International Ocean Colour Science Meeting 2015

Geostationary applications relevant to ecosystems & fisheries

Cara Wilson

NOAA/NMFS/SWFSC
Environmental Research Division
Monterey, CA USA

Let’s take a step back in time…

to 2006

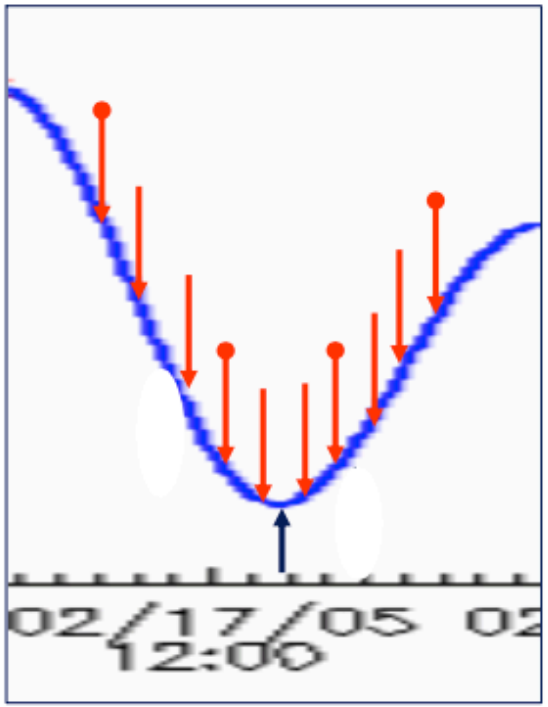
The Coastal Ocean Applications and Science Team (COAST) was trying to get the **HES-CW** (Hyperspectral Environmental Suite with Coastal Waters Imaging capability) flown on NOAA’s GOES-R, a future geostationary satellite (launch date of March 2016).

(We failed.)

Why we need high frequency sampling for coastal ocean dynamics

- Tides, diel winds, river runoff, upwelling and storm winds drive coastal currents that can reach several knots.
- Daily sampling at the same time (e.g. MODIS and in the future VIIRS) cannot resolve tides, diurnal winds, etc.
- Frequent sampling to resolve tides will provide the management and science community with a unique capability to observe the dynamic coastal ocean environment.
- Higher spatial resolution (300 m vs. 1000 m)
- Additional channels to measure solar stimulated fluorescence, suspended sediments, Colored Dissolved Organic Matter (CDOM) and HABs.

These improvements are critical for coastal waters.

