Time series of satellite images

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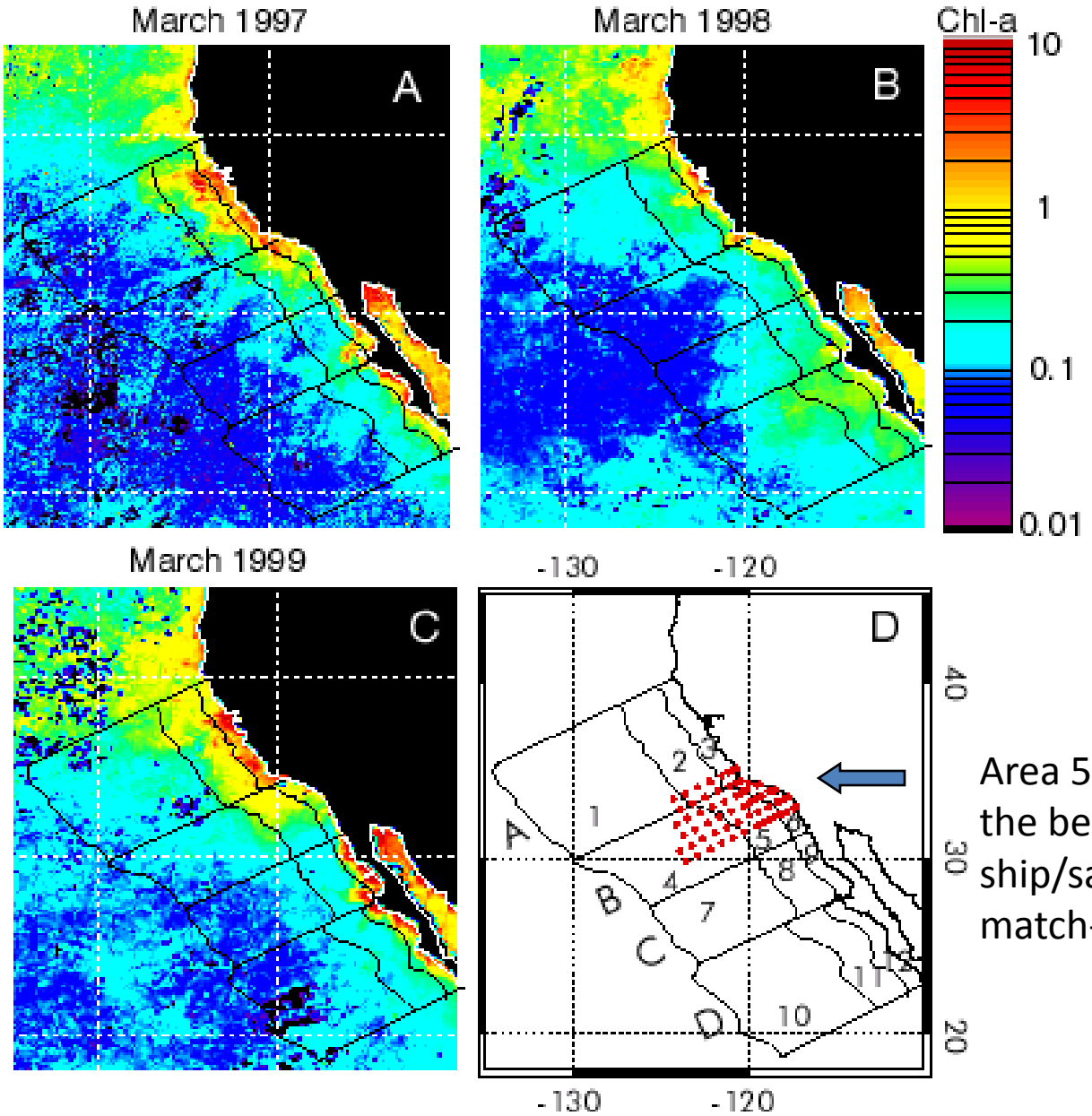
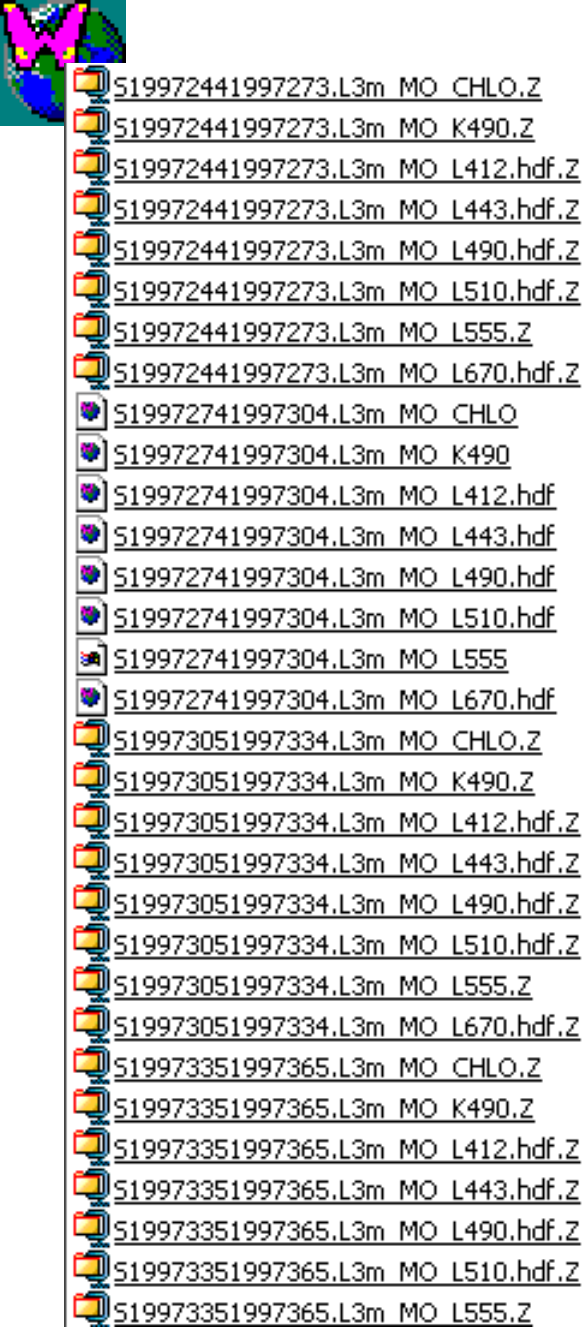
Kahru, M., B.G. Mitchell, Influence of the 1997-98 El Niño on the surface chlorophyll in the California Current, Geophysical Research Letters, Vol. 27, No. 18, 2937-2940, 2000.

