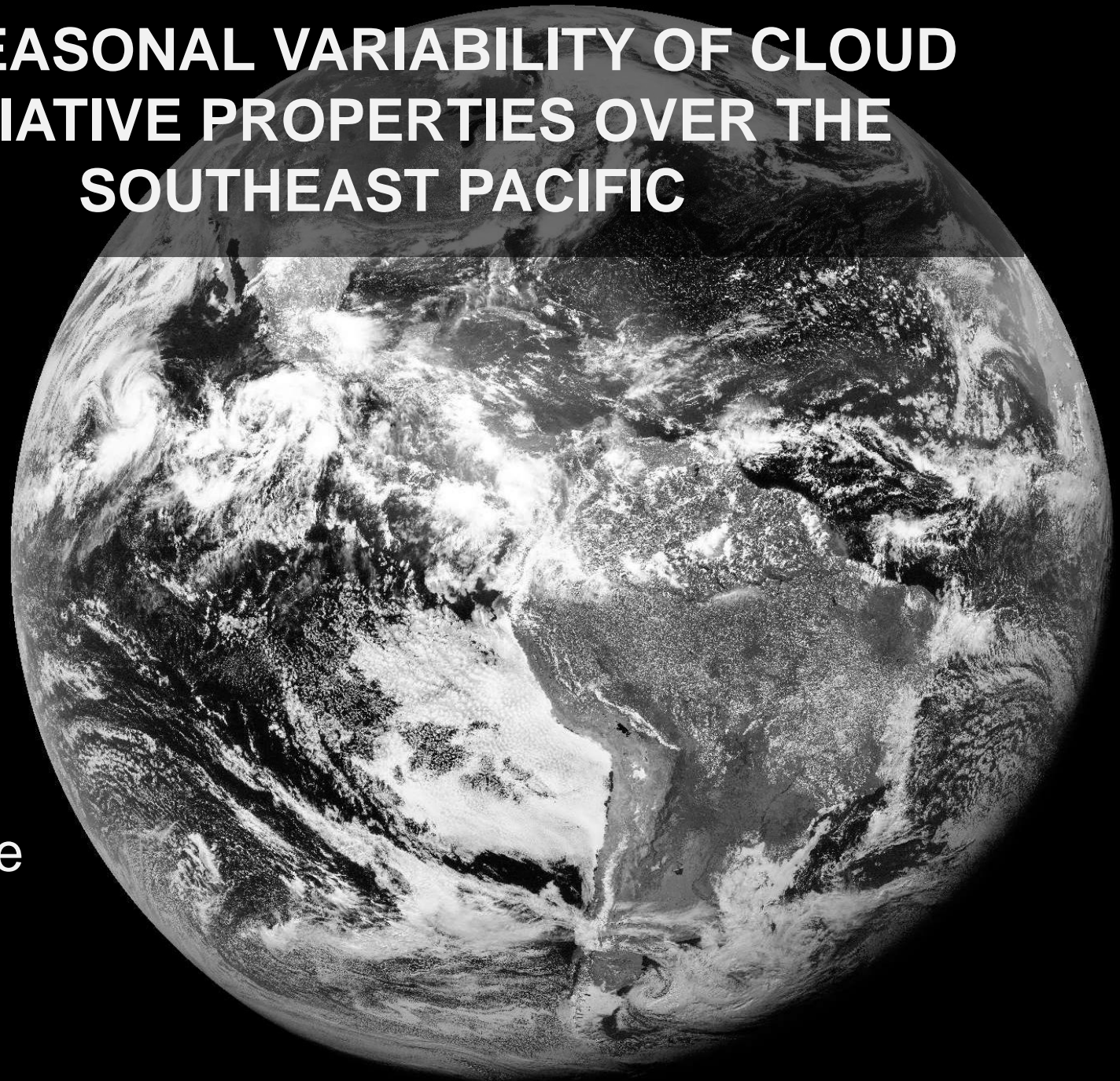


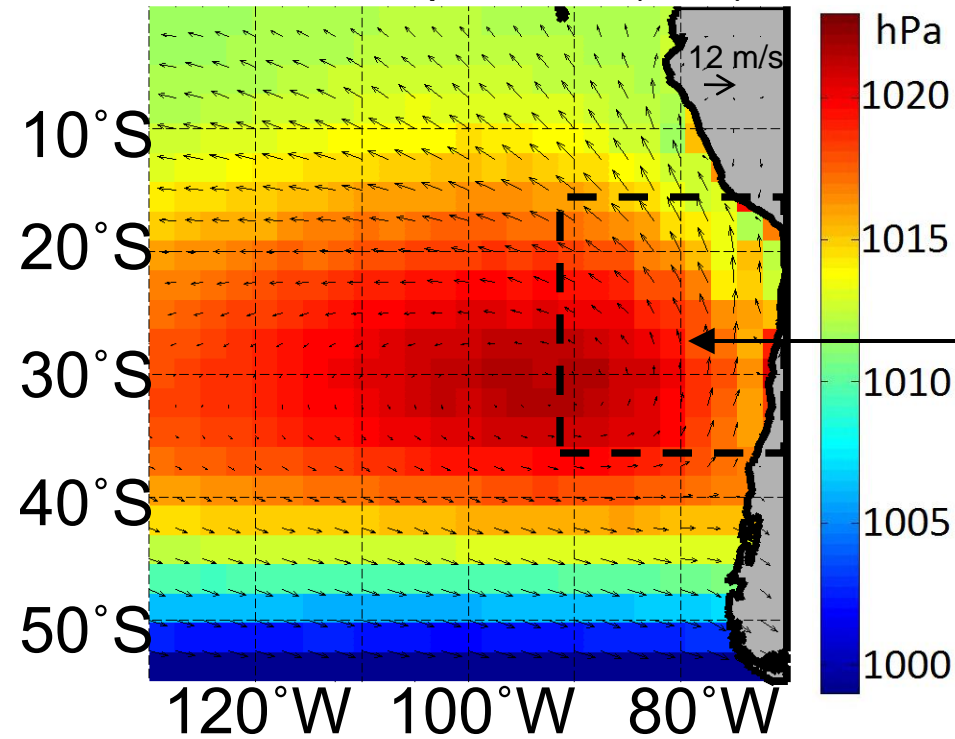
SUBSEASONAL VARIABILITY OF CLOUD RADIATIVE PROPERTIES OVER THE SOUTHEAST PACIFIC

Rhea George
Advised by:
Robert Wood
University of
Washington

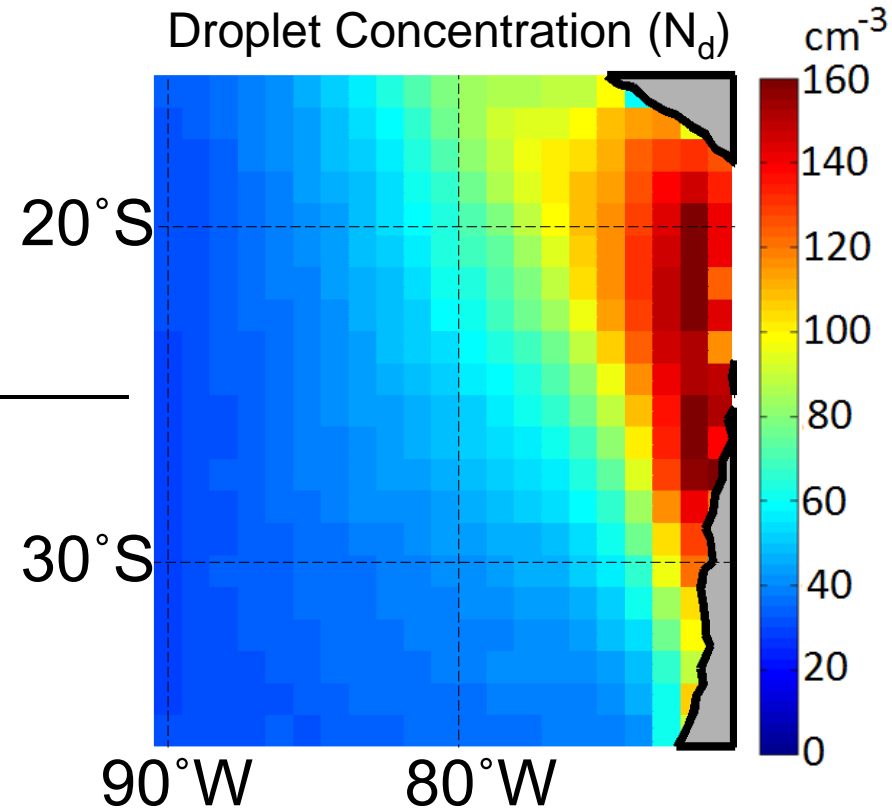


Data

2000-2008 time average
sea level pressure (SLP)



2000-2008 time average
Droplet Concentration (N_d)