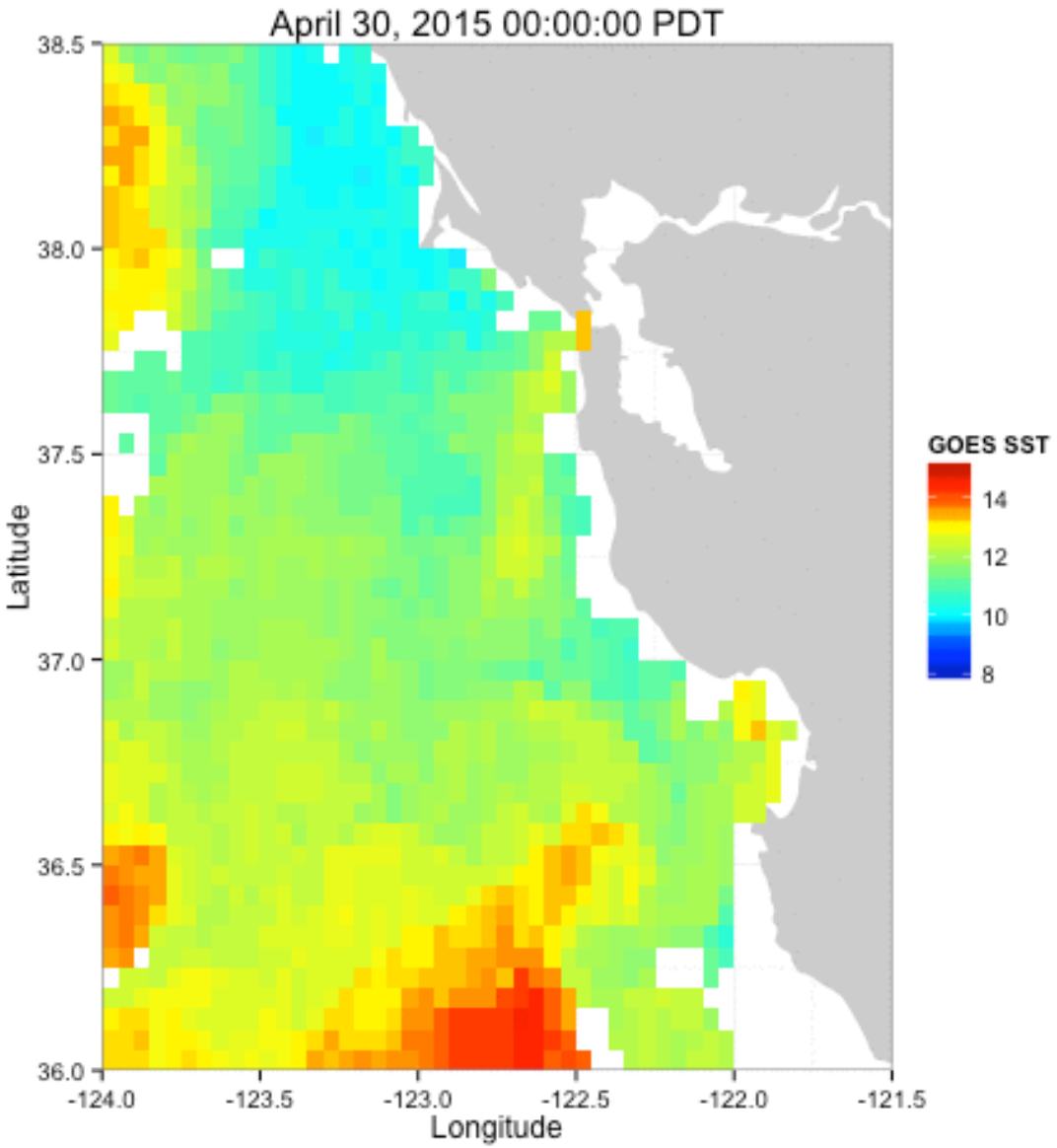


Example tidal cycle from Charleston, OR. Black arrows VIIRS sampling, red arrows hourly sampling.