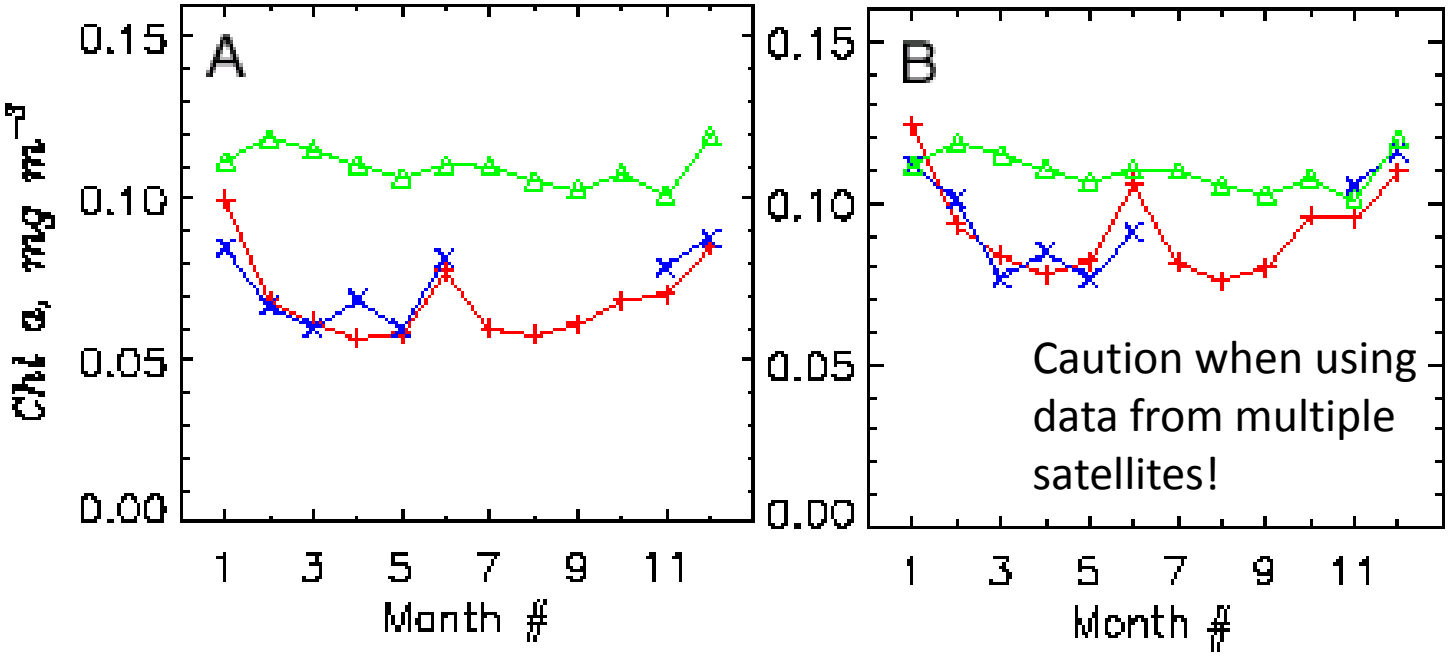


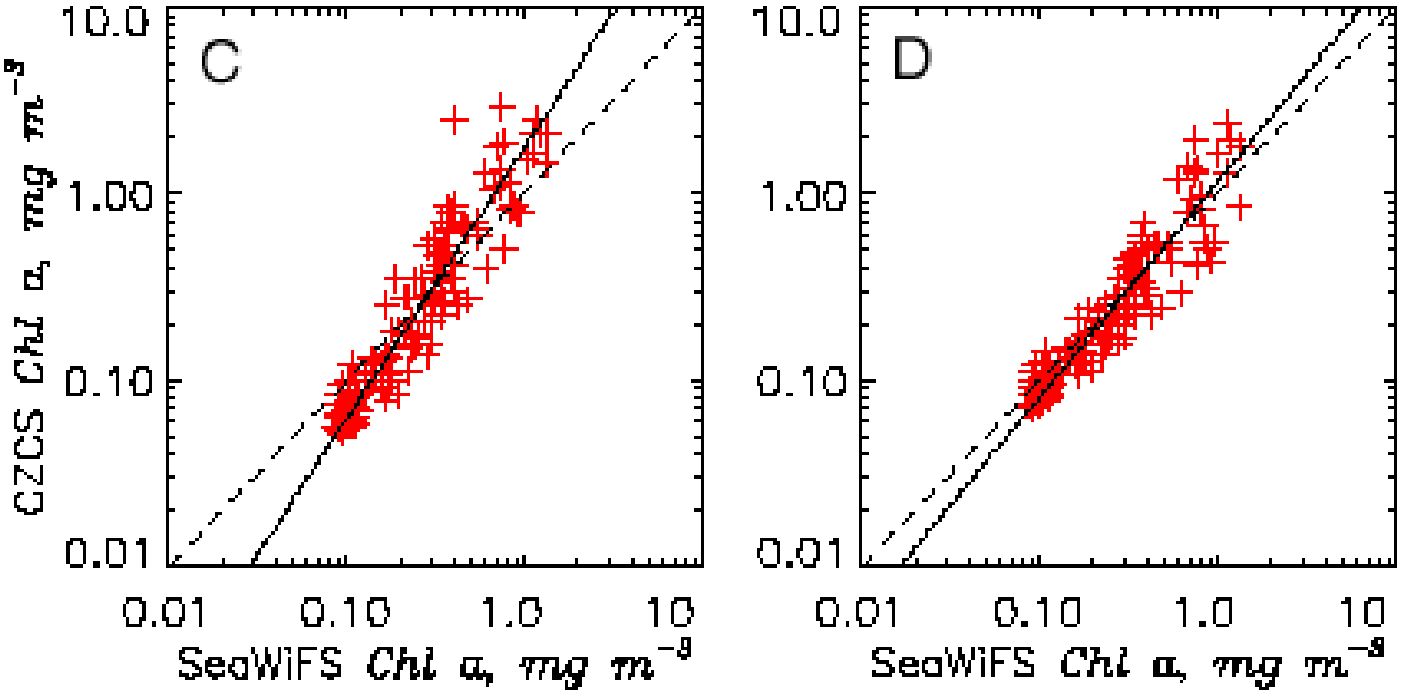
Area 5 with the best ship/satellite match-up

