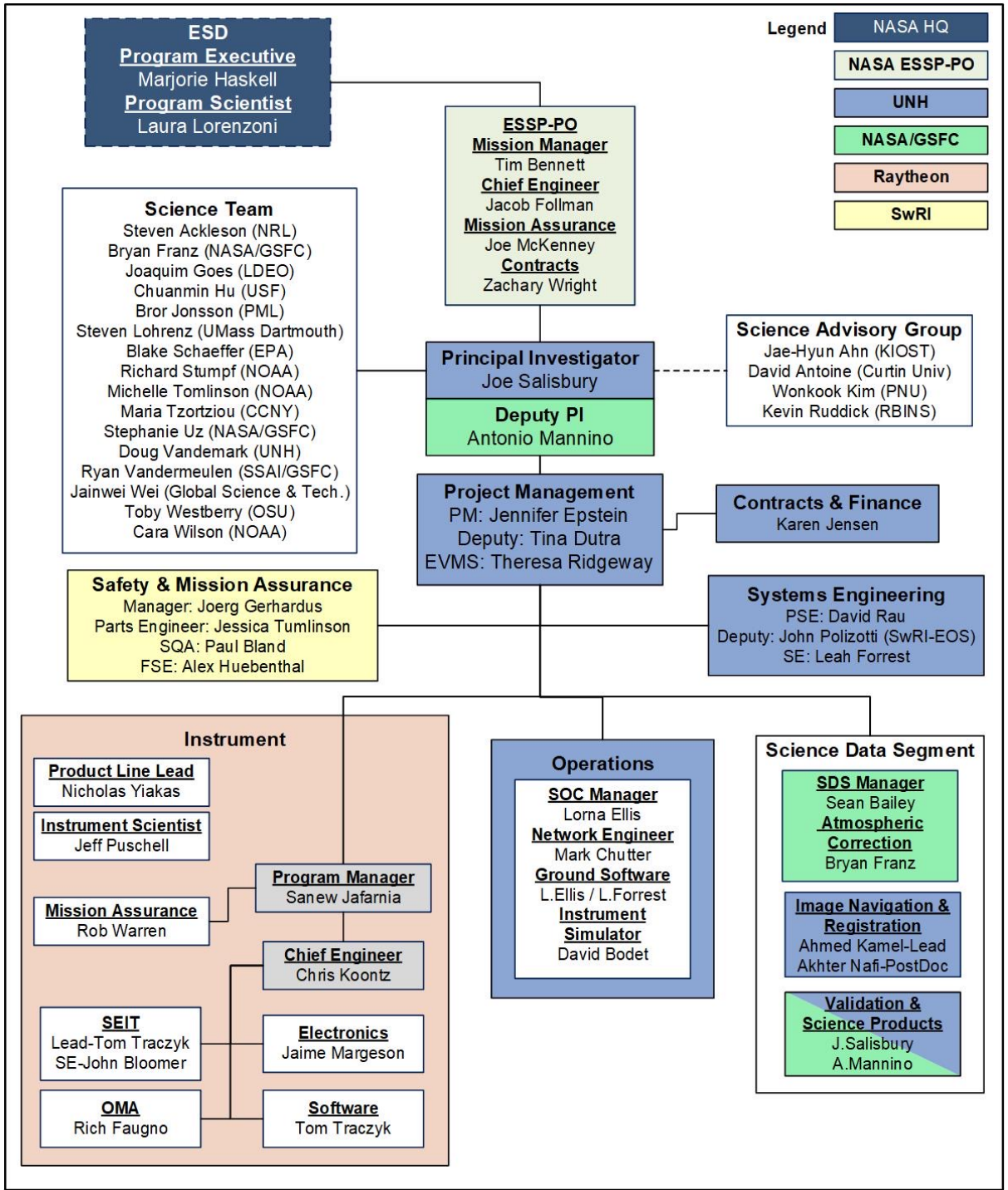
NASA

University of New Hampshire

NASA Goddard Space Flight Center

Raytheon Intelligence & Space

SwRI

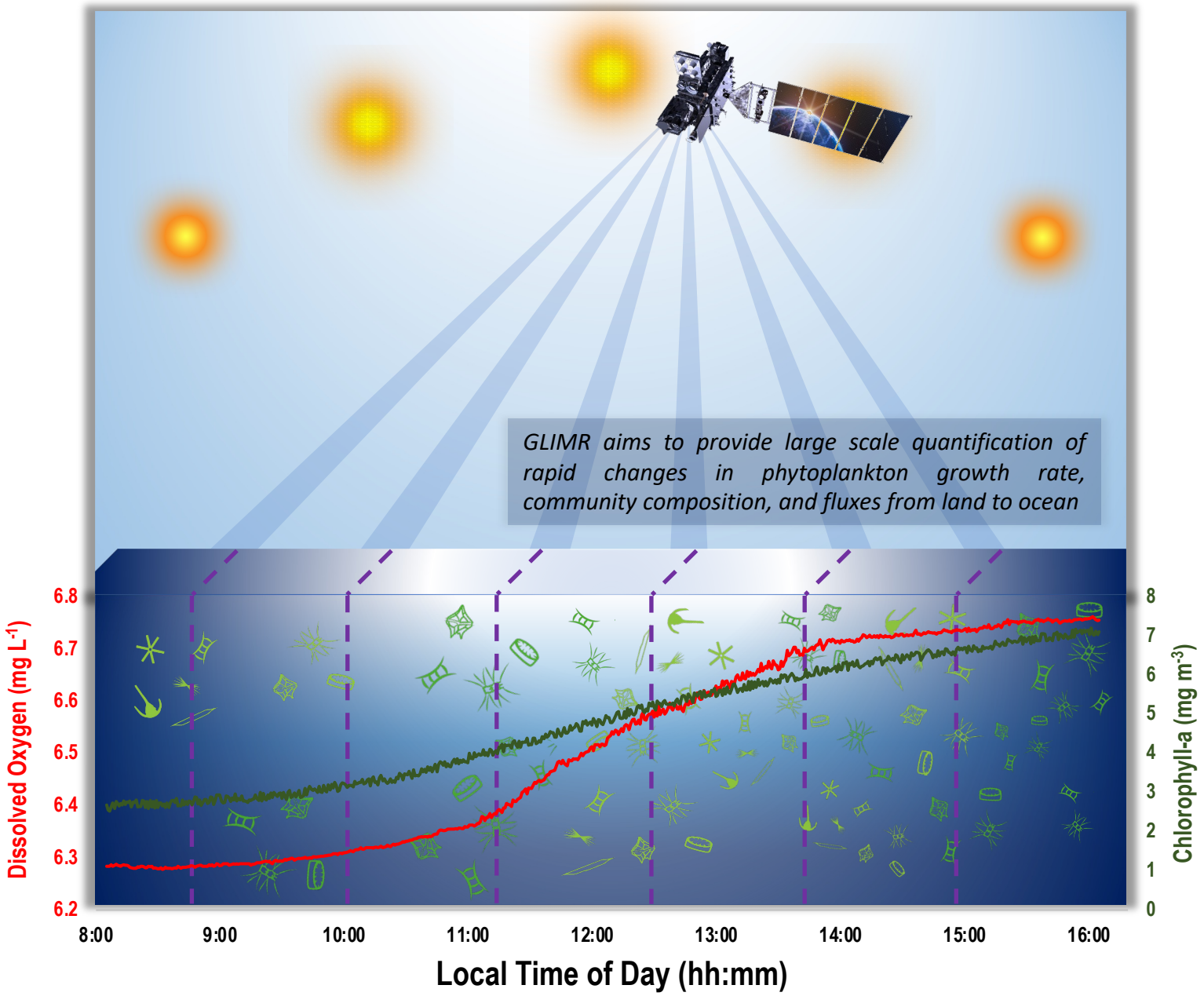


Why GEO?

Because fast observations are not enabled by LEO satellites, GLIMR is poised to revolutionize our understanding of:

Ocean Productivity
Phenology, PCC changes
Coastal environment dynamics
