Earth Science Enterprise
National Aeronautics and Space Administration

Satellite Altimetry: 15 Year Outlook*

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*A U.S. perspective

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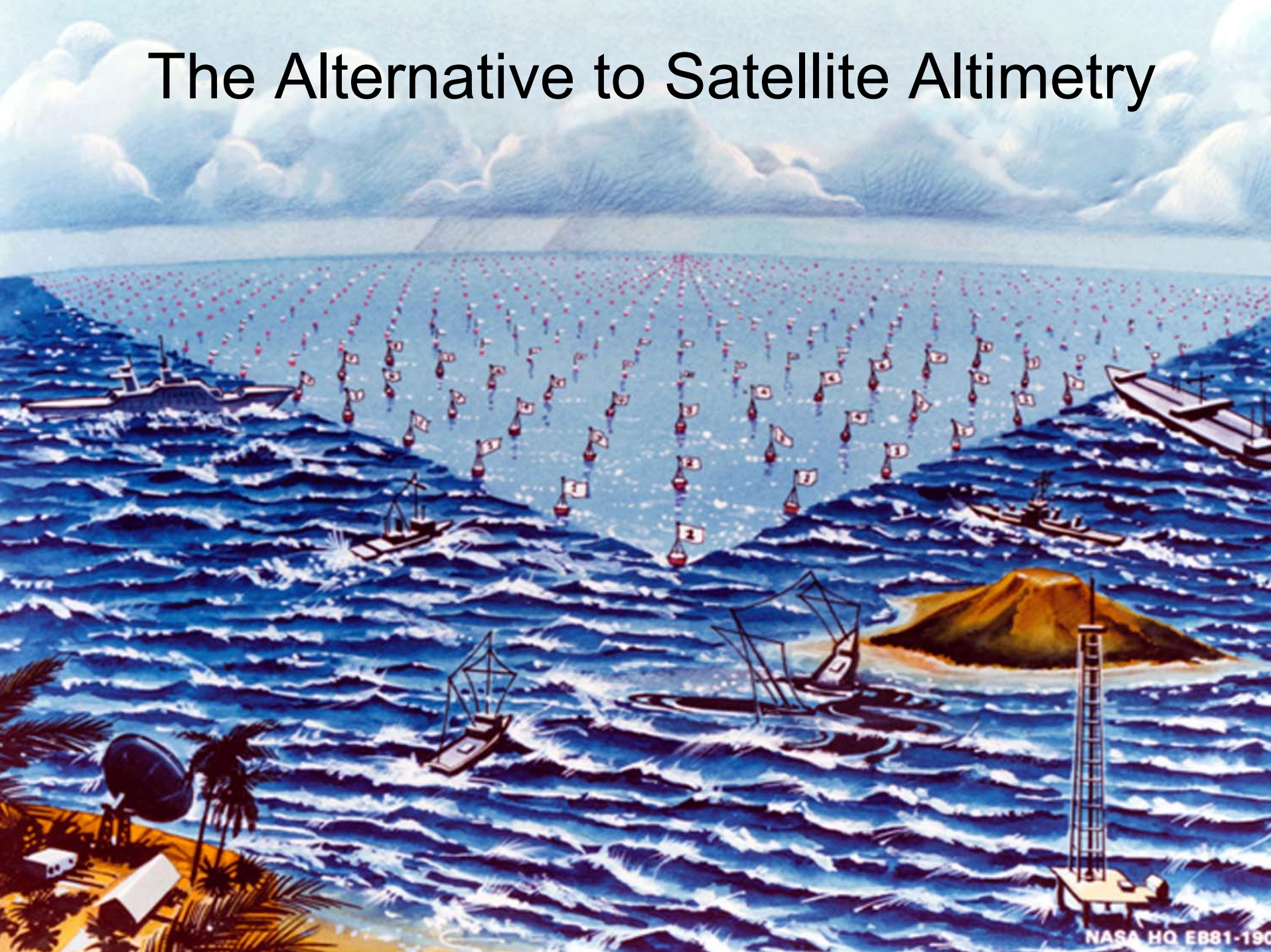
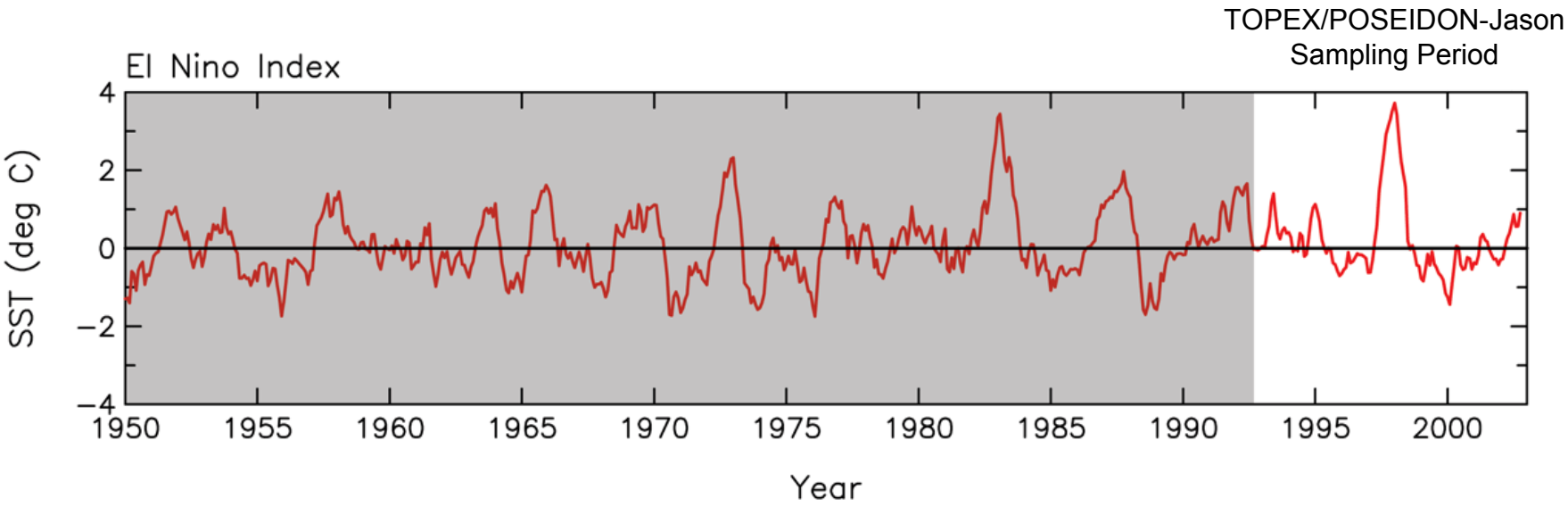
The Alternative to Satellite Altimetry