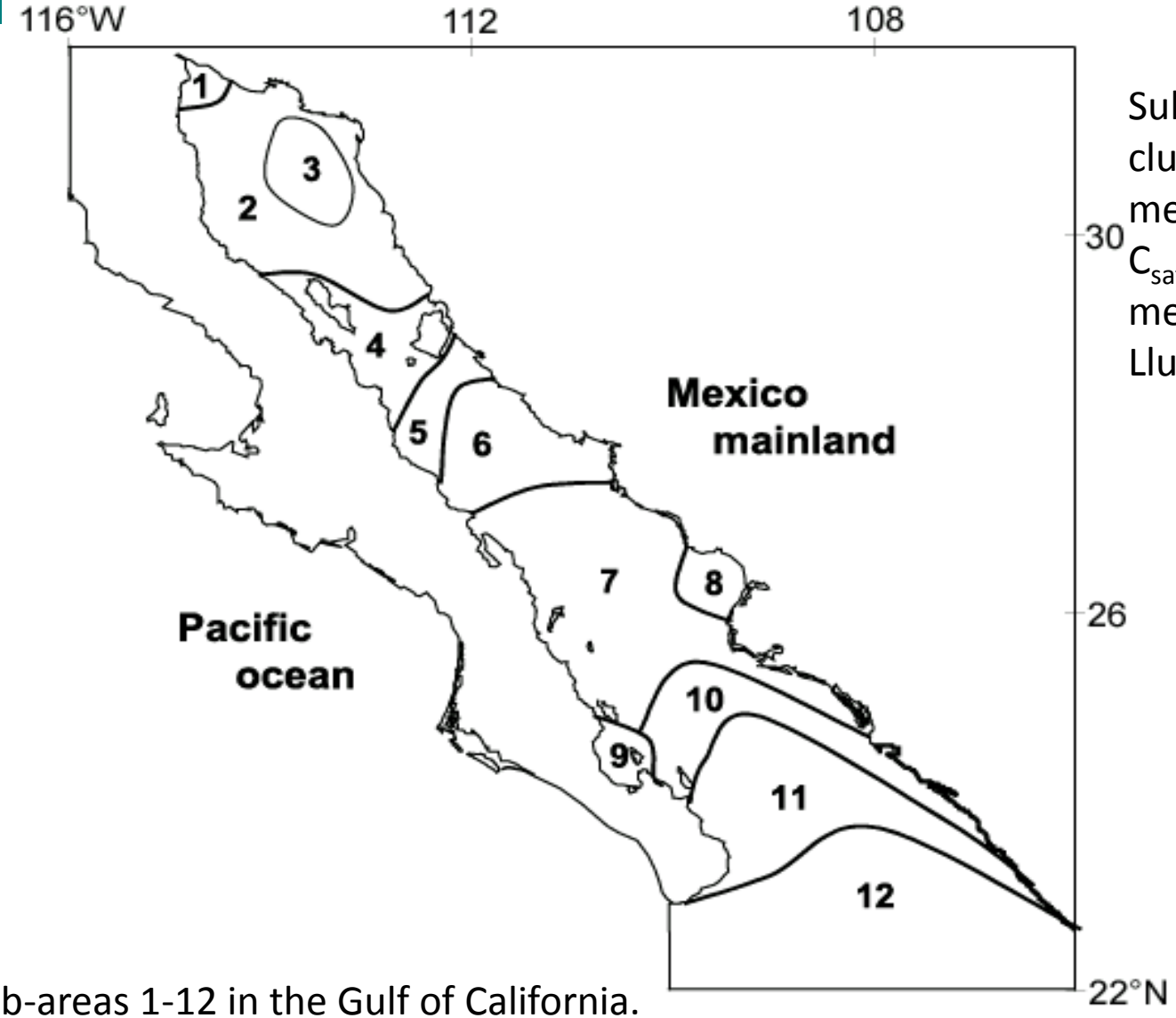


Large numbers of satellite images…
11-years of **SeaWiFS** data (8 bands, multiple derived products):
>120 monthly composites;
>11*42 8-day composites;
>11*365 daily composites;

+ OCM, MODIS-Terra, MODIS-Aqua, MERIS, MOS, OSMI, ….
Several **AVHRR** sensors in orbit since 1978… => tens of thousands of daily passes;
SSM/I and other sensors.

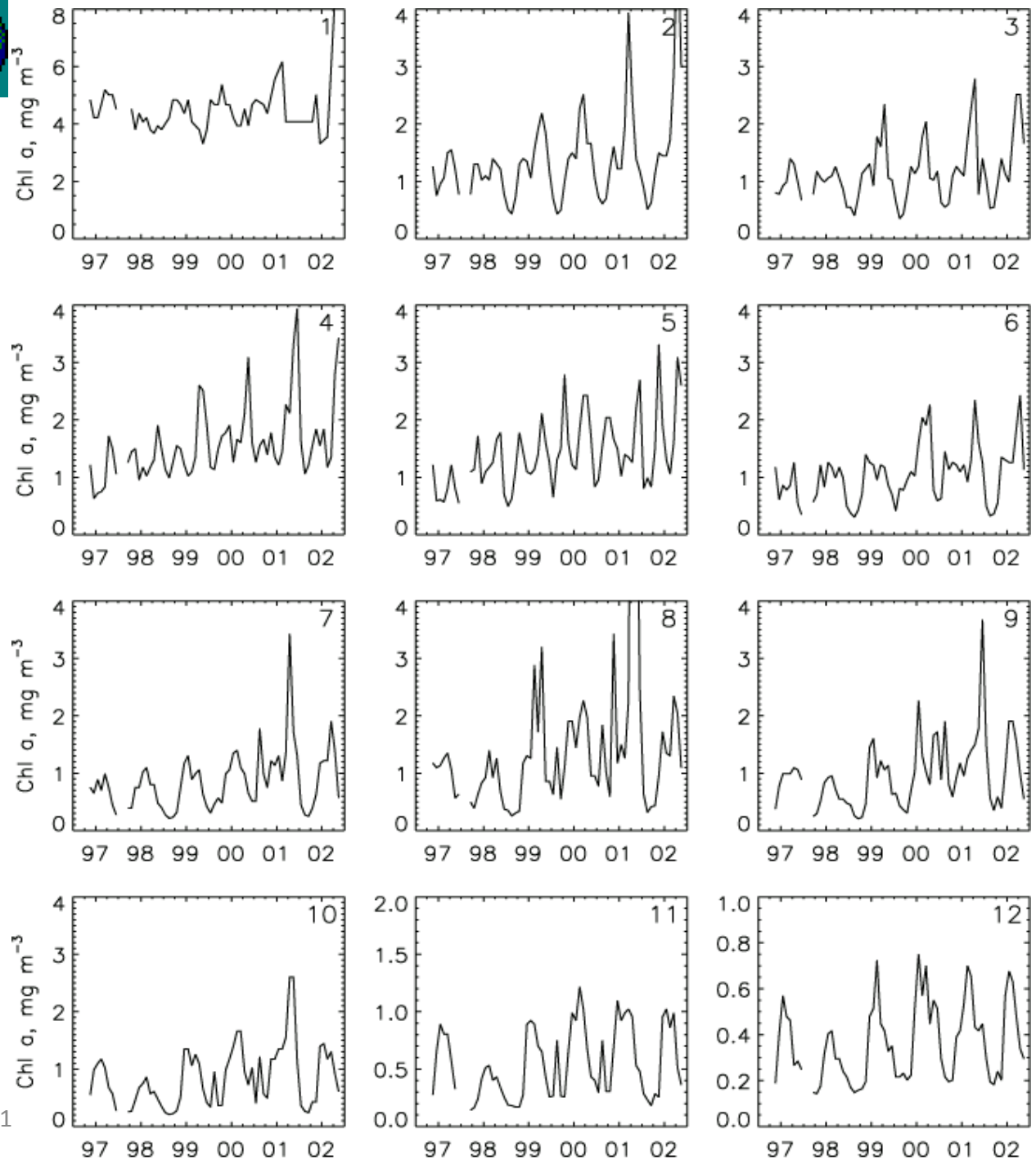

A
B
0.15
0.10
0.05
0.00
Chl a, mg m^{-3}
1 3 5 7 9 11
Month #
Caution when using data from multiple satellites!