Biology-physics interactions at meso-scale
Ocean Data assimilation techniques
Carbon deposition in continental margins
Detection and prediction of HABs evolution
Oil spill thickness, extent and prediction

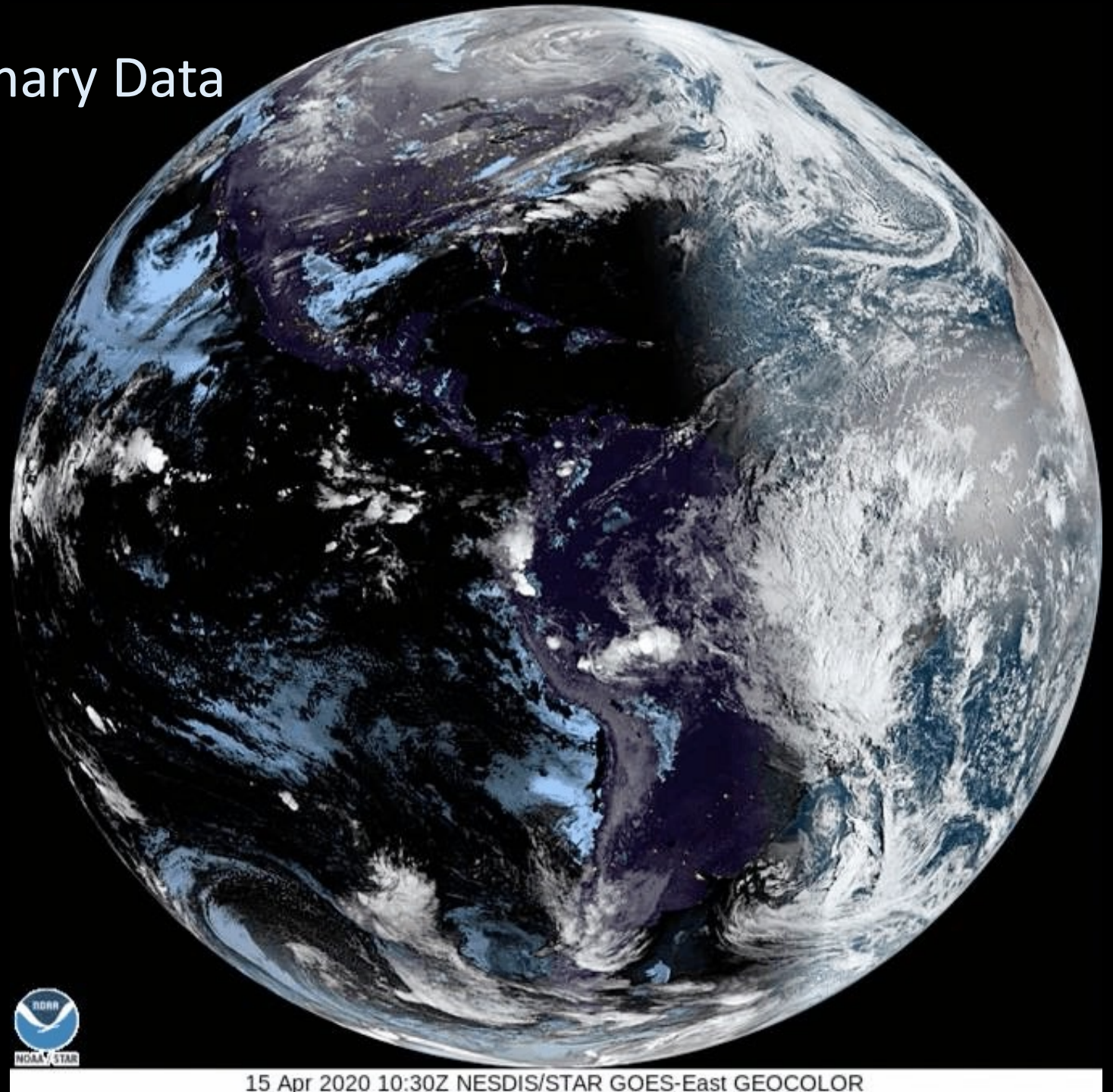
GLIMR will enable us to move beyond studying the *effects* of the process, and into the study of the processes themselves.