***SLP, Stability, Winds,
Temperature Advection***

NCEP Reanalysis

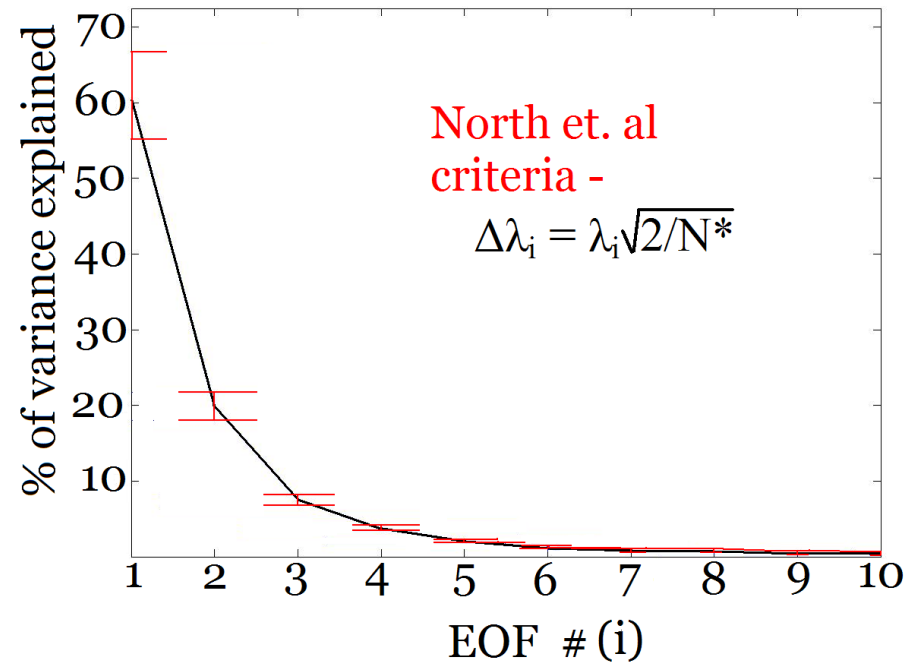
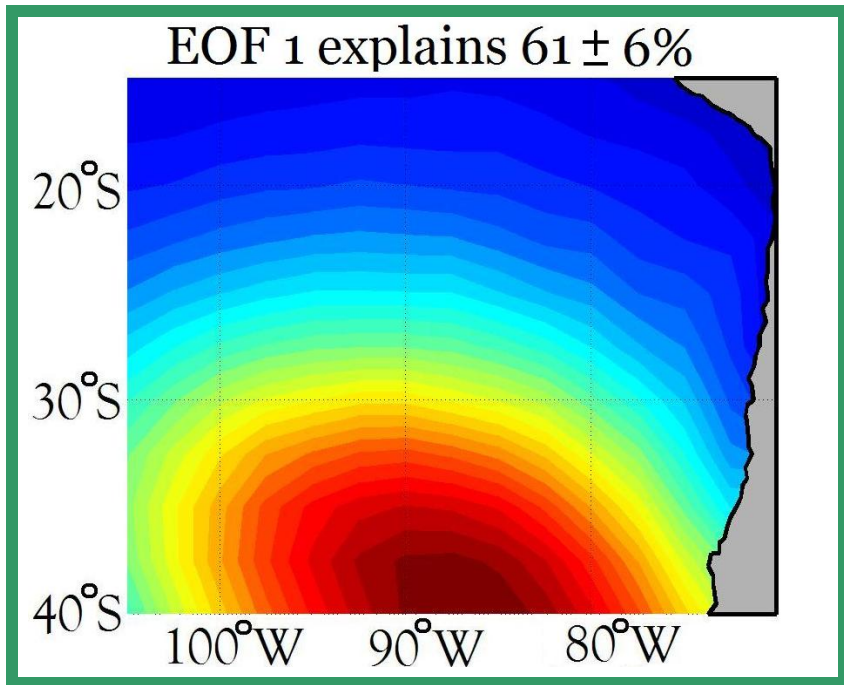
2.5 latitude x 2.5 ° longitude grid