C
D
10.0
1.00
0.10
0.01
CZCS Chl a, mg m^{-3}
0.01 0.10 1.0 10
SeaWiFS Chl a, mg m^{-3}

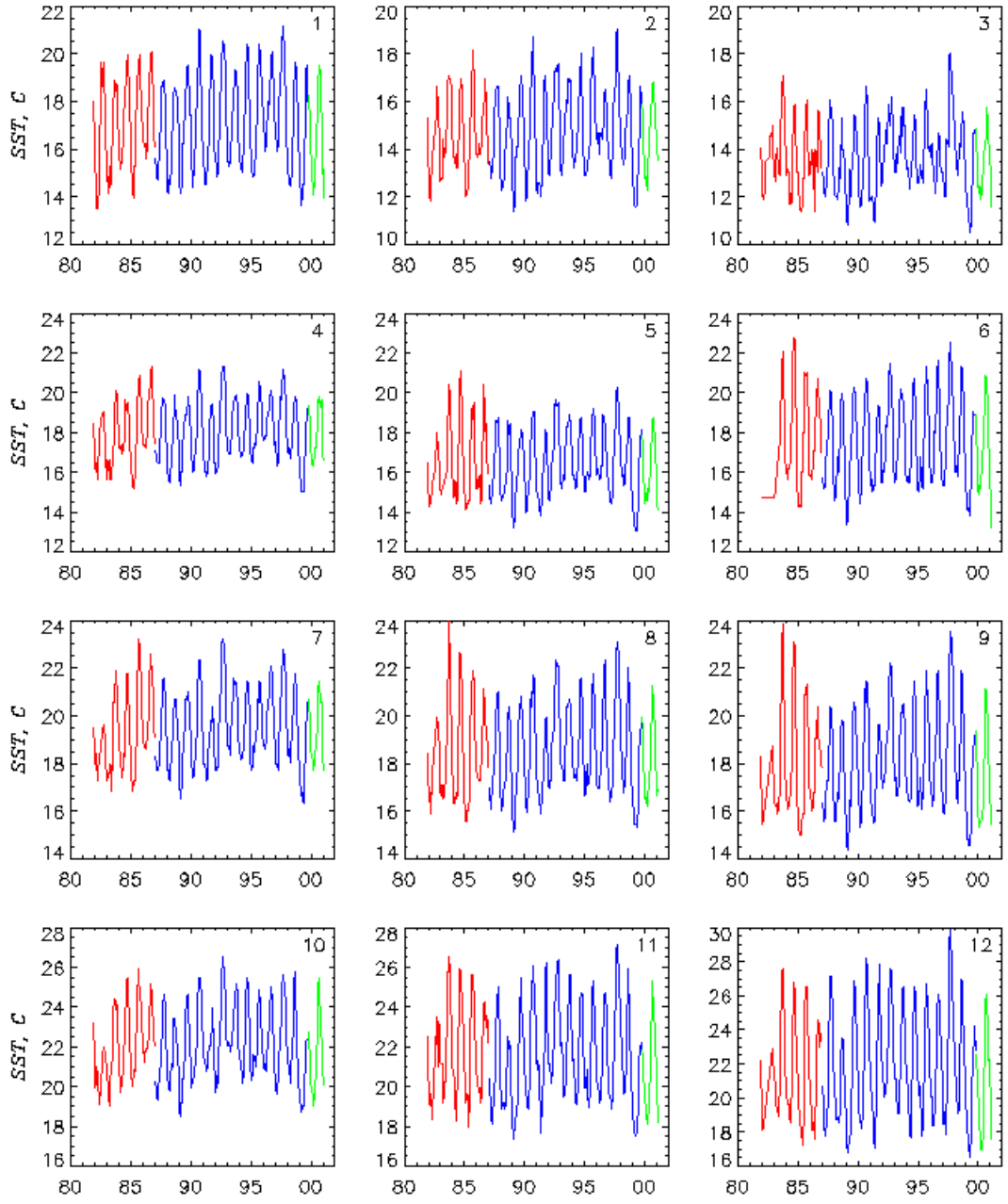


Sub-areas defined by cluster analysis of the mean annual cycle in C_{sat} based on CZCS measurements (S.E. Lluch-Cota).

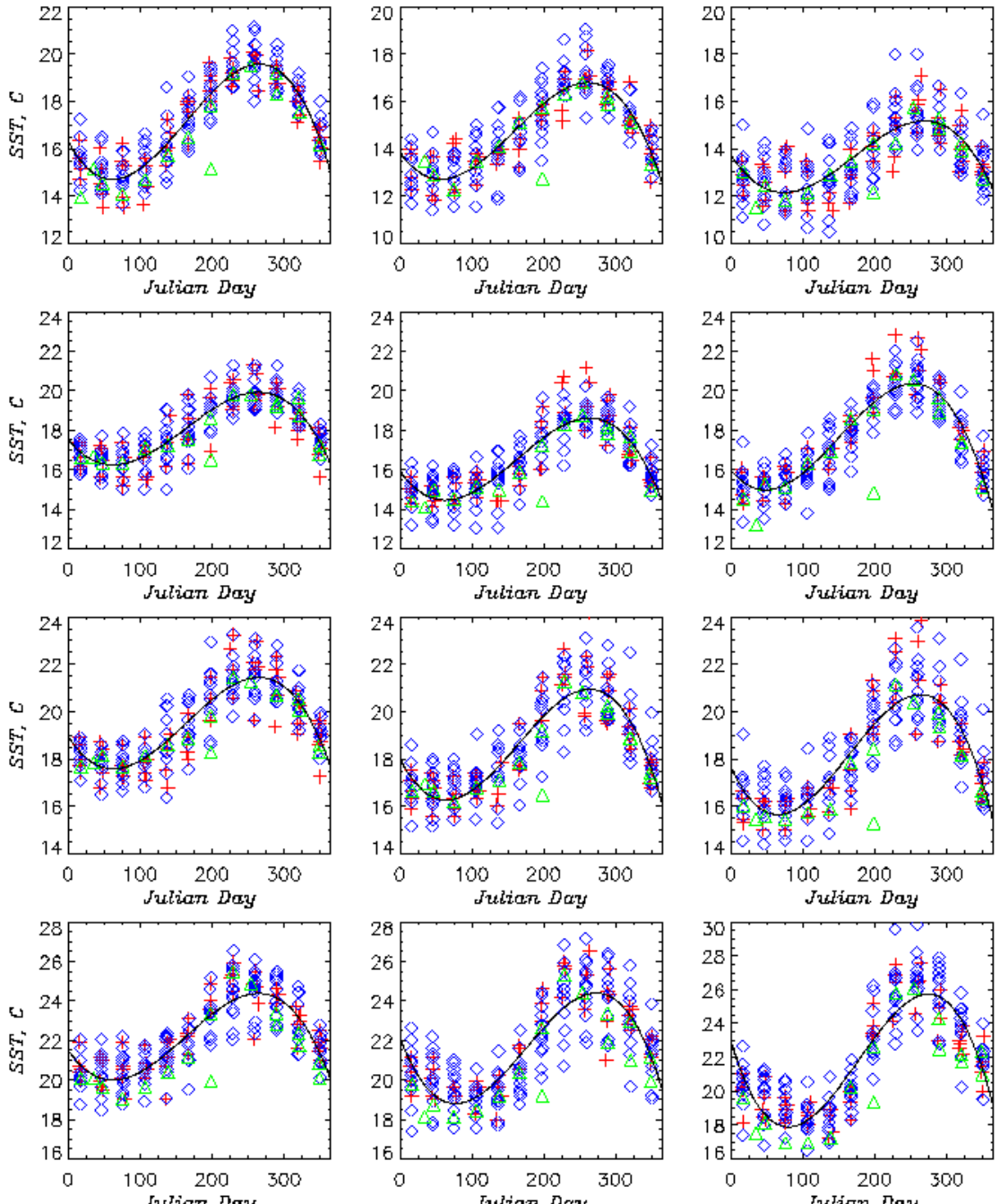
Sub-areas 1-12 in the Gulf of California.