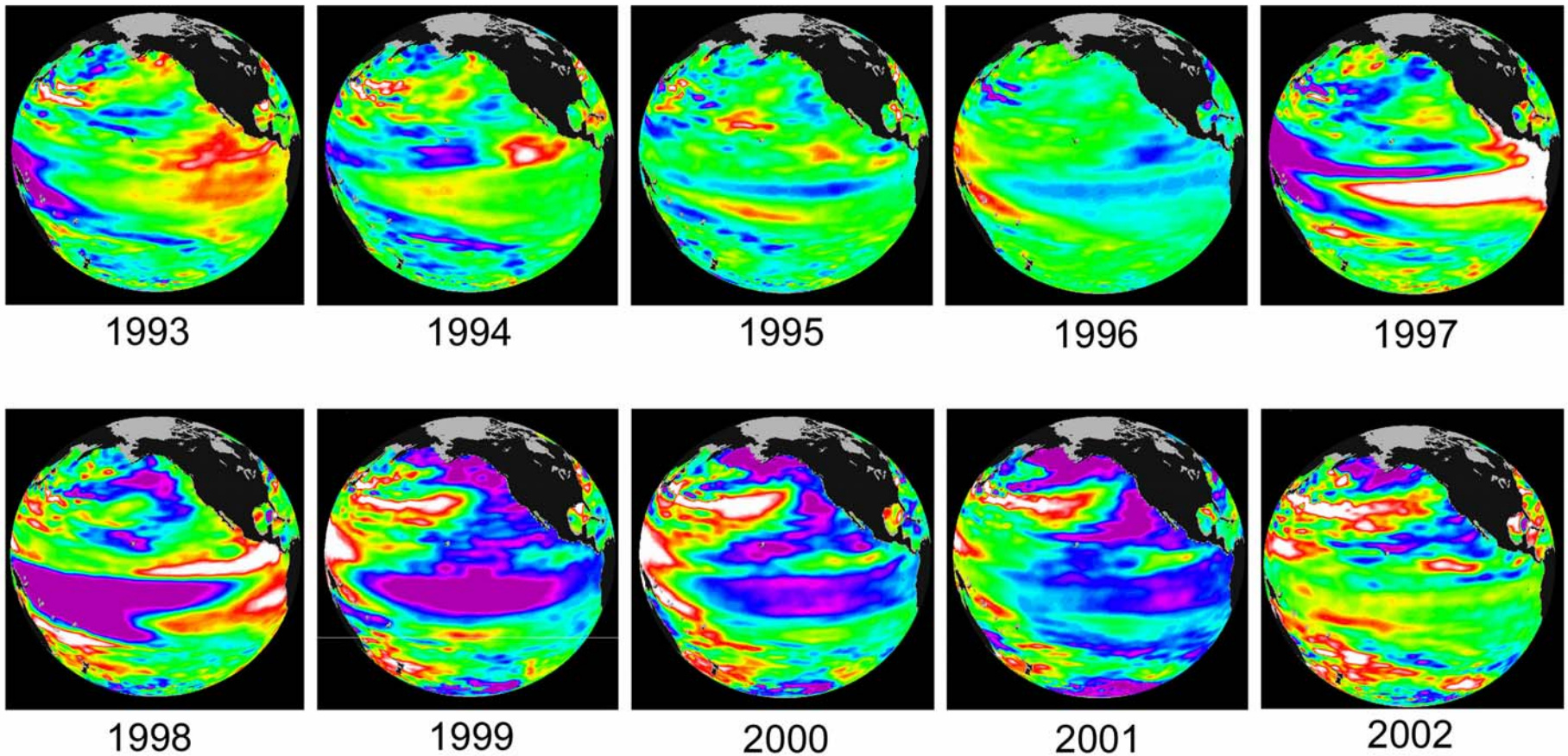
Continuity of precision altimetry remains a challenge