***N_d , Low Cloud Fraction,
LWP***

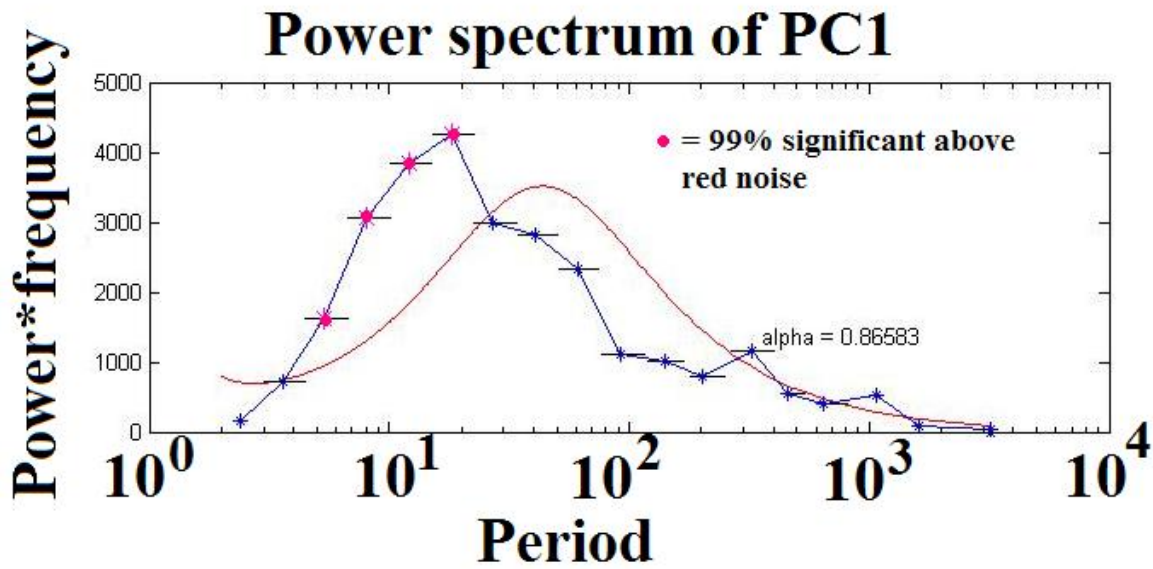
MODIS (satellite) data

1° latitude x 1° longitude grid

EOF Analysis of SLP 2000-2008

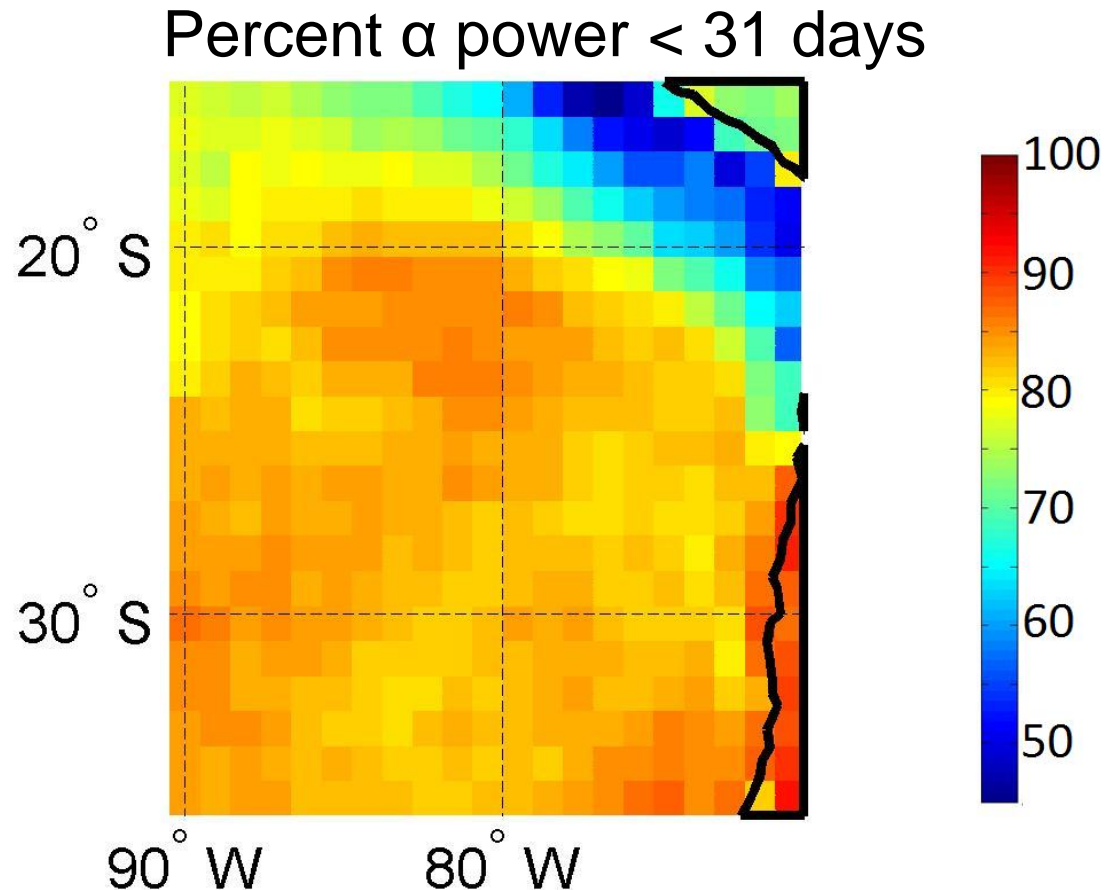


Temporal structure
 =
 Principal Component 1
 =
 “Subtropical High Strength”
 index
 =
SHS index