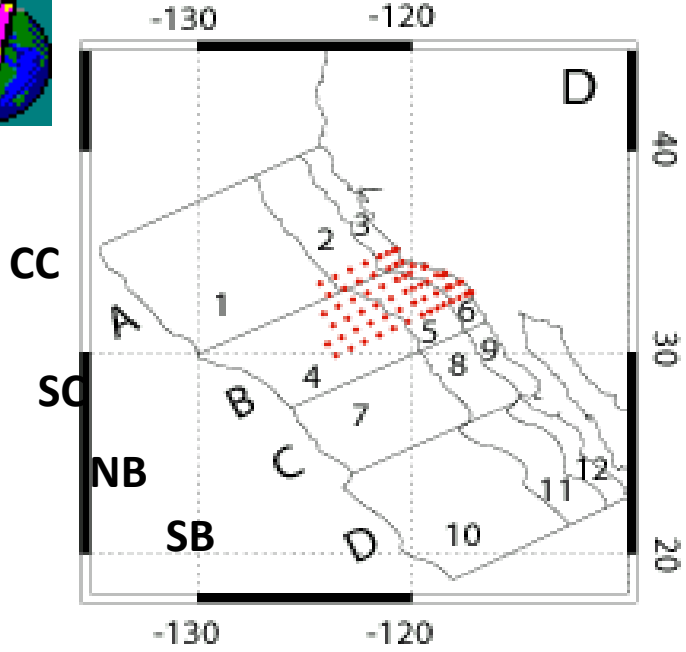
Monthly time series of C_{sat} in sub-areas 1-12 showing the median for each sub-area.

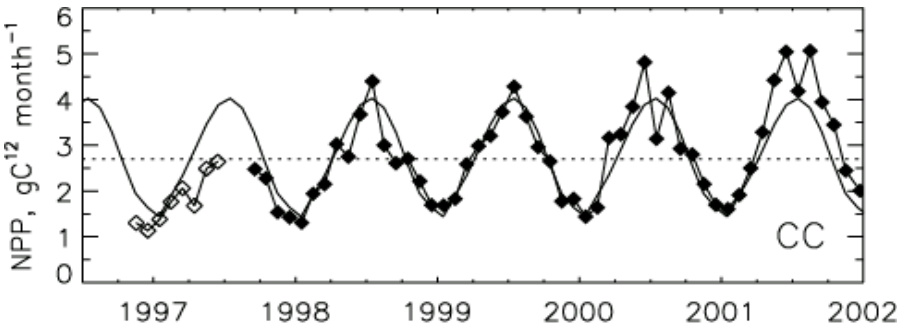


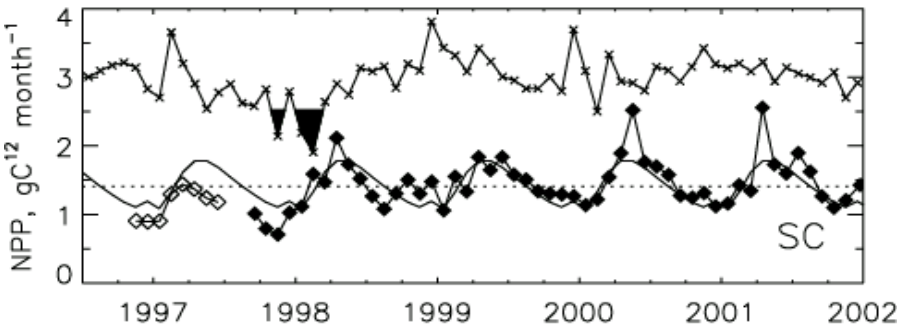
Monthly time series of SST in sub-areas of the CC showing the median for each sub-area using multiple AVHRR satellites and multiple datasets (different colors)

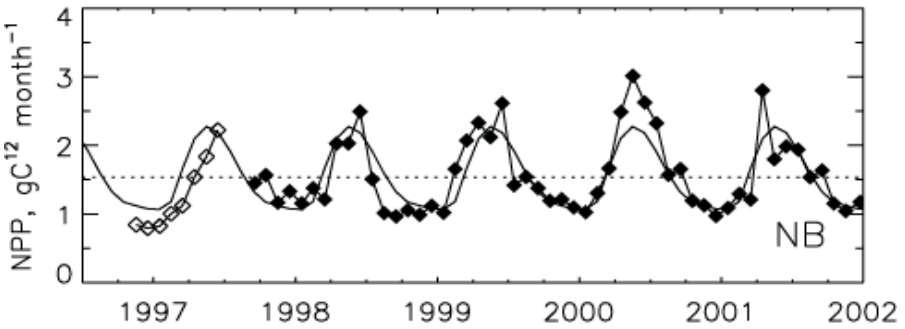


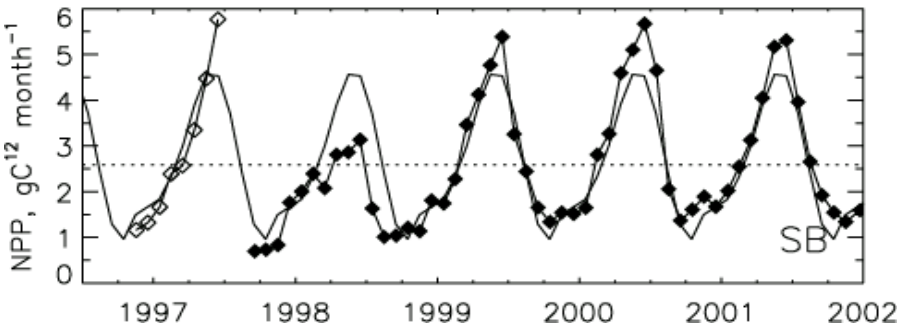
Create mean annual cycle to get anomalies versus the mean cycle.