- All US agencies recognize that altimetry is a one of the core future climate/ocean measurements
- TOPEX/Jason-class altimetry is viewed as "mature" technology and is enroute to "operational" implementation through OSTM and long-term NOAA/Eumetsat involvement.
- Broad multi-agency and international cooperation and collaboration must continue and grow


TOPEX/POSEIDON-Jason
Sampling Period
El Nino Index
SST (deg C)
4
2
0
−2
−4
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
Year

Annual Averages of SSH from 10 Years of TOPEX/POSEIDON Data

(Courtesy of L.-L. Fu)



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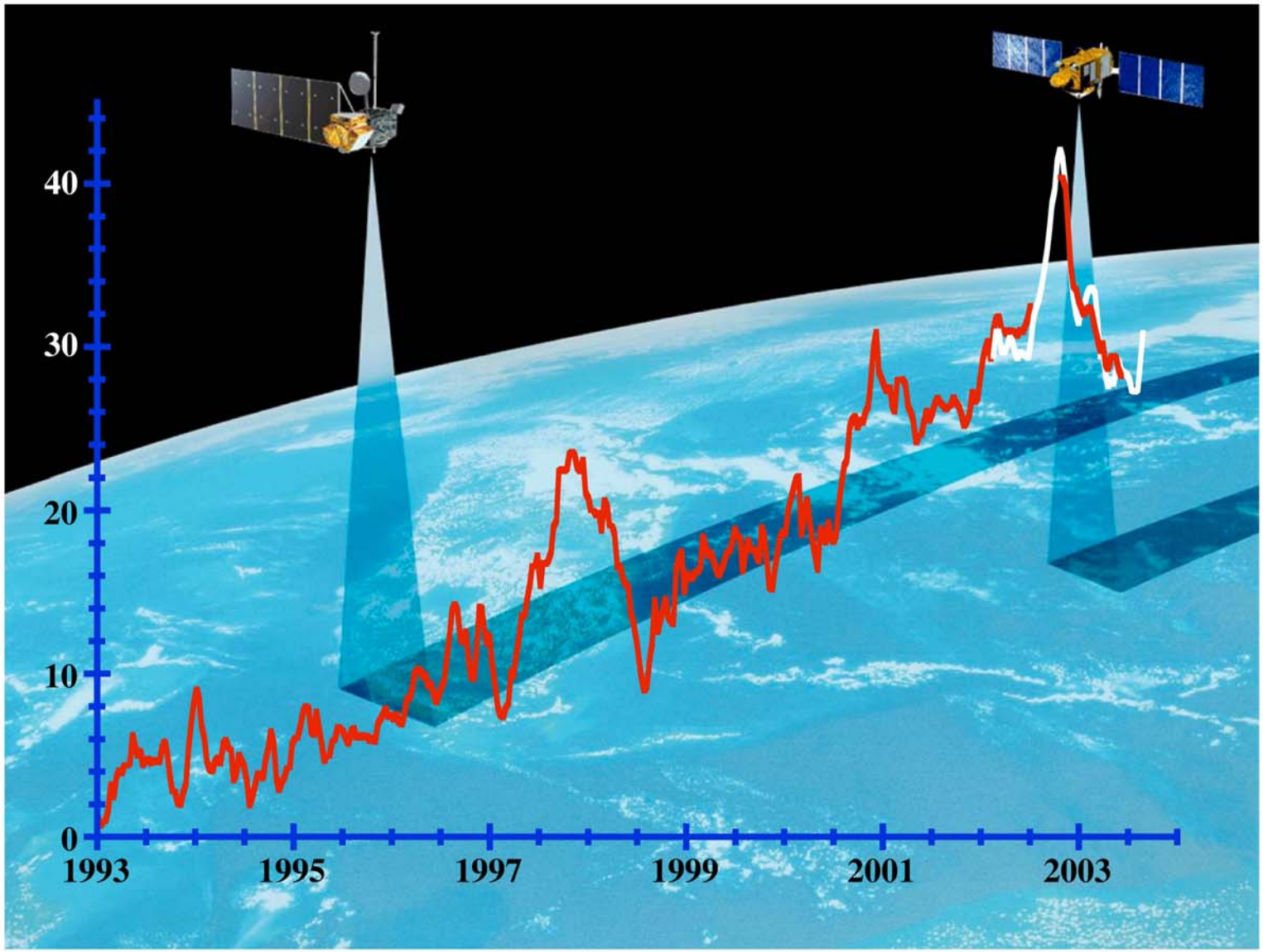
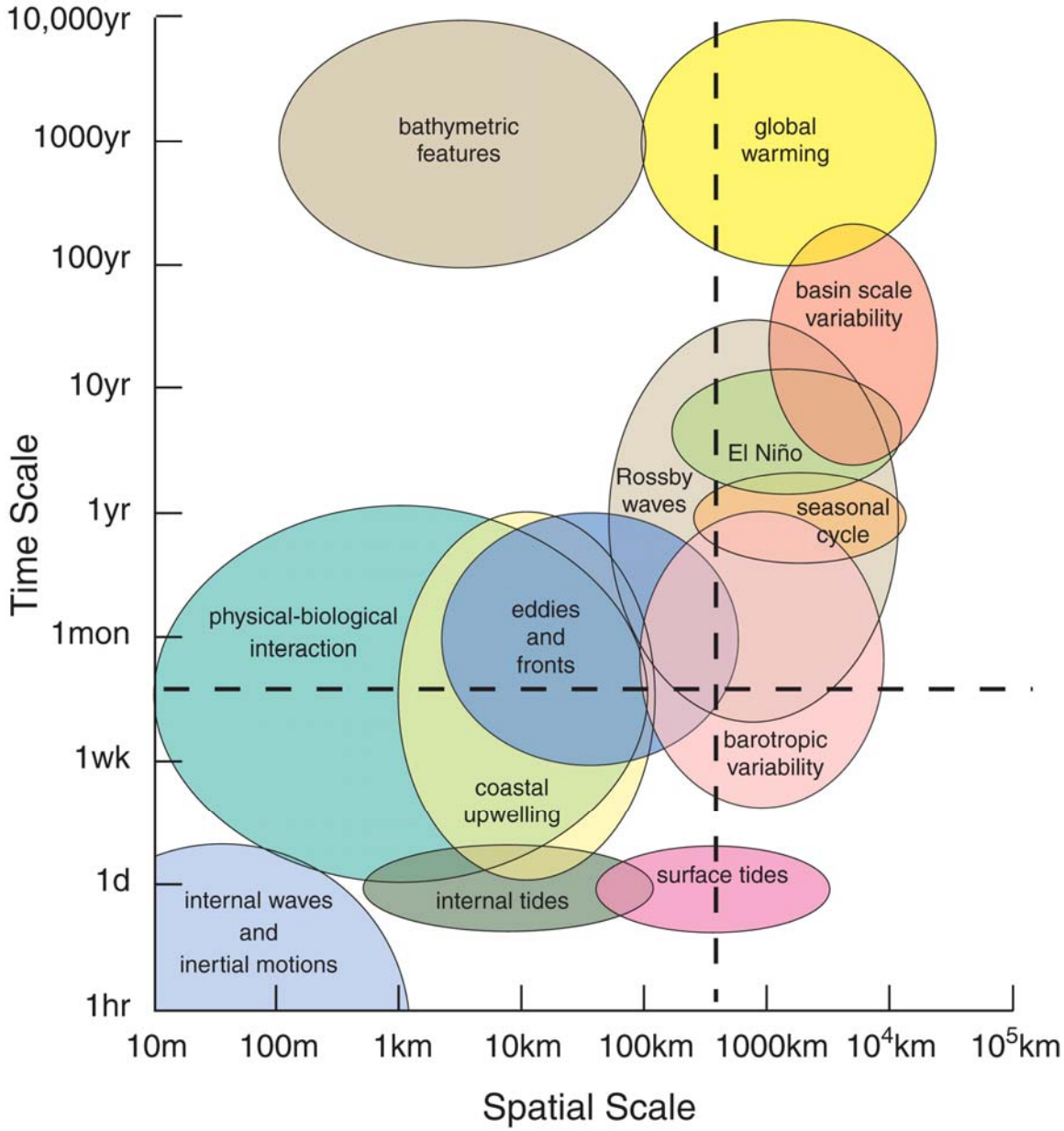
Maintaining the unique capability of altimetry for understanding the global change of the ocean