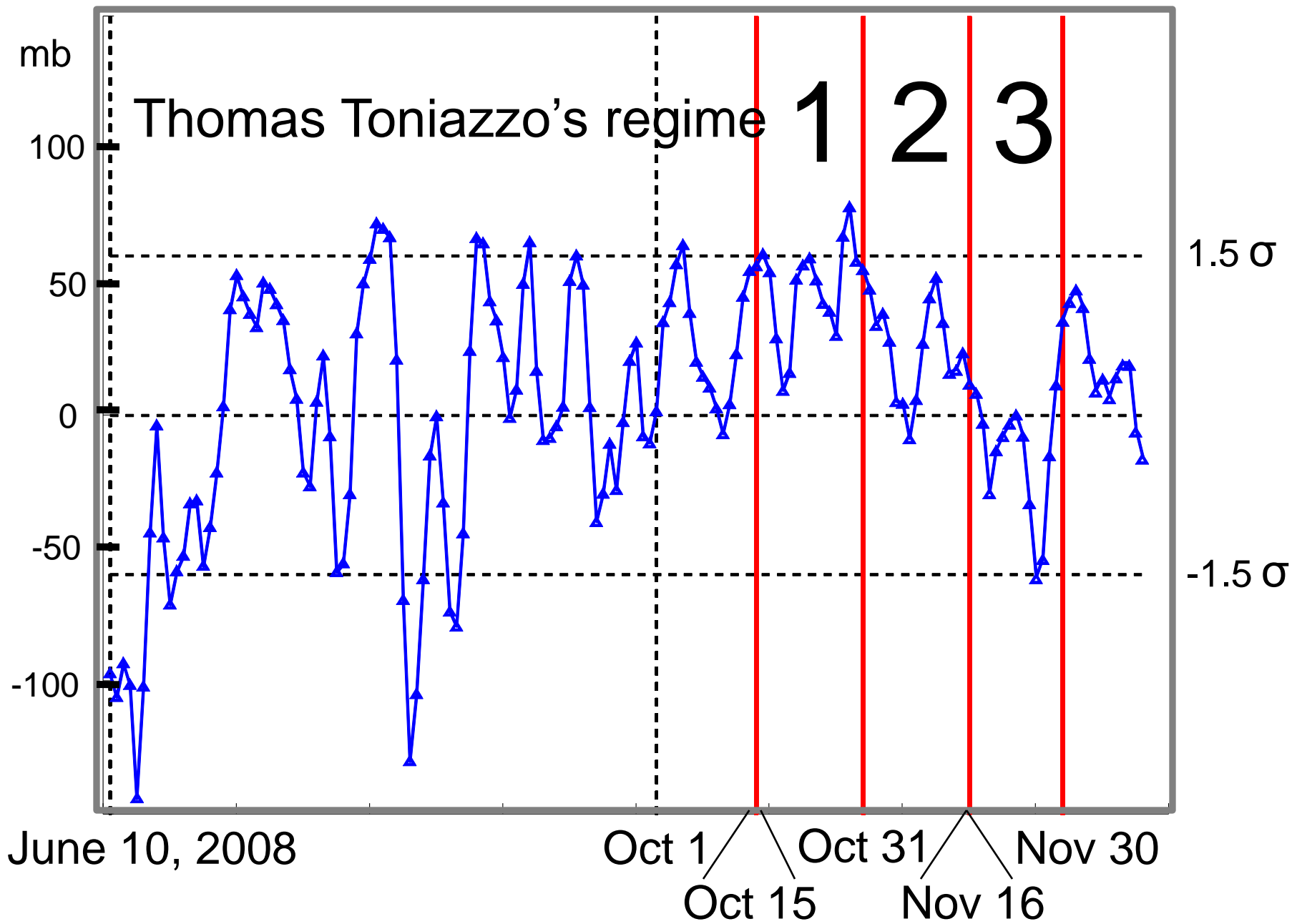


Subseasonalize variables

- Use butterworth high pass filter to remove periods > 31 days

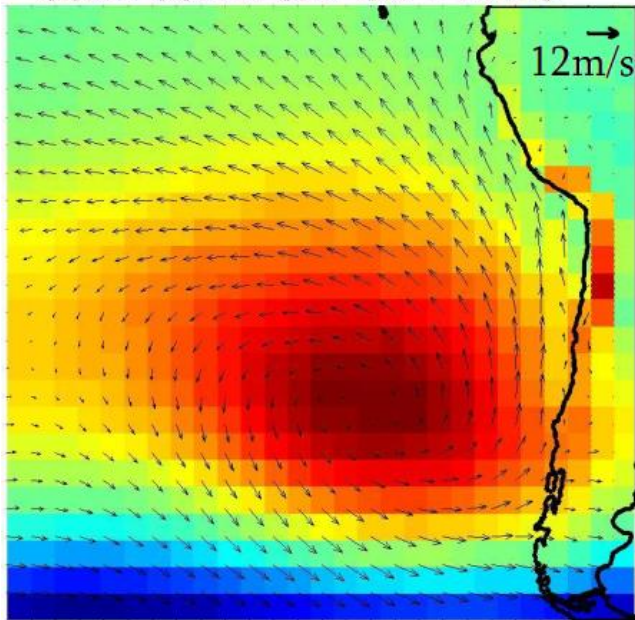


SHS index during VOCALS

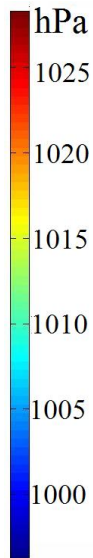