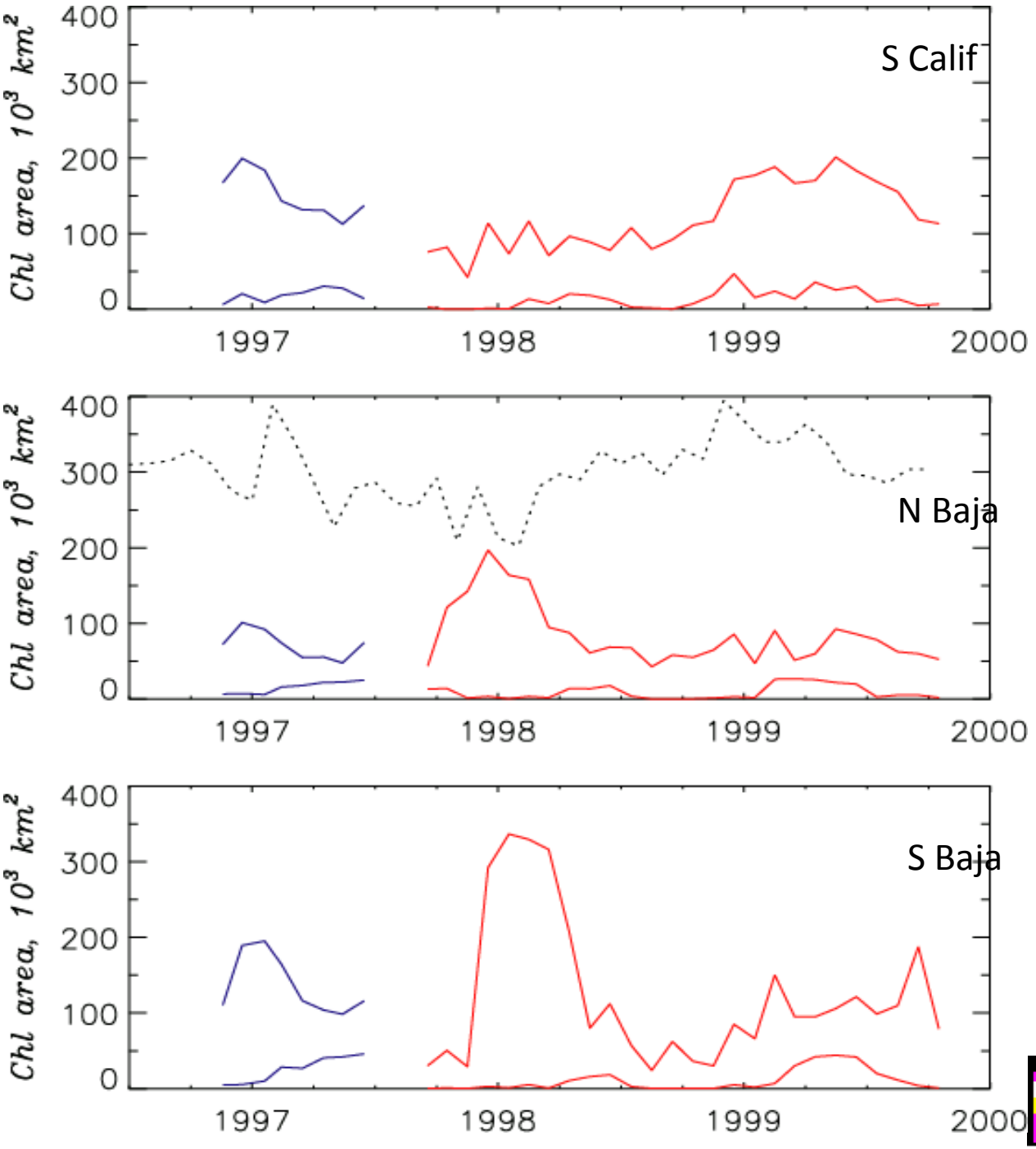


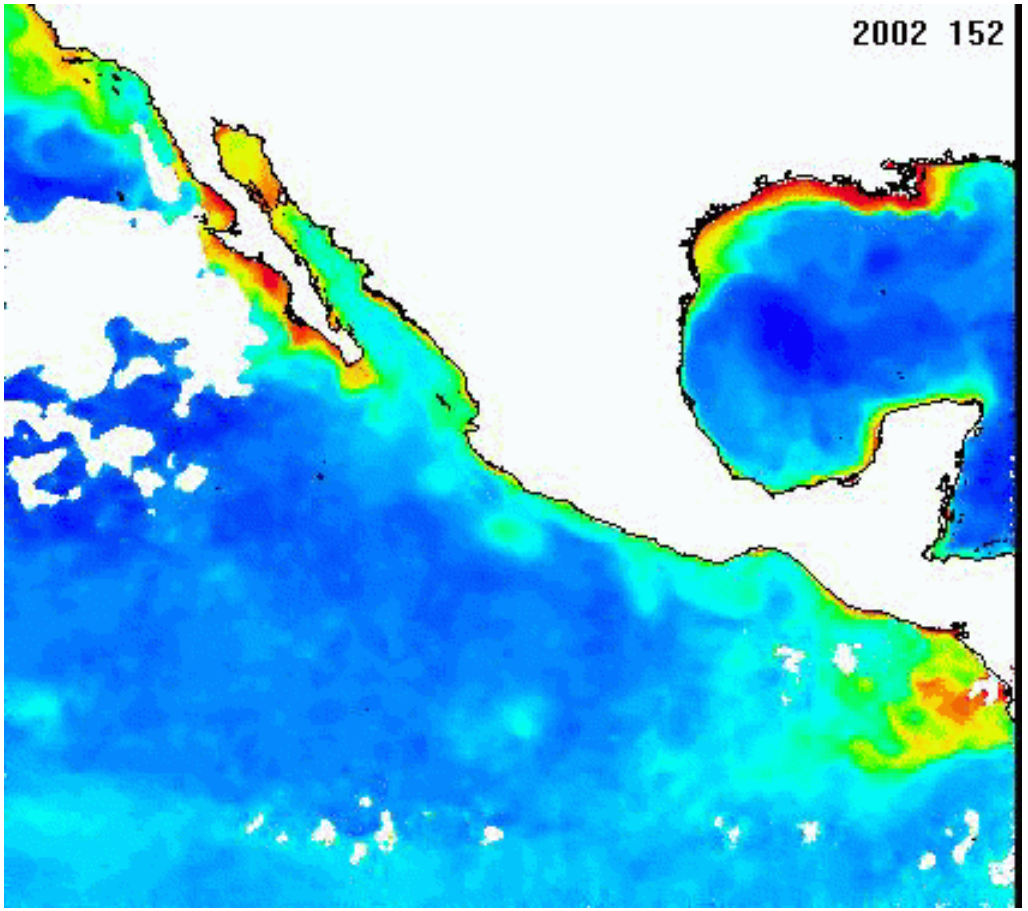




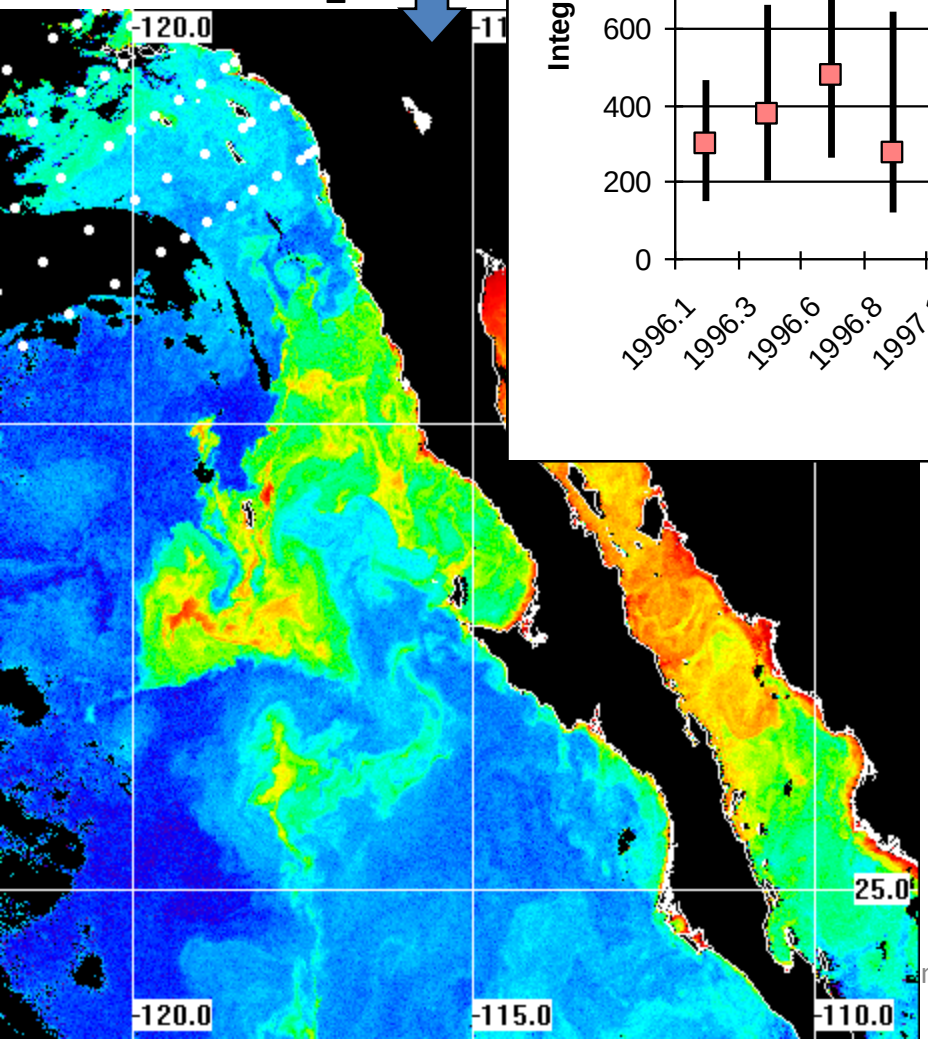
Time series of NPP in **0-100** km band in zones CC, SC, NB, SB calculated with Csat from OCTS (◊) and SeaWiFS (♦) and compared with the mean annual cycle (solid line). The dotted horizontal line is the long-term mean. Minima in the Northern Oscillation Index (×, relative scale) correspond to peaks in the El Niño (filled black areas).