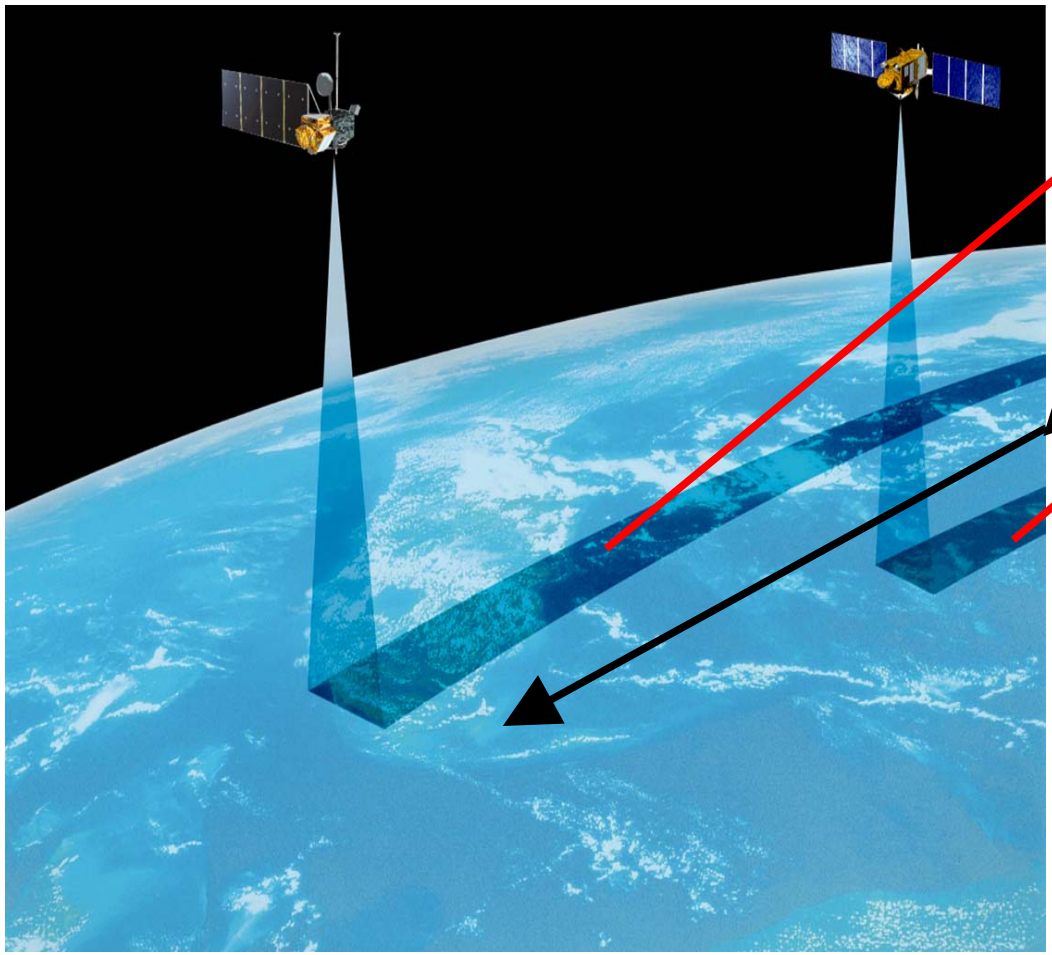


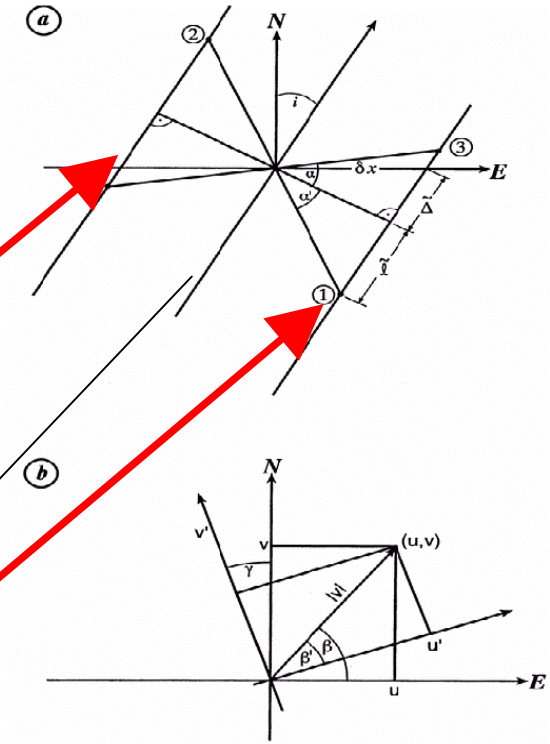
Scientific utilization of altimetry is still in infancy.

- We must expand understanding of the phenomena on the boundaries of altimetric resolution.