From a 2006 presentation by Curt Davis on the HES-CW

Geostationary SST

April 30, 2015

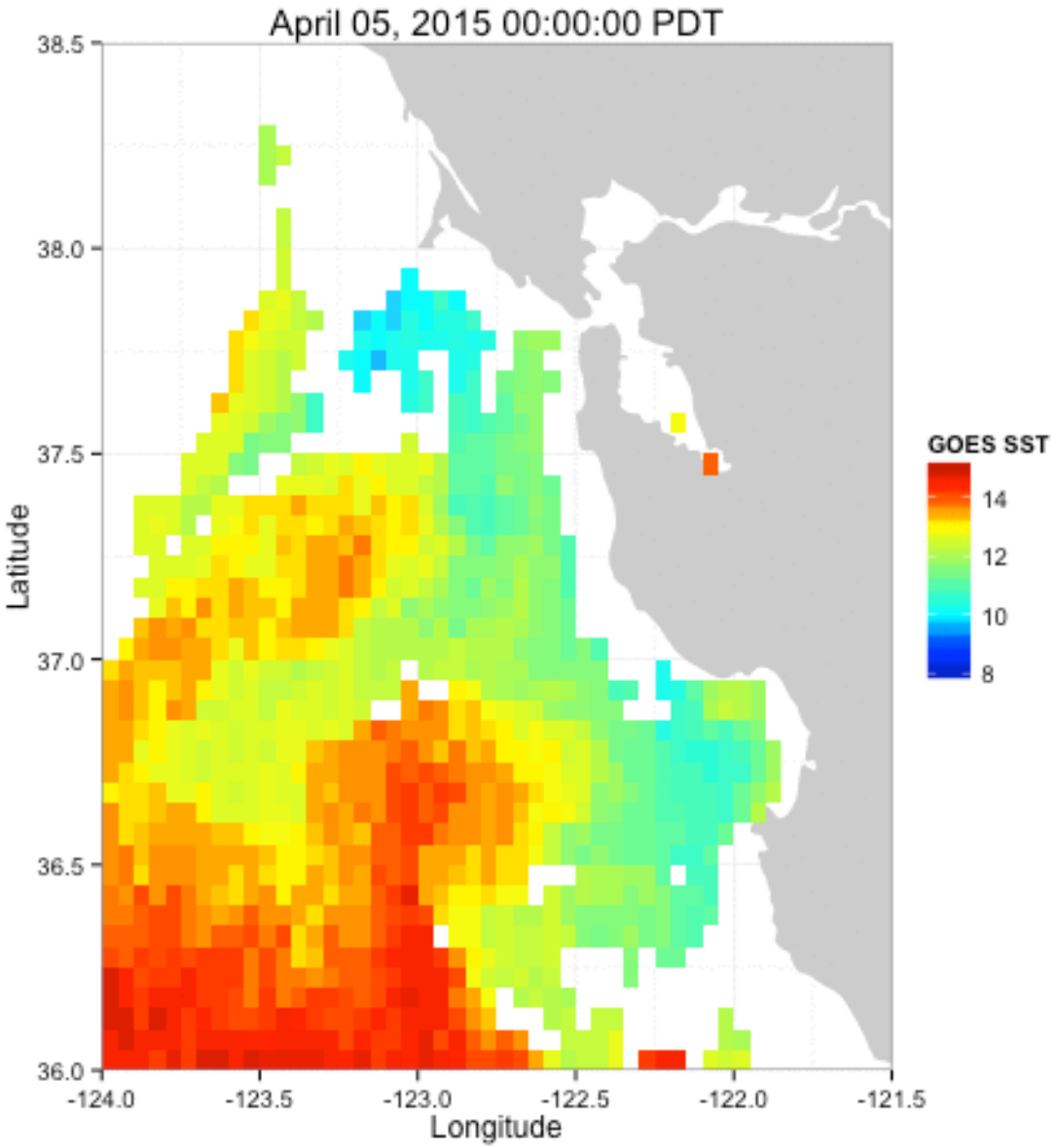


Data courtesy of ERDDAP, http://coastwatch.pfeg.noaa.gov/erddap

A more realistic example:

A lot of clouds!