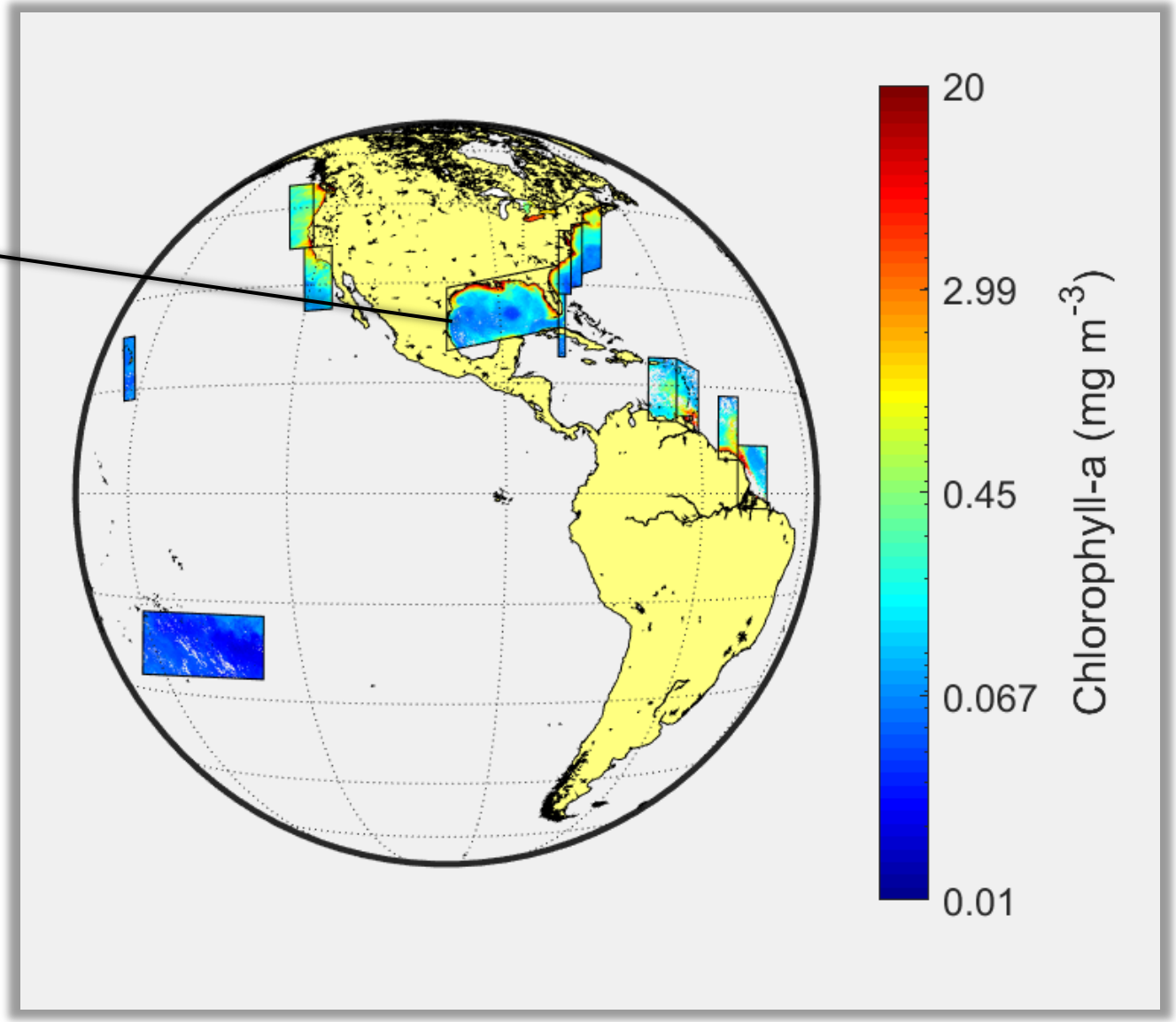
Additional benefits of Geostationary Data

- Viewing same areas of the earth throughout the day enables high-frequency time series
- “Stare” at any location (iFOV) to achieve required SNR
- Scan between cloudy periods of the day (much more data)