10,000yr
1000yr
100yr
10yr
1yr
1mon
1wk
1d
1hr
Time Scale
bathymetric features
global warming
basin scale variability
El Niño
Rossby waves
seasonal cycle
physical-biological interaction
eddies and fronts
barotropic variability
coastal upwelling
surface tides
internal tides
internal waves and inertial motions
10m
100m
1km
10km
100km
1000km
10^4km
10^5km
Spatial Scale

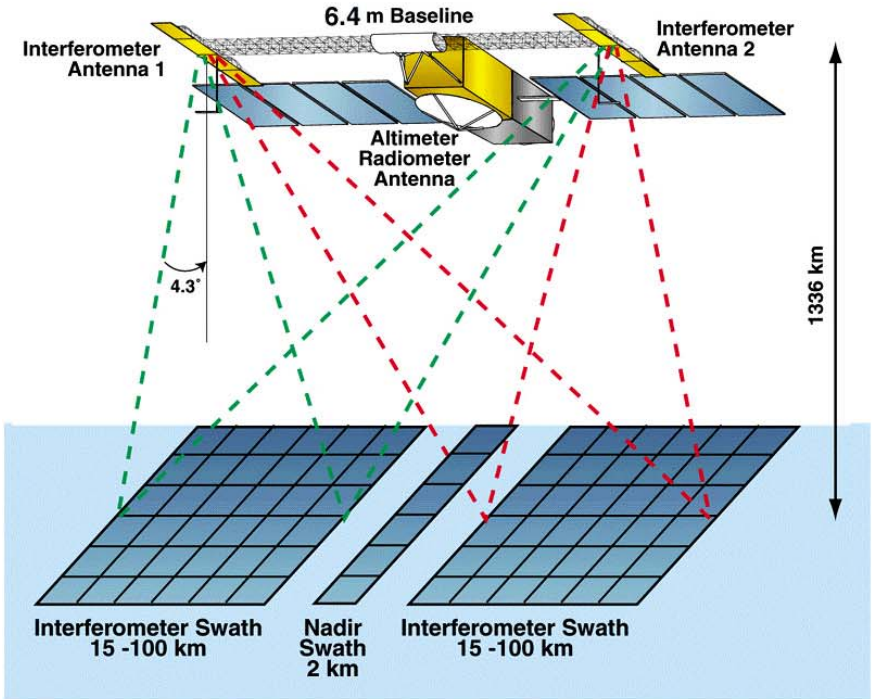
Determining Geostrophic Velocities

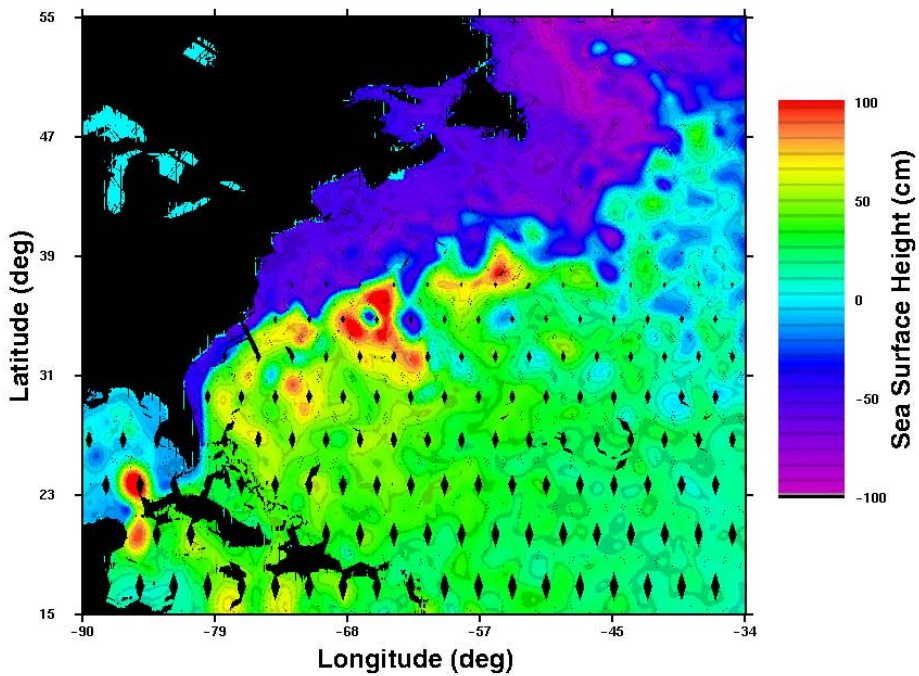




SSH gradients can be determined simultaneously in two directions from which the geostrophic flow field follows.