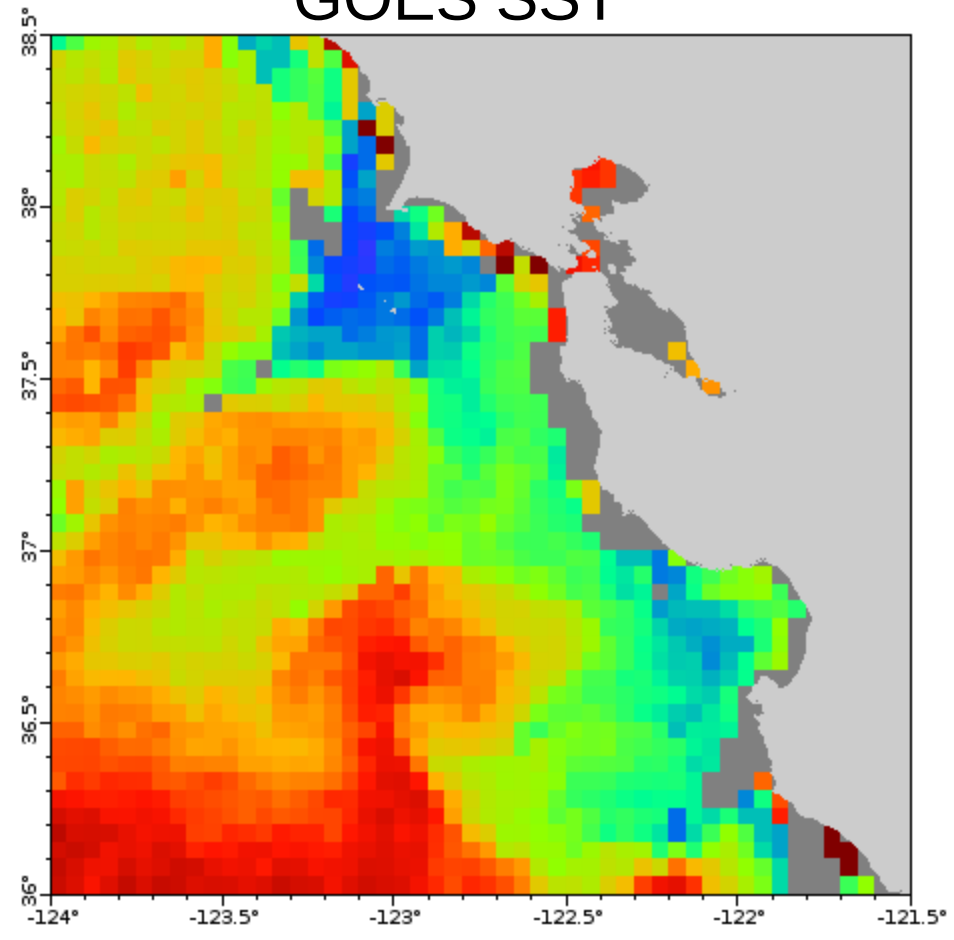
April 5, 2015

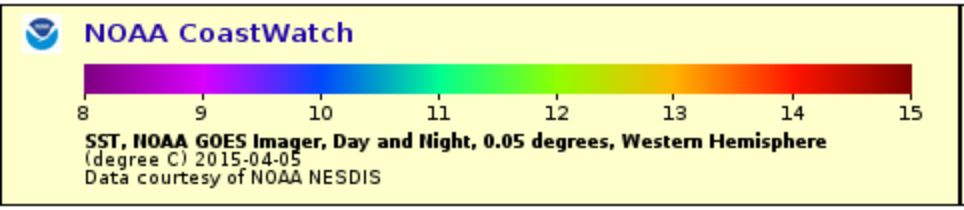


Data courtesy of ERDDAP, http://coastwatch.pfeg.noaa.gov/erddap

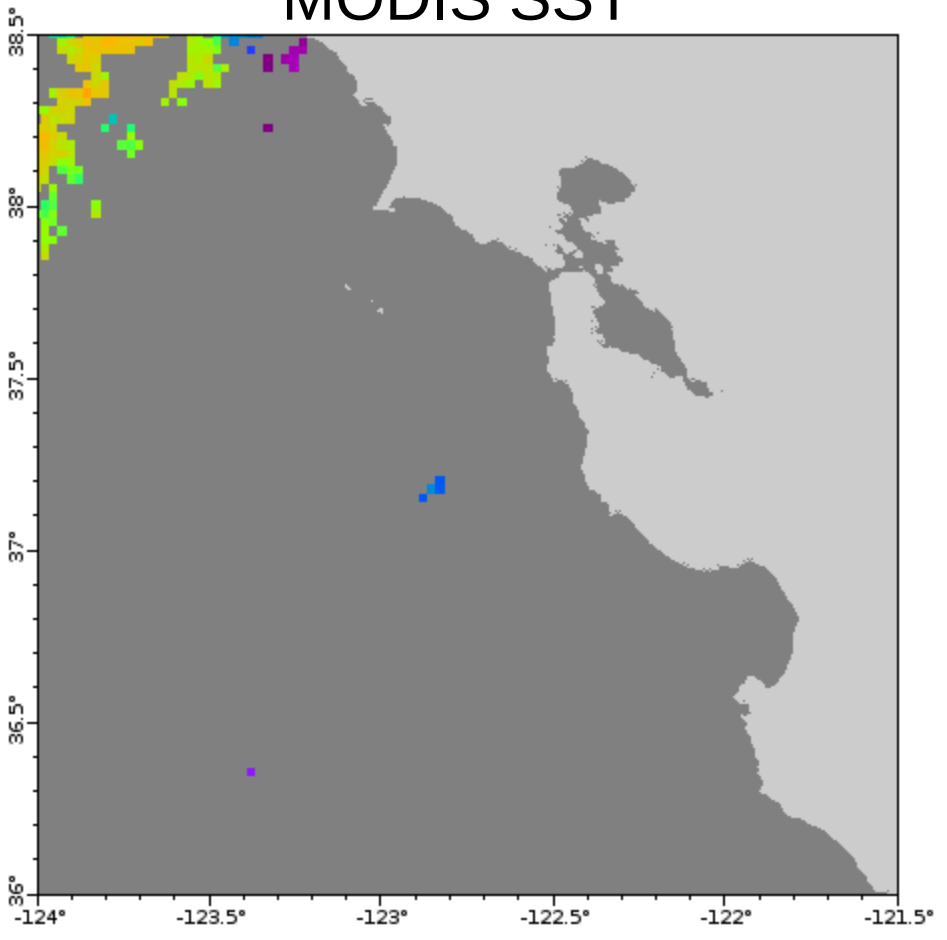
April 5, 2015

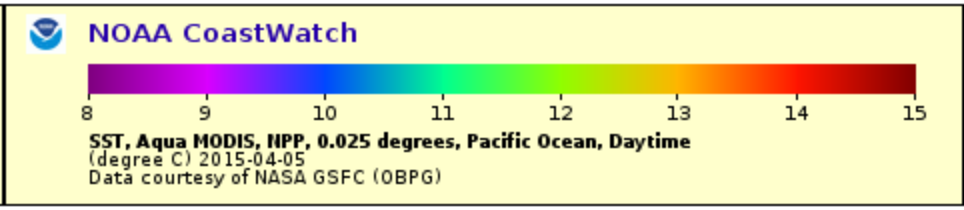
GOES SST





MODIS SST

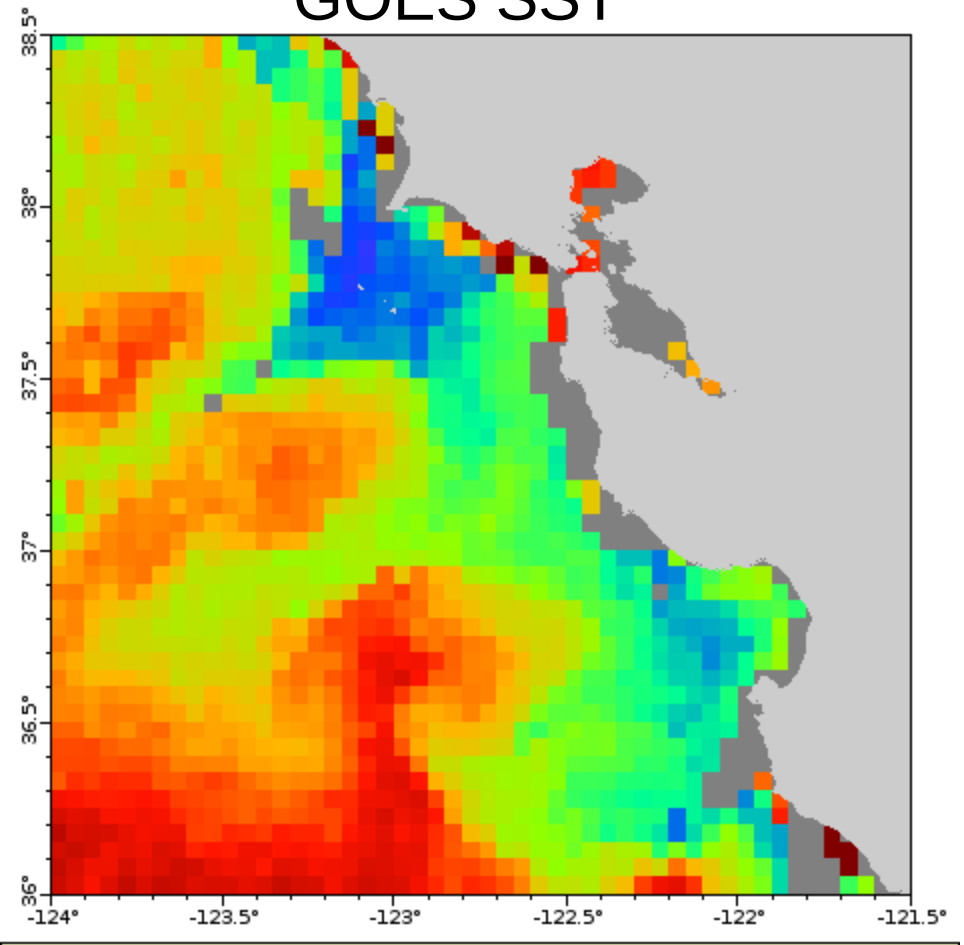