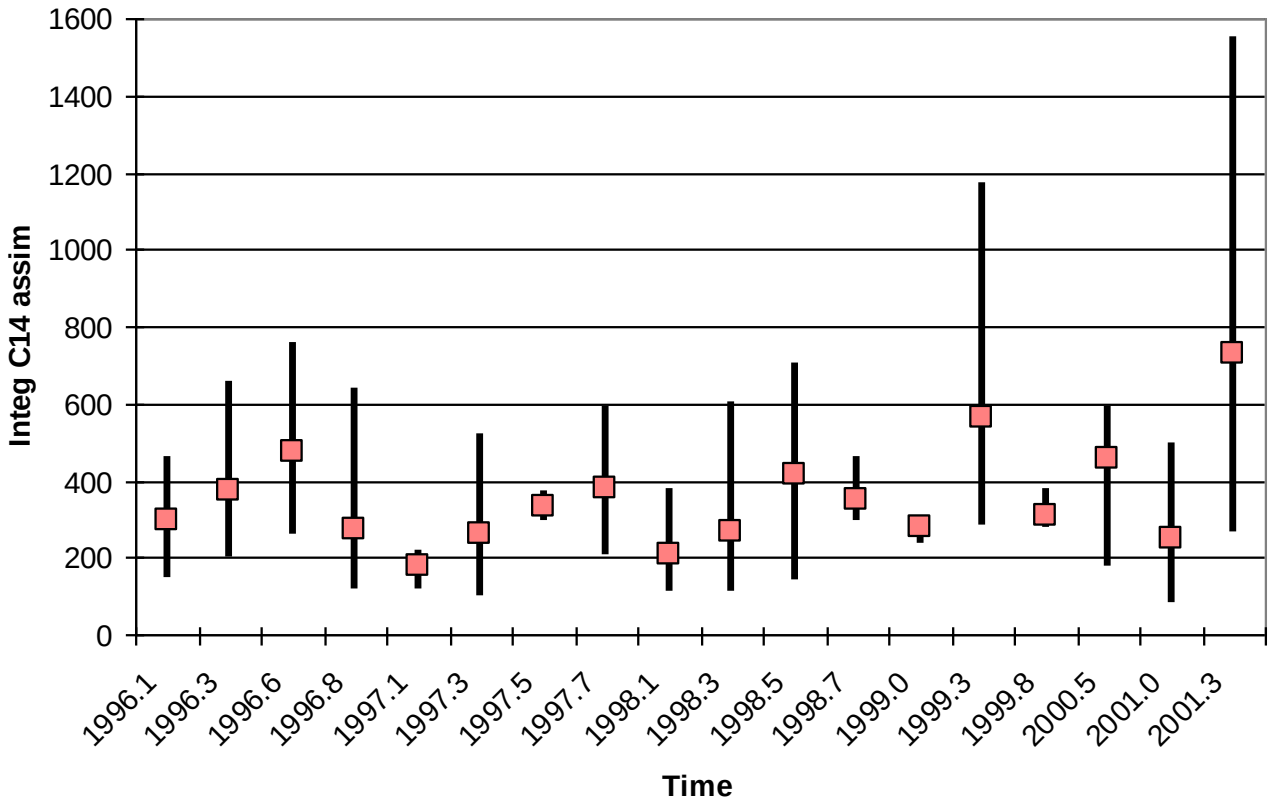
Areal extent of mesotrophic (top line, 0.2 < Chl <= 1.0), and eutrophic (bottom line, Chl > 1.0) waters in Southern Calif., Northern and Southern Baja derived from OCTS and SeaWiFS data.





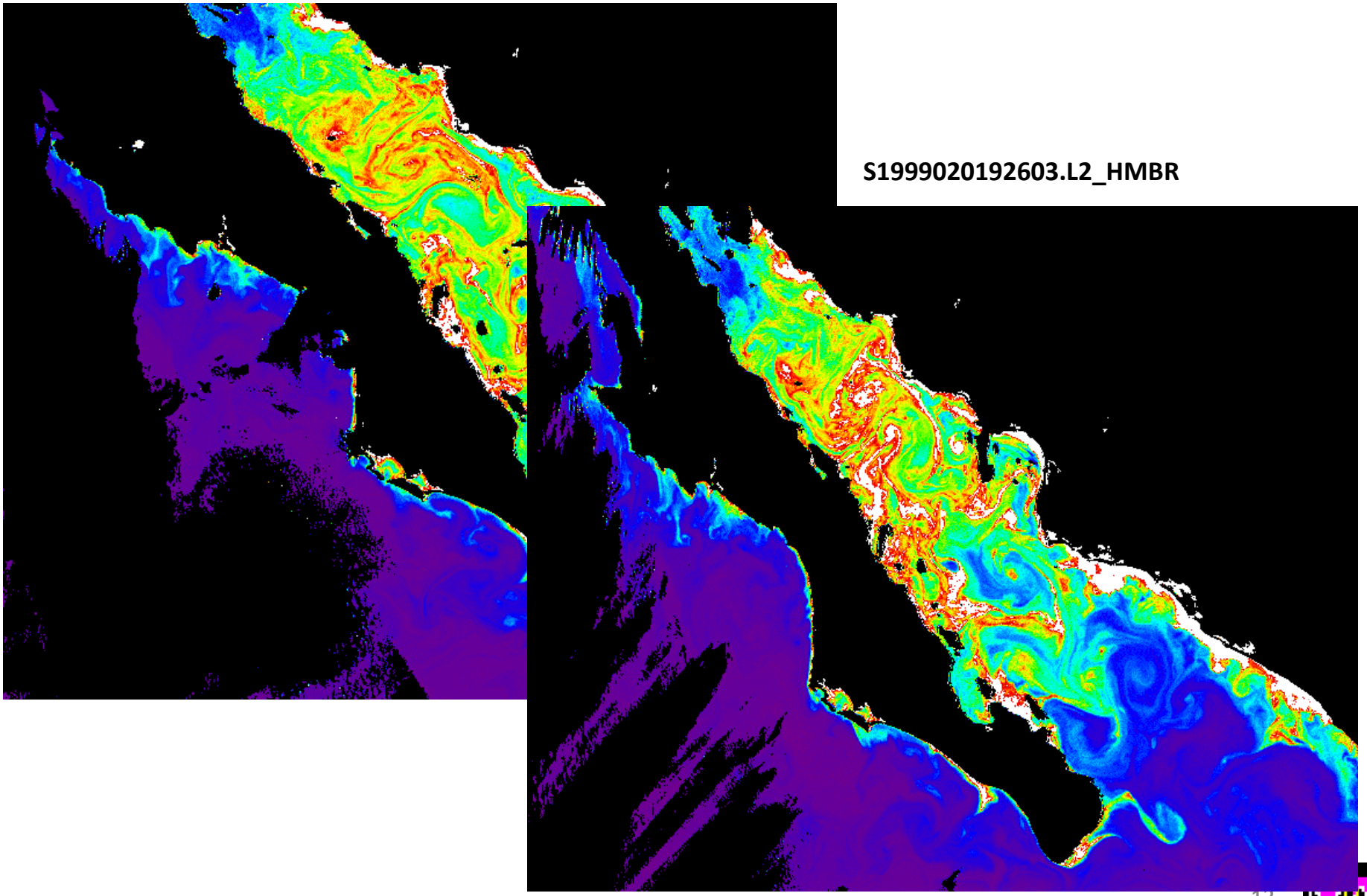
- Satellites cover large areas
- Good areal estimates