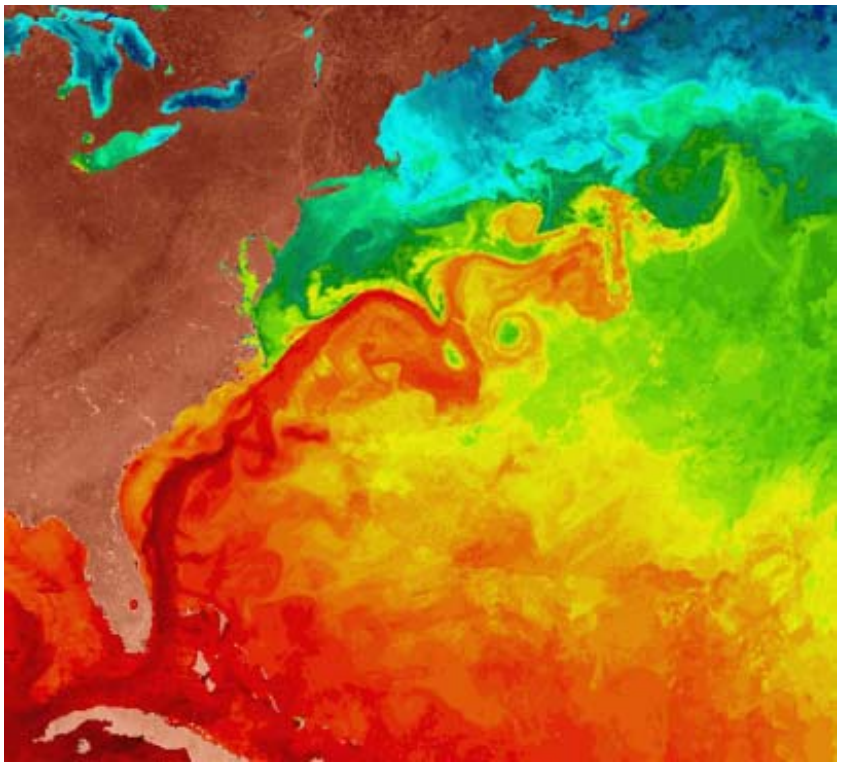
Wide-Swath Ocean Altimeter (WSOA)





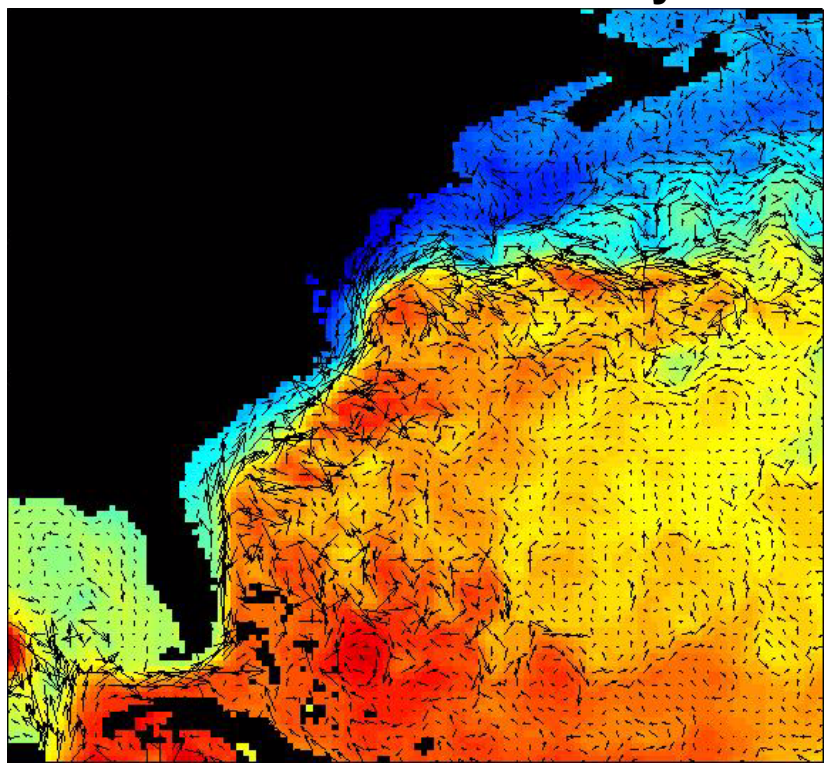
Need for observing the energetic mesoscale ocean currents and eddies