Data courtesy of ERDDAP, http://coastwatch.pfeg.noaa.gov/erddap

April 5, 2015

GOES SST

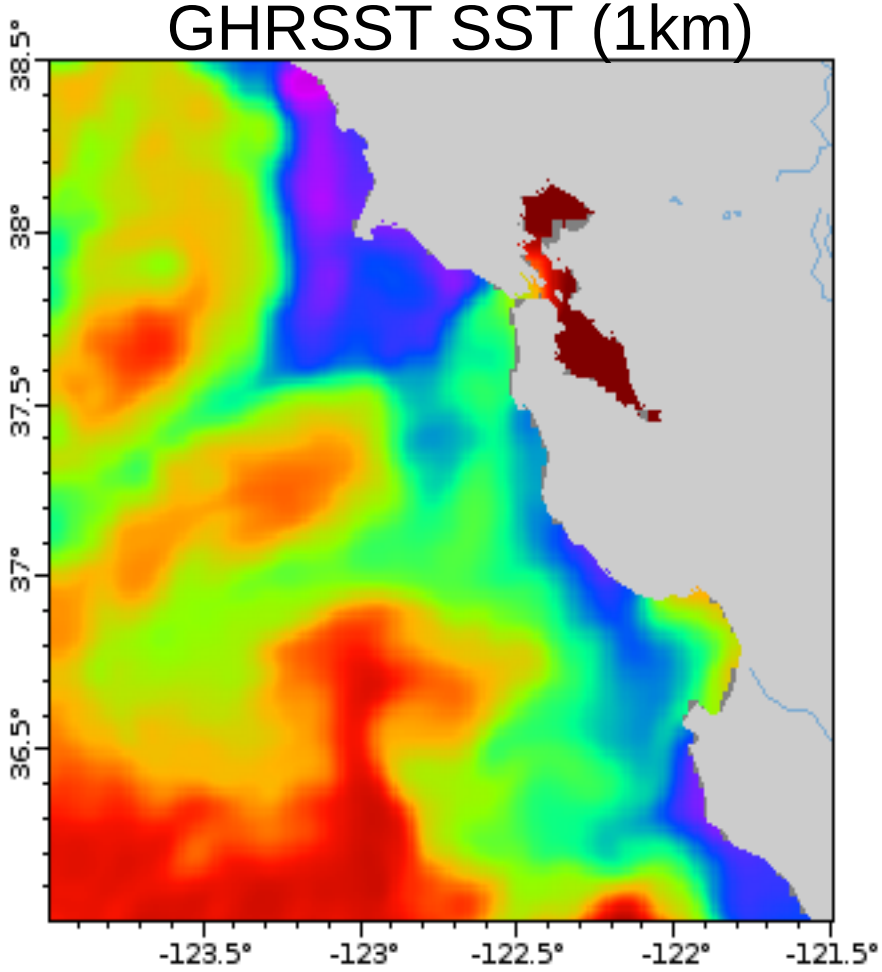


NOAA CoastWatch

8 9 10 11 12 13 14 15

SST, NOAA GOES Imager, Day and Night, 0.05 degrees, Western Hemisphere
(degree C) 2015-04-05
Data courtesy of NOAA NESDIS

GHRSST SST (1km)