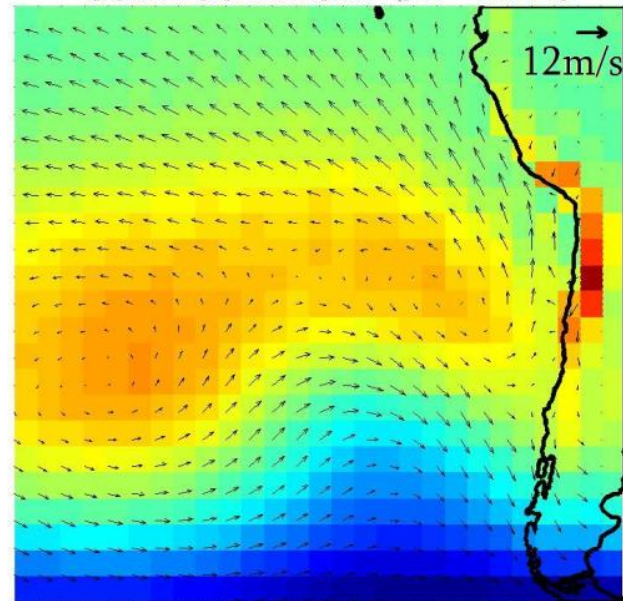


Composite SLP on SHS index

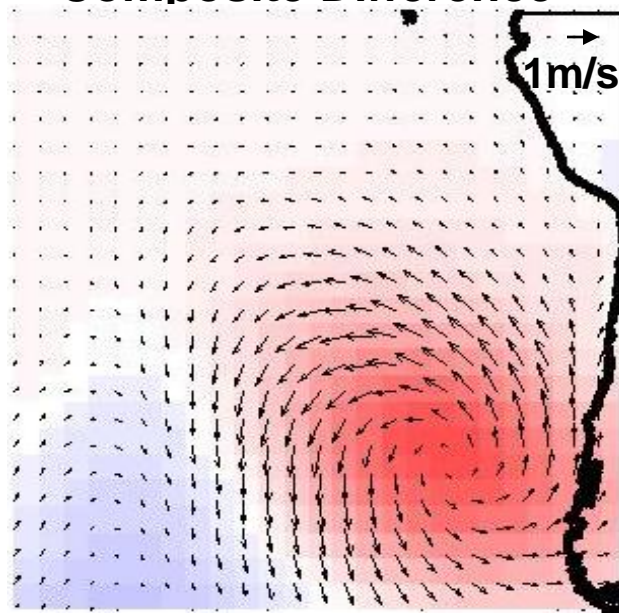
COMPOSITE SLP ON + DAYS



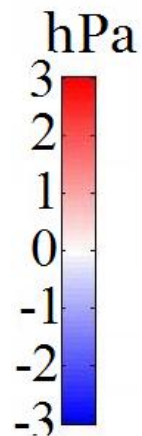
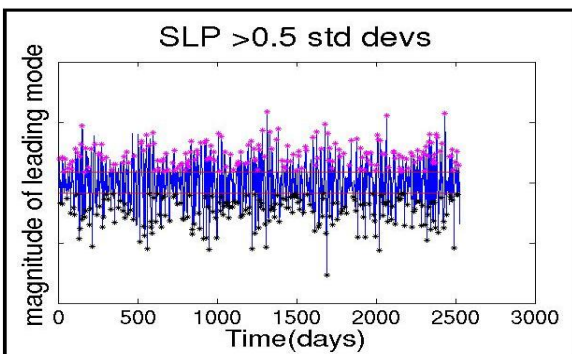
COMPOSITE SLP ON - DAYS