GOES-16 Full Disk Animation – 15-16 April 2020



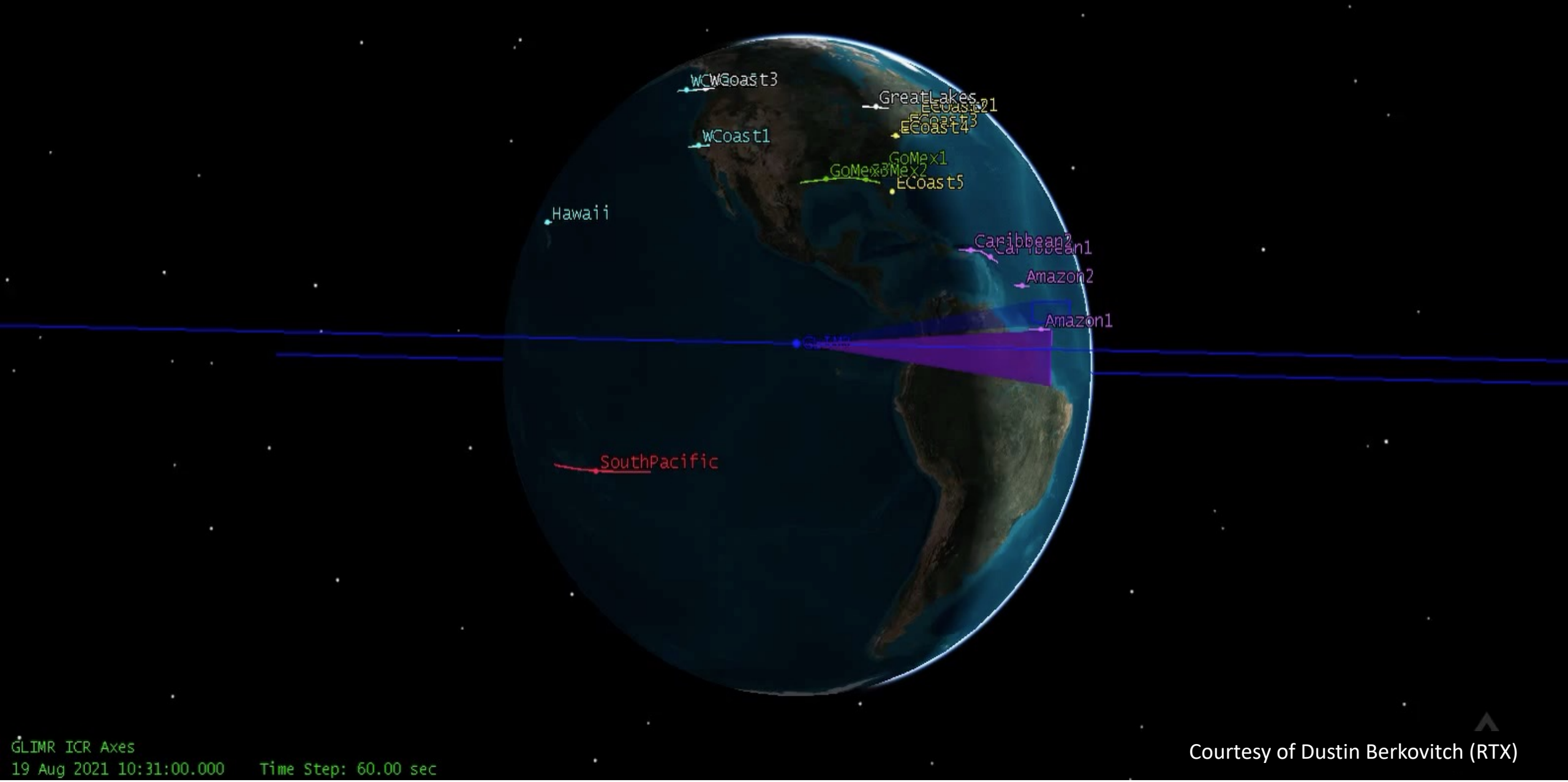
Where does GLIMR Look? Primary science scans (right) and detail of the Gulf of Mexico (left)



Primary Science Scans

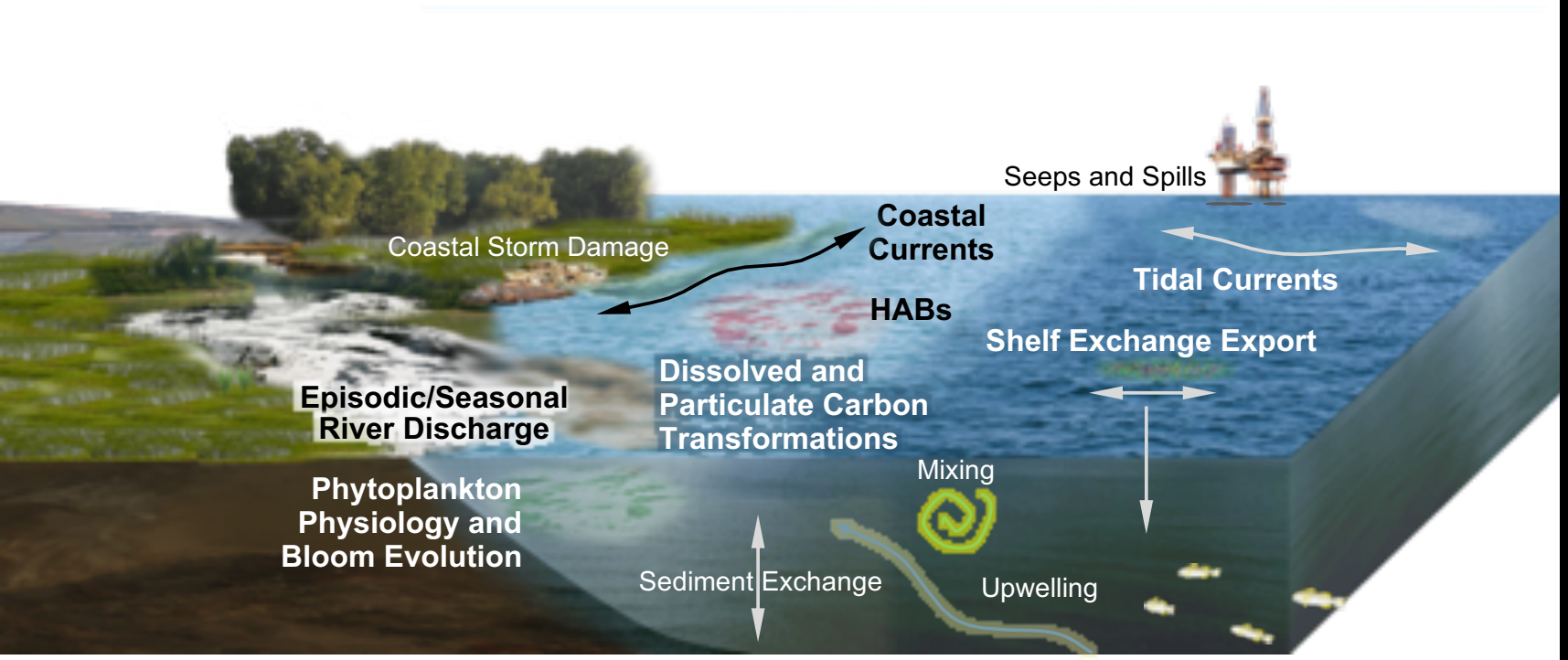
- 6x/day Gulf of Mexico (GoMex)
- 2x/day US East Coast
- 2x/day US West Coast
- 2x/day Amazon River Plume ROI
- 2x/day Caribbean Sea ROI
- 3x/day other HAB target sites
- Calibration Sites (MOBY/S. Pacific/PACE)