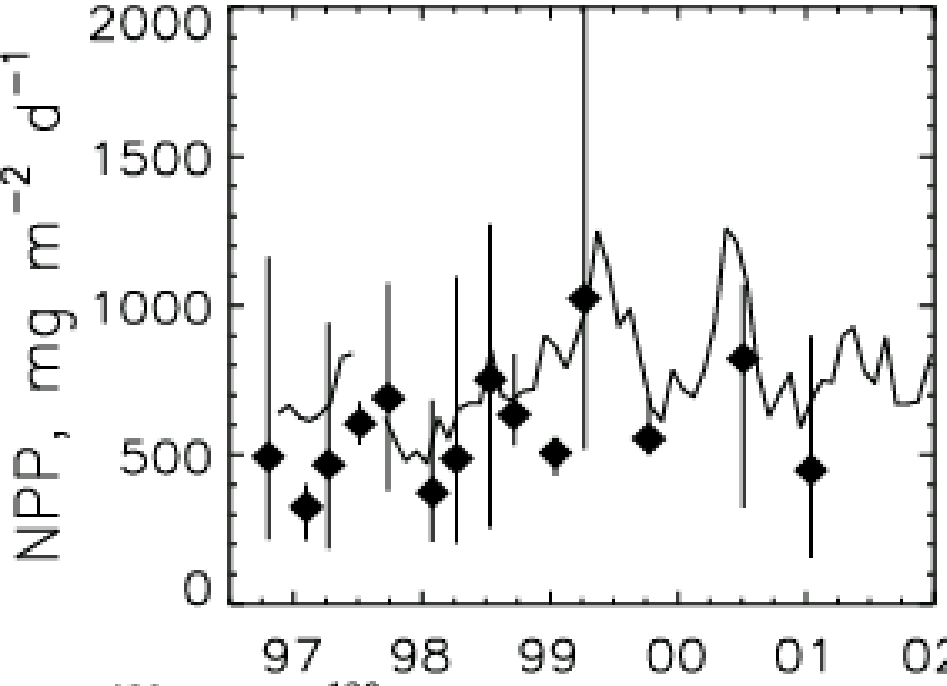
- PP measurements have very high variability
- Very time consuming
- CalCOFI: 1 PP station per day, 3-6 per area #5
- Very hard to get reliable averages over time and space

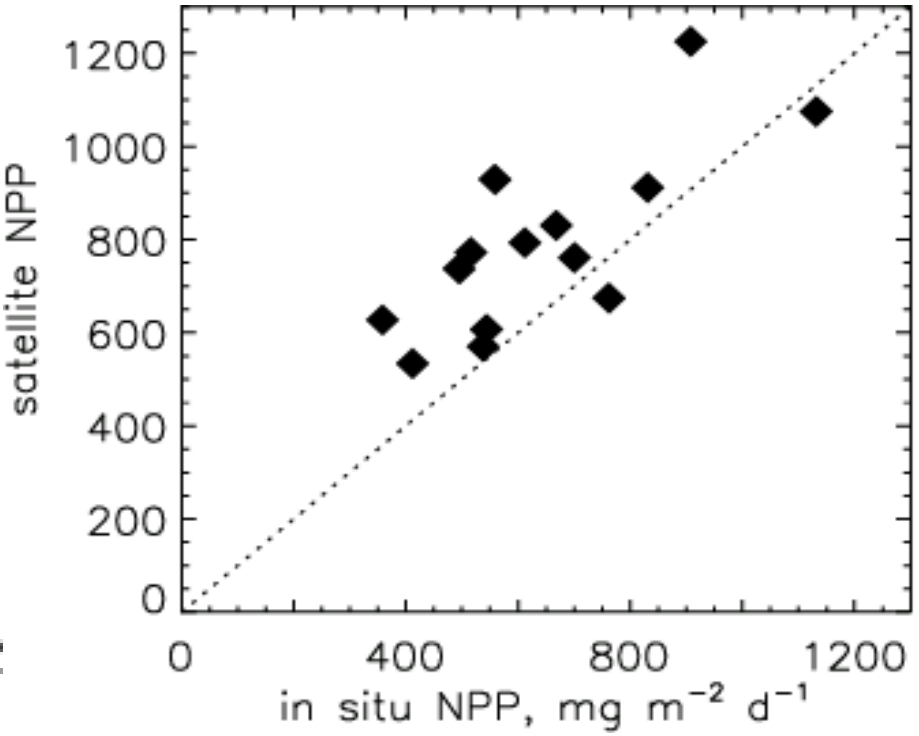
S1999018193513.L2_HMBR

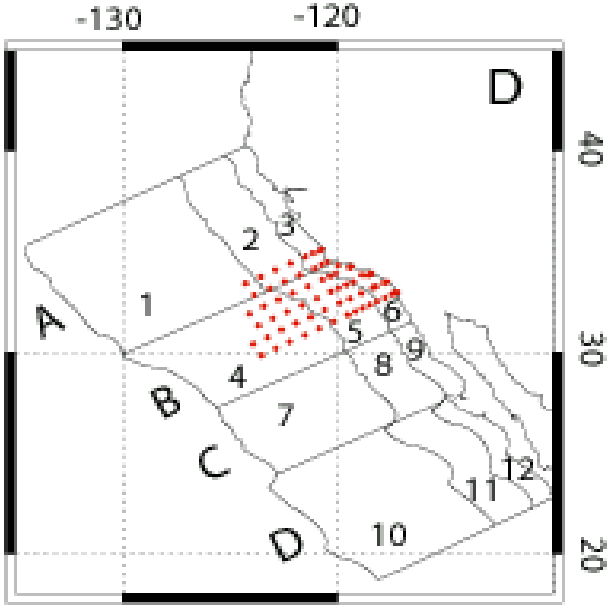


S1999020192603.L2_HMBR

Validation of satellite derived NPP vs. CalCOFI in situ







Satellite estimates of NPP versus ship measurements in the 100-300 km band off Southern California (area 5) with CalCOFI stations. The satellite estimate is the median for the area, the ship measurement is the mean of a few stations in that sub-area during a cruise. Reduced major axis regression: intercept = 183, slope = 1.04, r2 = 0.59.

Now is your term!

- Create your own area masks (e.g. on a blank global image, masks have values of 1, 2,…)
- Save the mask image as a HDF file
- Select a time series of images (in the same projection and size as the mask!), create a list file of images with the full pathname
- Run *wam_statist*
- To make plots in *Excel*, sort the masked areas with *sortmasks*
- Make plots