Composite Difference

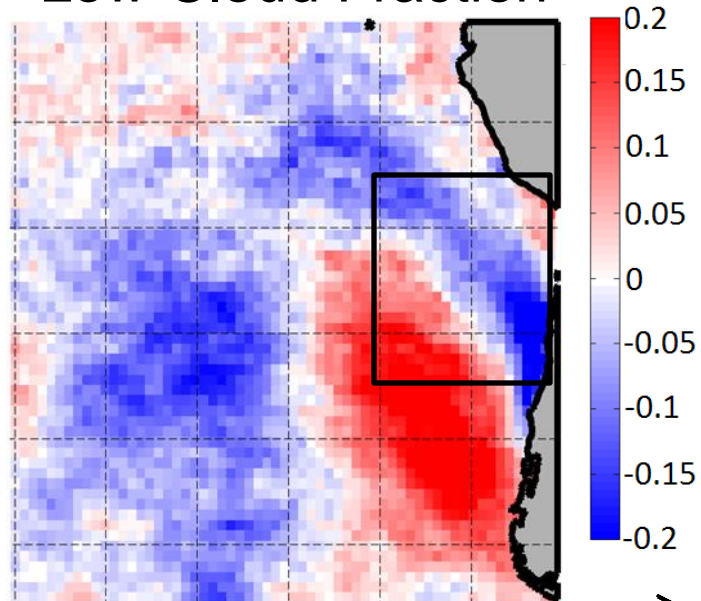


SHS index

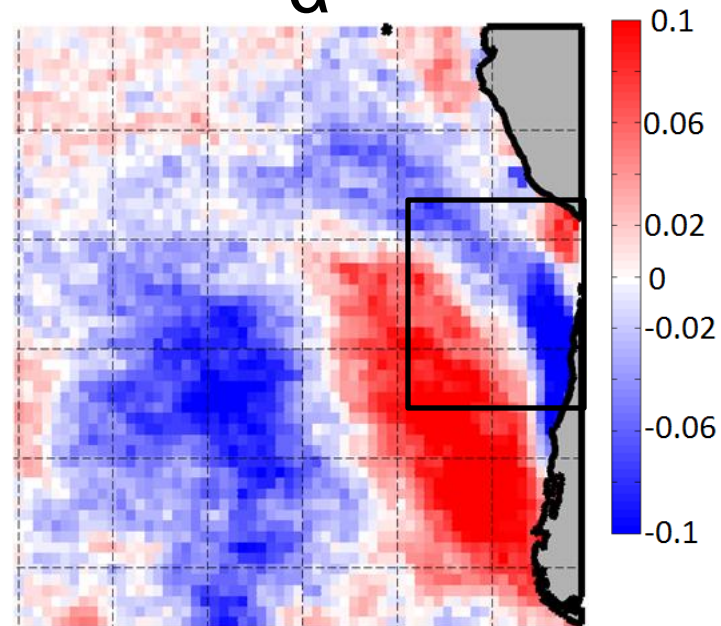


Composite difference plots on SLP dominant mode of variability

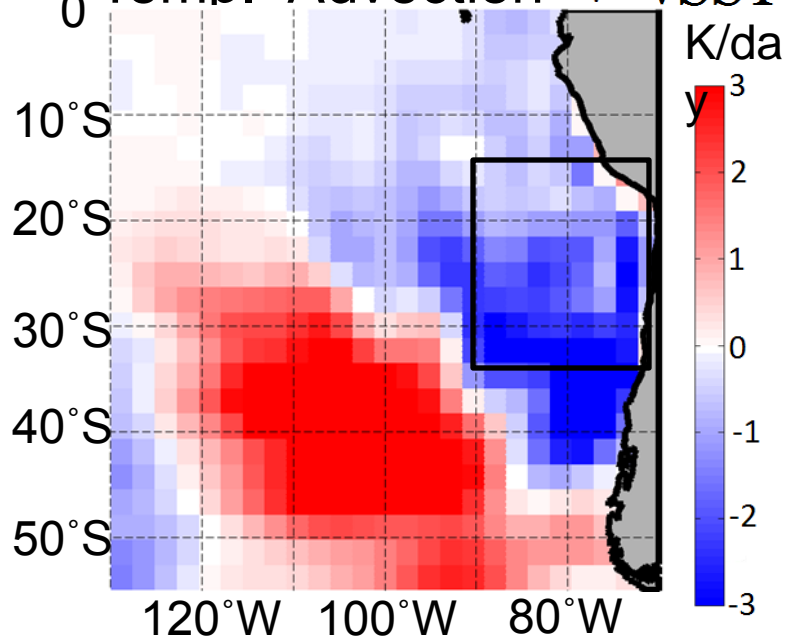
Low-Cloud Fraction



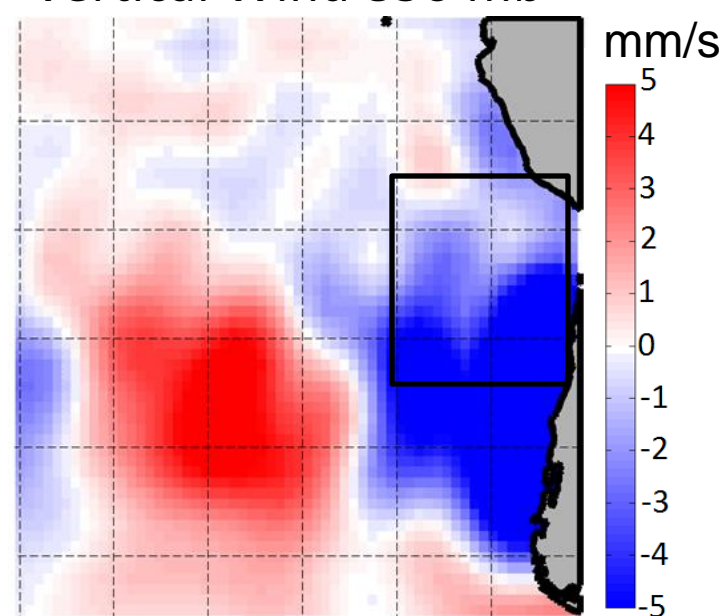
α