A day in the life of GLIMR from 95W



Courtesy of Dustin Berkovitch (RTX)

GLIMR Science Overview



Phytoplankton Growth and Physiology

Understanding processes contributing to rapid changes in phytoplankton growth rate and community composition.

Short Term Coastal Processes

Investigate how high frequency fluxes of sediments, organic matter, and other materials between and within coastal ecosystems regulate the productivity and health of coastal ecosystems.

Planned GLIMR Data Products

"PACE-like" Ocean Color Products
Remote sensing reflectance (360 to 720nm every 15 or 10 nm @ 5 nm steps)
Spectral diffuse attenuation coefficients
Apparent visible wavelength
Spectral absorption coefficients (a_t, a_p, a_{ph}, a_{cdm}, a_g) and backscatter coefficients (380 to 680 nm)
CDOM Spectral slope coefficients
Chlorophyll-*a*
Phytoplankton pigments
Phytoplankton community composition
Daily and instantaneous PAR
Fluorescence line height
Euphotic depth
Particulate organic carbon
Dissolved organic carbon
Suspended particulate matter
Particle size distribution

Rates and Flux Products
Net primary production (NPP)
Net community production of POC
Fluxes of SPM, POC and DOC
Surface Ocean Currents

Applied Science Products
HAB detection index
Karenia brevis cell count index
Mycrocystis cell count index
Floating algae biomass
Water type classification
Petroleum detection and thickness
Oil density
Absorbing aerosol index

GLIMR: Overview of Funded Science Team Members with Tasks

GLIMR Science Team

Validated Science Products for both coastal and offshore GOM waters: Stocks and rates
Direct mapping to science questions

Partner Institution/Agency	Team Member
City College of NY, NASA/GSFC	Maria Tzortziou [1,9, 14]
US EPA	Blake Schaeffer [1,9]
NASA/GSFC	Antonio Mannino [1,2,4, 9, 14]
University of New Hampshire	Joseph Salisbury [2,5,6]
Oregon State University	Toby Westberry [7,8]
University of Mass. (Dartmouth)	Steven Lohrenz [7]
University of New Hampshire	Douglas Vandermark [2,7]
Columbia University/LDEO	Joaquim Goes [3,5,8]
NASA/GSFC	Ryan Vandermeulen [2,4,9]
Univ. S. Florida	Chuanmin Hu [3,10,11]
University of New Hampshire	TBD
NASA/GSFC	Bryan Franz/ Sean Bailey[12,13]