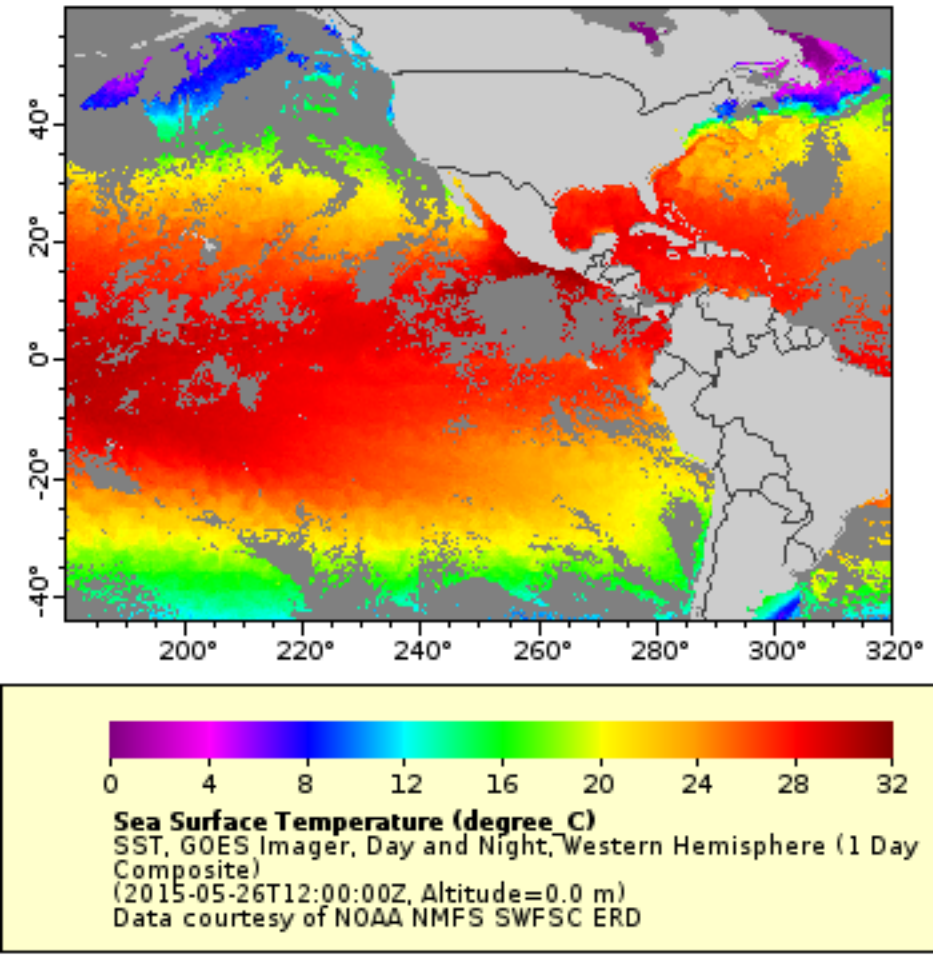


8 9 10 11 12 13 14 15

Analysed Sea Surface Temperature (degree_C)
GHRSST Global 1-km Sea Surface Temperature (G1SST), Global, 0.01 Degree, Daily
(2015-04-05T00:00:00Z)
Data courtesy of NASA JPL