Sea surface temperature from an IR sensor



Not directly linked to subsurface circulation

Desired sea surface height and currents from altimetry

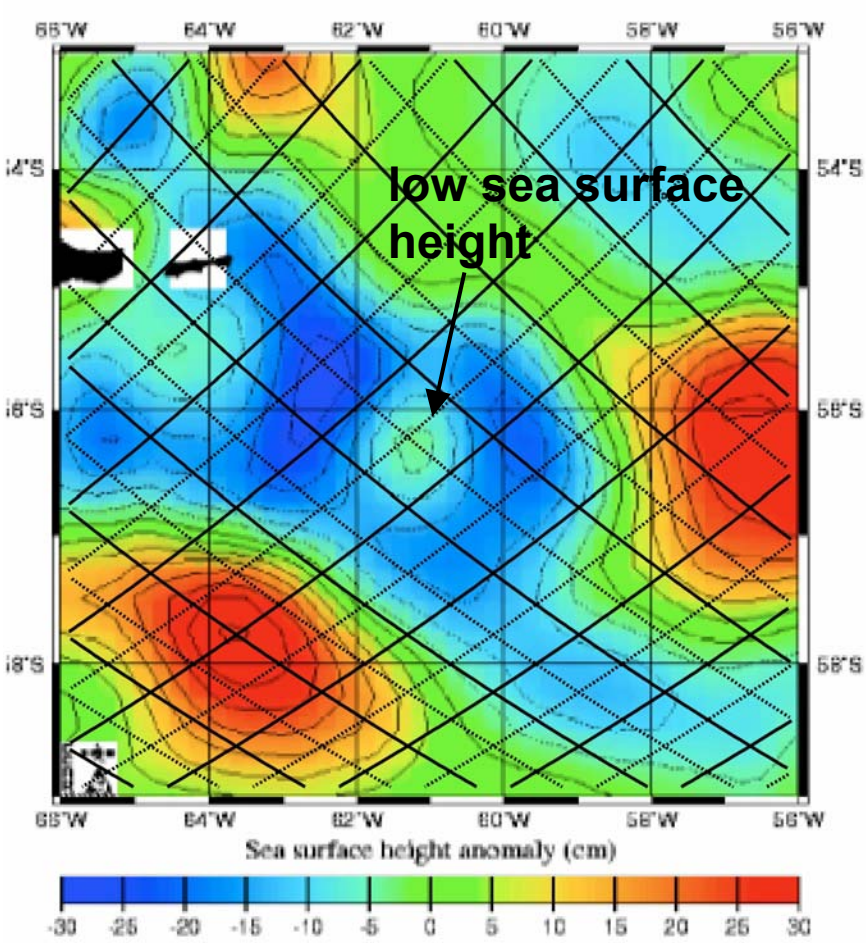


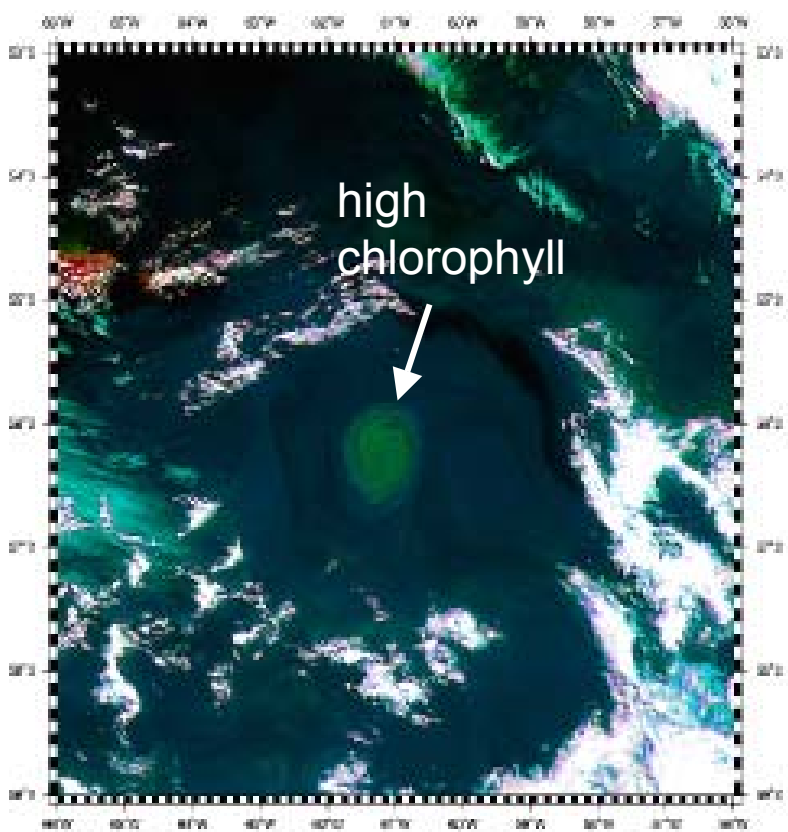
Directly linked to subsurface circulation

Biogeochemical Applications

Comparison of sea surface height from T/P and Jason with ocean color from SeaWifs in the Drake Passage of the Southern Ocean.

Mesoscale eddies, not resolvable by a single nadir altimeter, are important in global biogeochemical cycles





Summary

- Master the analysis of lower frequency, basin scale sea level variations.

- Provide a high quality, higher-resolution ocean surface topography data set. Determine its strengths and weaknesses.

- Expand the utilization of altimetric data for applications outside ocean surface topography (e.g., biology, gas exchange, geodesy, hydrology).

Thank You!


NASA