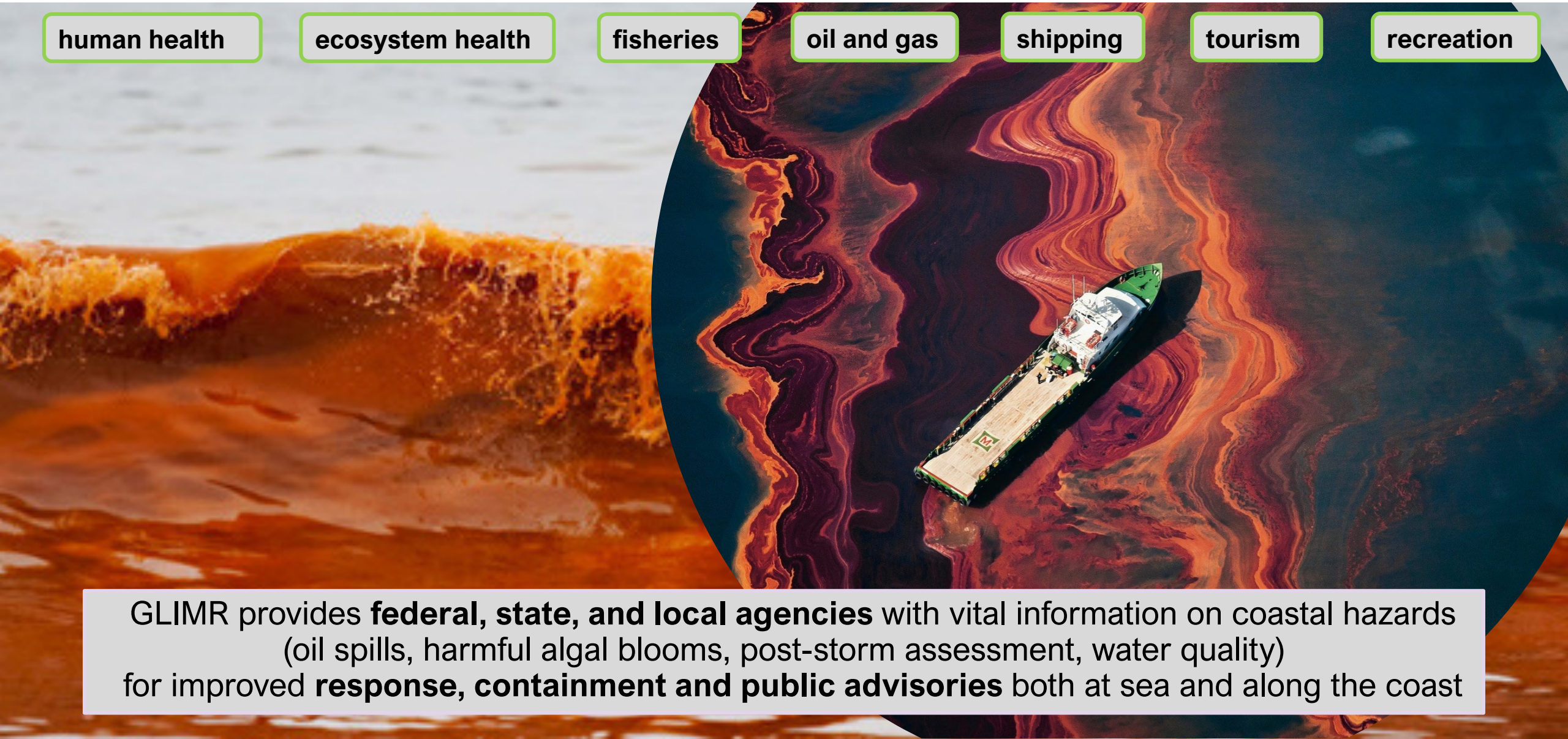
Planned Science Products
1. Turbidity, Water Clarity, **
2. Surface Ocean Currents/Lateral Fluxes
3. Hyperspectral HAB algorithms*, **
4. Water type classification**
5. Net Community production**
6. Ecosystem processes via modeling
7. Net Primary Production (w/*Hyperspectral data*)**
8. Net Primary Production (*using GEO data*)**
9. Water Quality Indicators (e.g., CDOM quality)
10. Petroleum detection and thickness
11. Oil density
12. Inherent optical properties **
13. Rrs, Chl, FLH, PAR, K_d**
14. DOC, POC**

* Additional effort by unfunded personnel
** Produced and sent to the DAAC

GLIMR: Applied Science Foci

Targeting the formation, magnitude, and trajectory of **harmful algal blooms** and **oil spills.**

human health | **ecosystem health** | **fisheries** | **oil and gas** | **shipping** | **tourism** | **recreation**



GLIMR provides **federal, state, and local agencies** with vital information on coastal hazards (oil spills, harmful algal blooms, post-storm assessment, water quality) for improved **response, containment and public advisories** both at sea and along the coast

GLIMR: Overview of Applications Team Members & Planned data products

GLIMR Applications Team

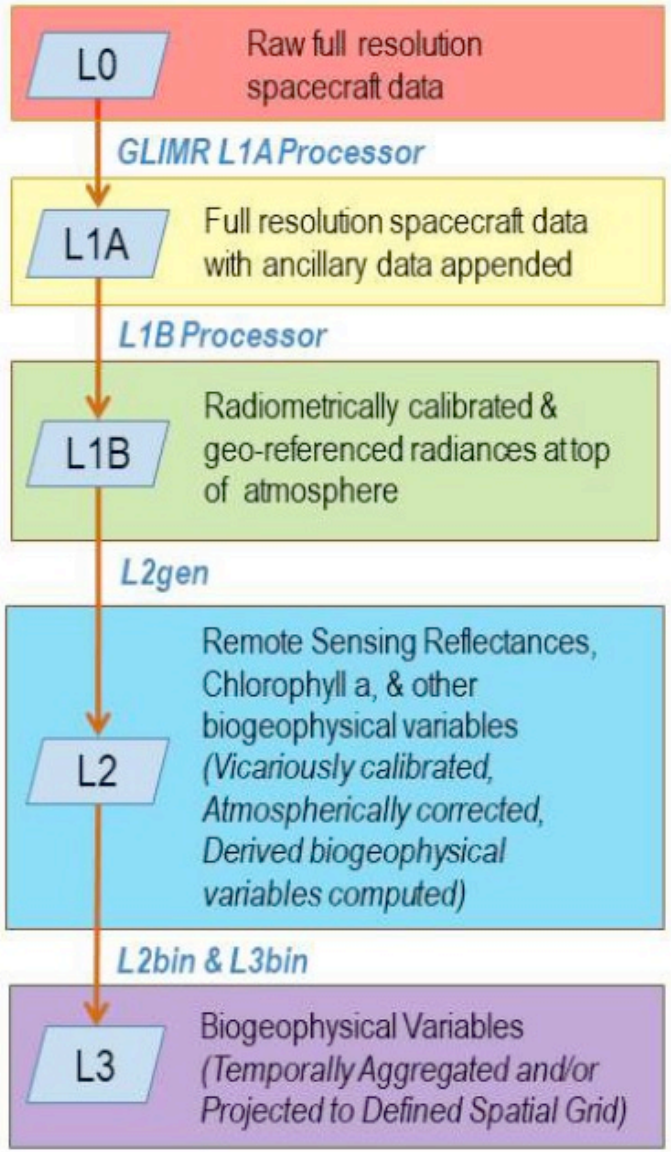
Applied Science Products for both inland and coastal waters: Stocks, rates & fluxes