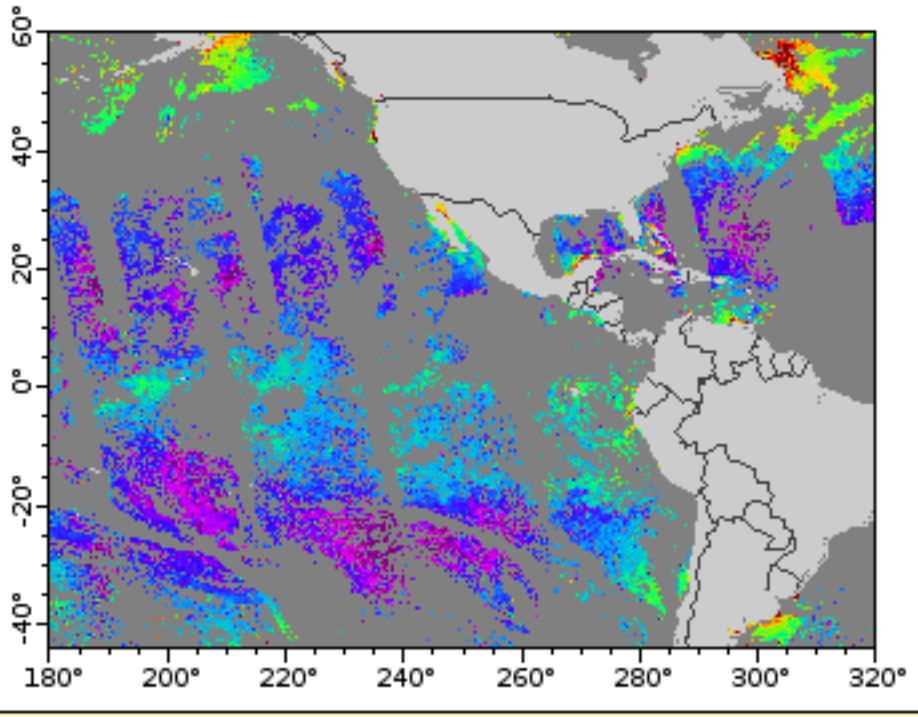
May 26, 2015

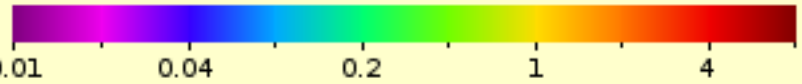
GEO SST



Sea Surface Temperature (degree_C)
SST, GOES Imager, Day and Night, Western Hemisphere (1 Day Composite)
(2015-05-26T12:00:00Z, Altitude=0.0 m)
Data courtesy of NOAA NMFS SWFSC ERD

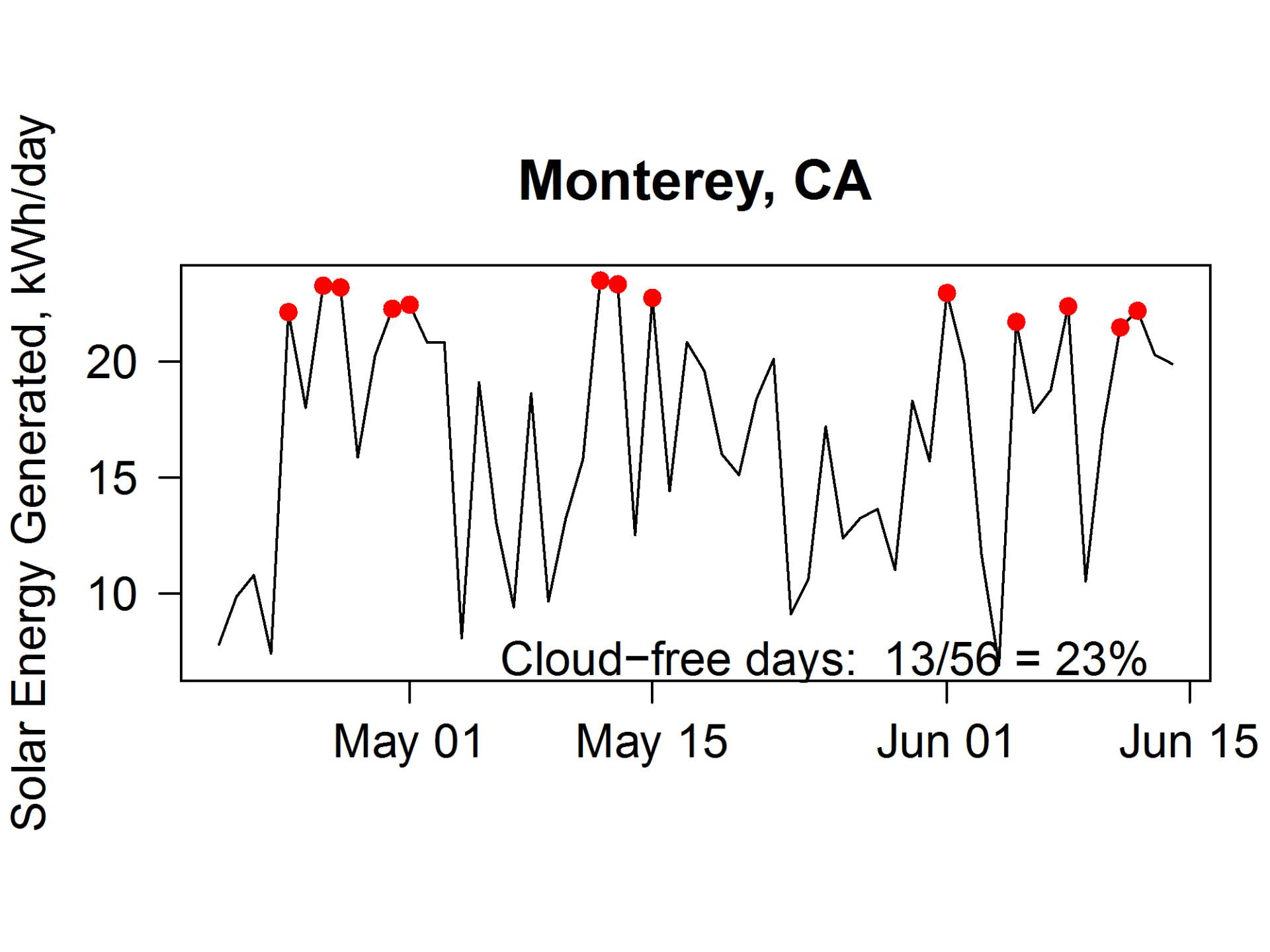
Polar-orbiting Chl





Concentration Of Chlorophyll In Sea Water (mg m-3)
Chlorophyll-a, Aqua MODIS, NPP, Pacific Ocean (1 Day Composite
(2015-05-26T12:00:00Z, Altitude=0.0 m)
Data courtesy of NOAA NMFS SWFSC ERD