Partner Institution/Agency	Team Member
City College of NY, NASA/GSFC	Maria Tzortziou (POC) [7, 8]
US EPA	Blake Schaeffer [1,2,4]
US Naval Research Laboratory	Steve Ackleson [1,8]
NOAA NCCOS	Richard Stumpf [2,3]
NOAA, CoastWatch	Michelle Tomlinson [1,2,3]
NOAA, Fisheries	Cara Wilson [11]
NASA/GSFC	Stephanie Uz [1,2,3]
Columbia University/LDEO	Joaquim Goes [6,7,8]
NASA/GSFC	Ryan Vandermeulen [1,7,8]
Univ. S. Florida	Chuanmin Hu [9,10]

Planned Applications Products
1. Turbidity, Water Clarity
2. HAB detection Index
3. Karenia brevis cell count index
4. Mycrocystis cell count index
5. Floating algae biomass
6. Net Primary Production (NPP)
7. Water type classification
8. Water Quality Indicators (e.g., CDOM quality)
9. Petroleum detection and thickness
10. Oil density
11. Fisheries applications

Potential Other Applications Products
Nitrogen Dioxide (NO2)
Absorbing aerosols
Air Quality Index and other atm. applications
Land applications (NDVI, land surface reflectance)
Whitening Agents (human activity)

OBPG Science Data Processing



L0 Unprocessed GLIMR (digital number counts) and spacecraft data at full resolution transmitted directly to GSFC/OBPG through ESSP PO arrangements.

L1A Reconstructed, unprocessed instrument data at full resolution with time-referenced and annotated ancillary information including radiometric and geometric calibration coefficients and georeferencing parameters (e.g. platform ephemeris data) computed and appended but not applied to the Level 0 data
Available within hours of receipt of L0 raw TM

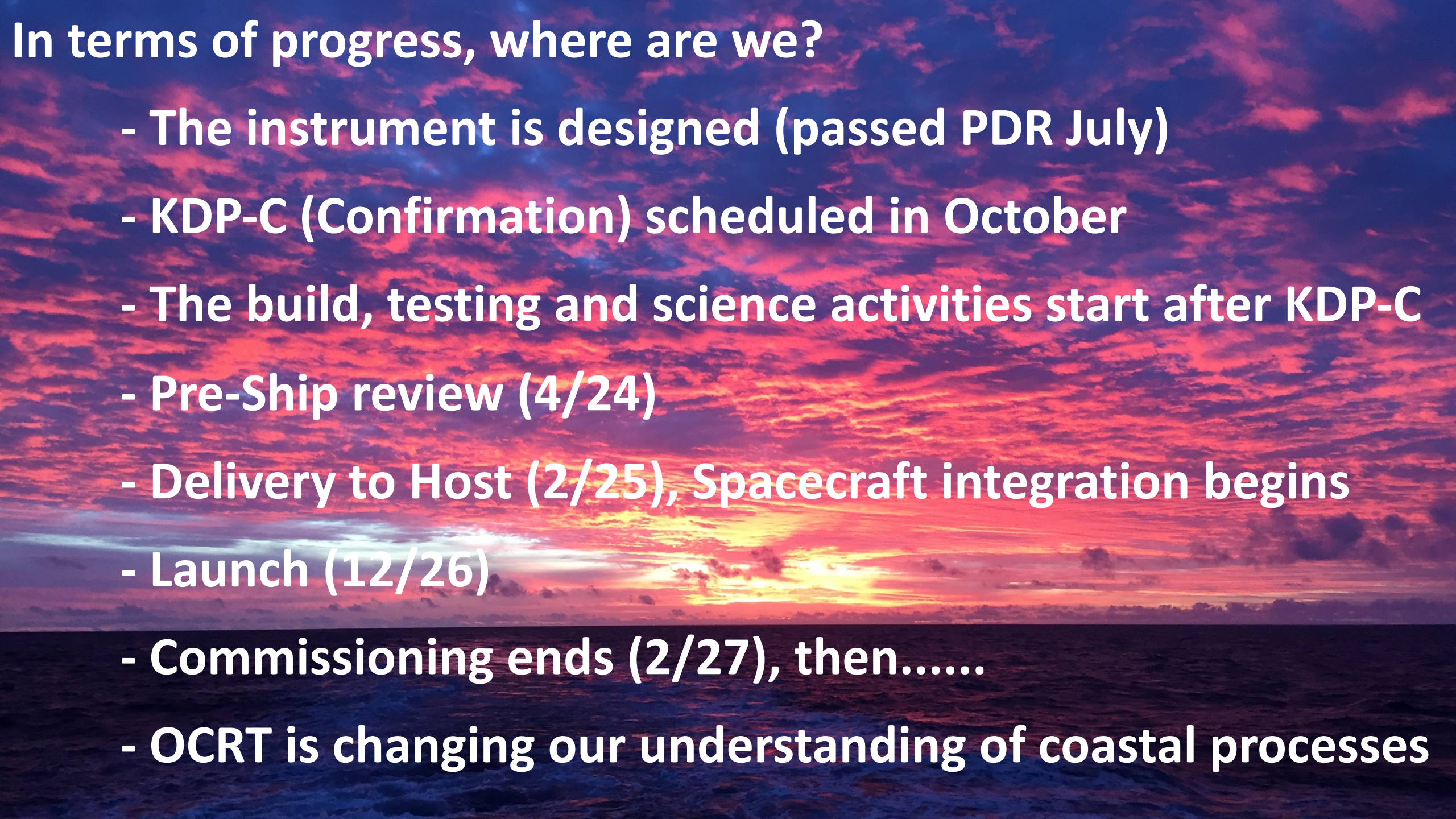
L1B Level 1A data with instrument and radiometric calibrations applied.
Available within 4 hours of L1A creation

L2 Derived (by the L2gen program) biogeophysical variables at the same resolution as the source Level 1 data.
Available in quick look form within 8 hours of collection and in refined form within 1 month of receipt of data

L3 Derived biogeophysical variables aggregated and projected onto well defined spatial grid over a well defined time period.
Level 3 products are binned by space and time

GLIMR will emulate PACE by example

20+ years of ocean color data processing heritage



In terms of progress, where are we?