Data courtesy of ERDDAP, http://coastwatch.pfeg.noaa.gov/erddap


Monterey, CA
Solar Energy Generated, kWh/day
20
15
10
Cloud−free days: 13/56 = 23%
May 01
May 15
Jun 01
Jun 15

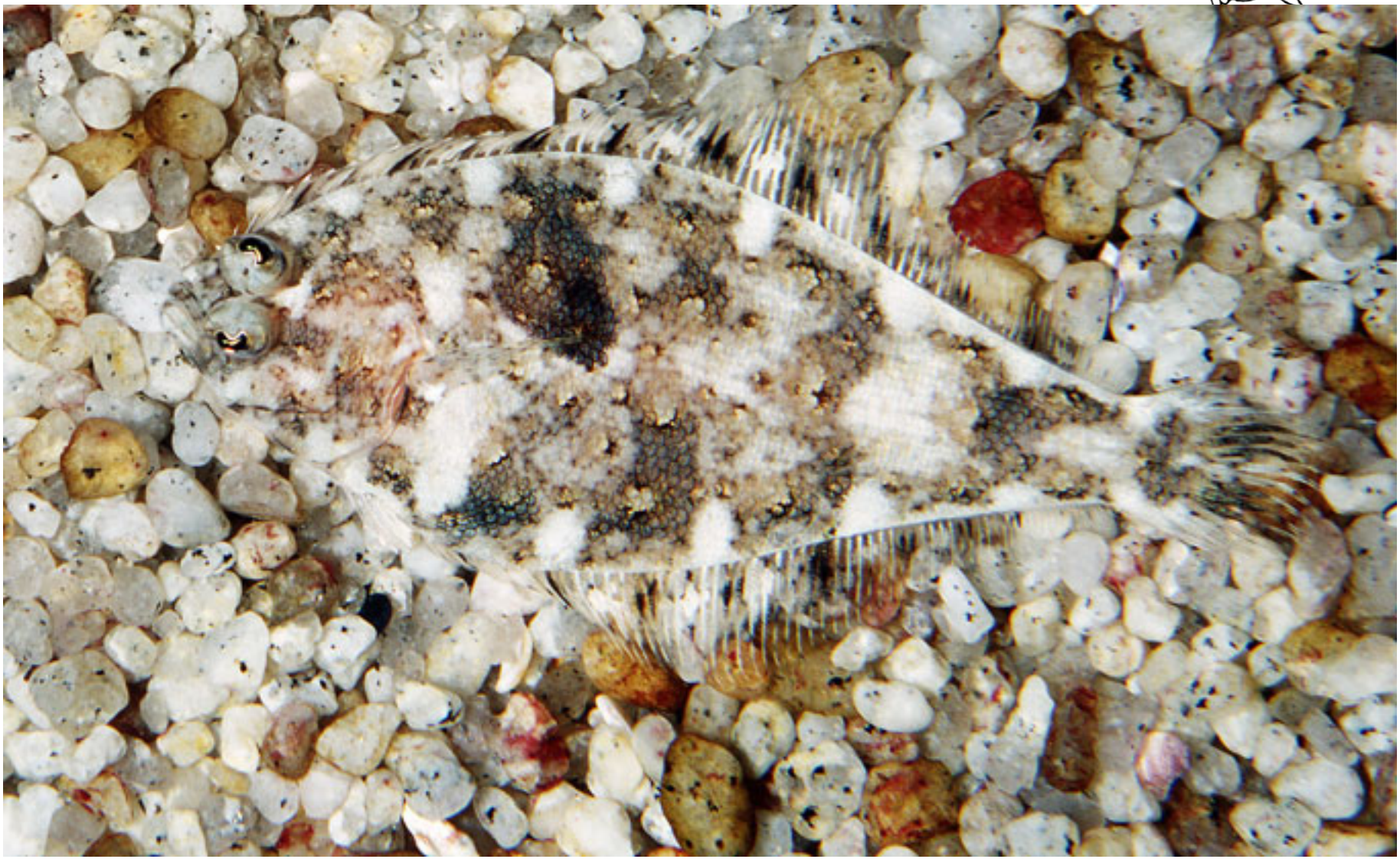
Take-home points

- Biggest advantage of geostationary ocean color data will be improved spatial coverage, ***not*** improved temporal resolution.

- High-temporal resolution, i.e. to define tidal cycles, will ***only*** be possible in cloud-free regions.

- Blending of data from multiple sensors (i.e. IR and microwave) and platforms (i.e. polar and geo) has been successfully done for SST data via the GHRSST project. Blending of OC data is considerably more challenging, but has been done by ESA's GlobColour project (http://www.globcolour.info).

Where were the Fish?



“Ocean Color & Fisheries” keynote talk, Thursday 8:00 am (not 8:30!)