- The instrument is designed (passed PDR July)
- KDP-C (Confirmation) scheduled in October
- The build, testing and science activities start after KDP-C
- Pre-Ship review (4/24)
- Delivery to Host (2/25), Spacecraft integration begins
- Launch (12/26)
- Commissioning ends (2/27), then……
- OCRT is changing our understanding of coastal processes

Operation Priorities

Primary Science Scans

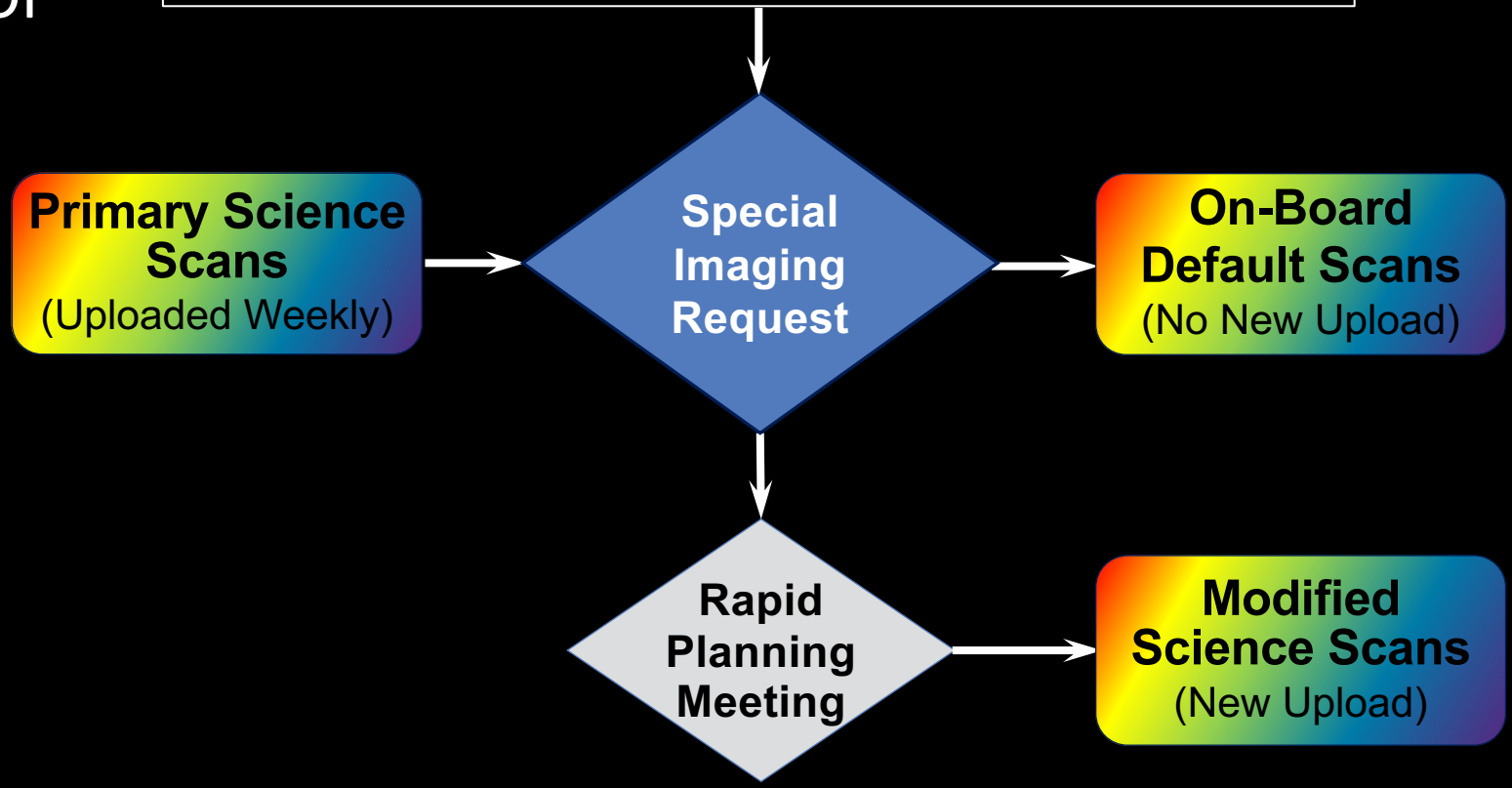
- 6 times/day Gulf of Mexico
- 2x/day US East Coast
- 2x/day US West Coast
- 2x/day Amazon River plume ROI
- 2x/day Caribbean Sea ROI
- 3x/day other HAB target sites

Primary Calibration Scans

- 2x/day South Pacific clear waters
- 3x/day coincident with PACE's OCI for cross-calibration
- 1x/month Lunar calibr. sites

Special Request Priorities

1. Disaster and Emergency Acquisitions
   a) Federally Declared Disasters
   b) Threshold Violations (HABs, oil, etc.)
2. Field Campaigns
3. Engineering and Calibrations
4. US researcher requests
5. International researcher requests




Thank You