Temp. Advection $-\overline{\mathbf{V}} \cdot \nabla \overline{\text{SST}}$

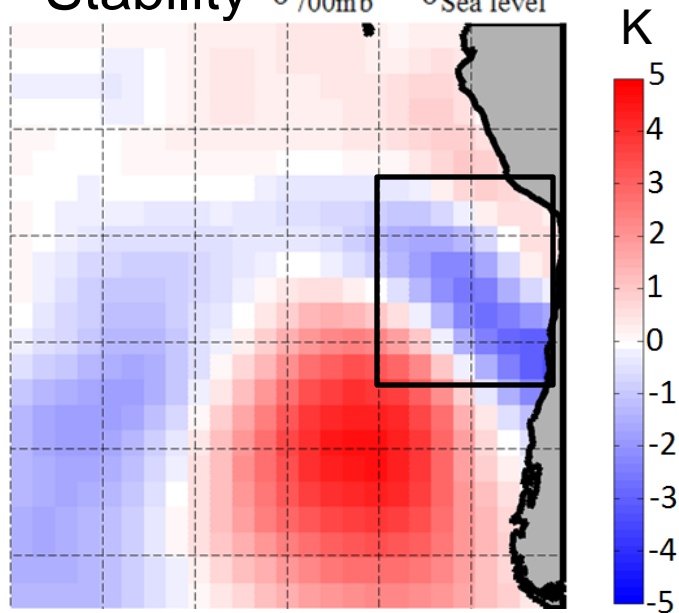


Vertical Wind 850 mb

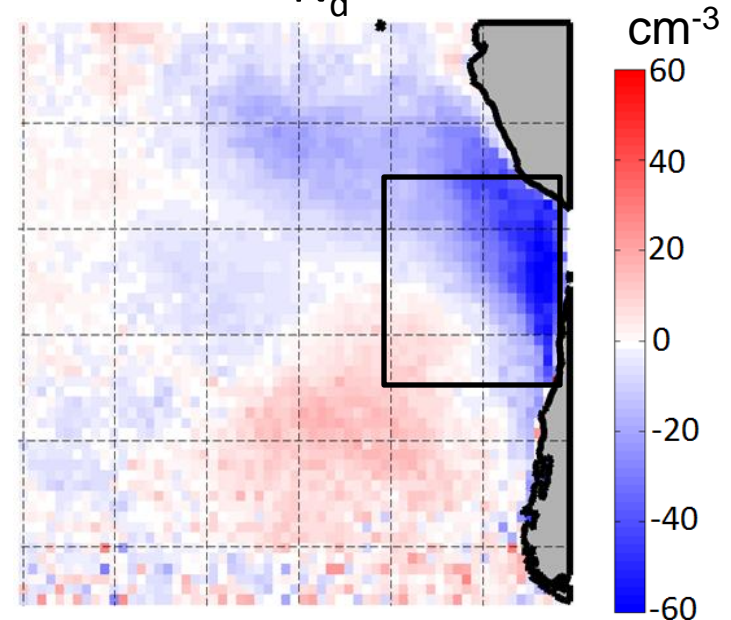


Composite difference plots on SLP dominant mode of variability

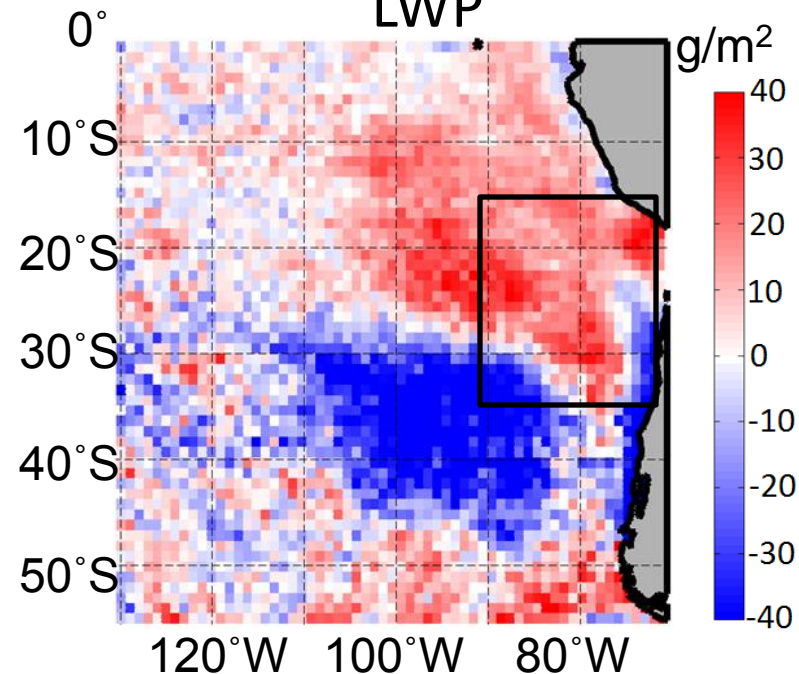
Stability $\theta_{700\text{mb}} - \theta_{\text{Sea level}}$



N_d

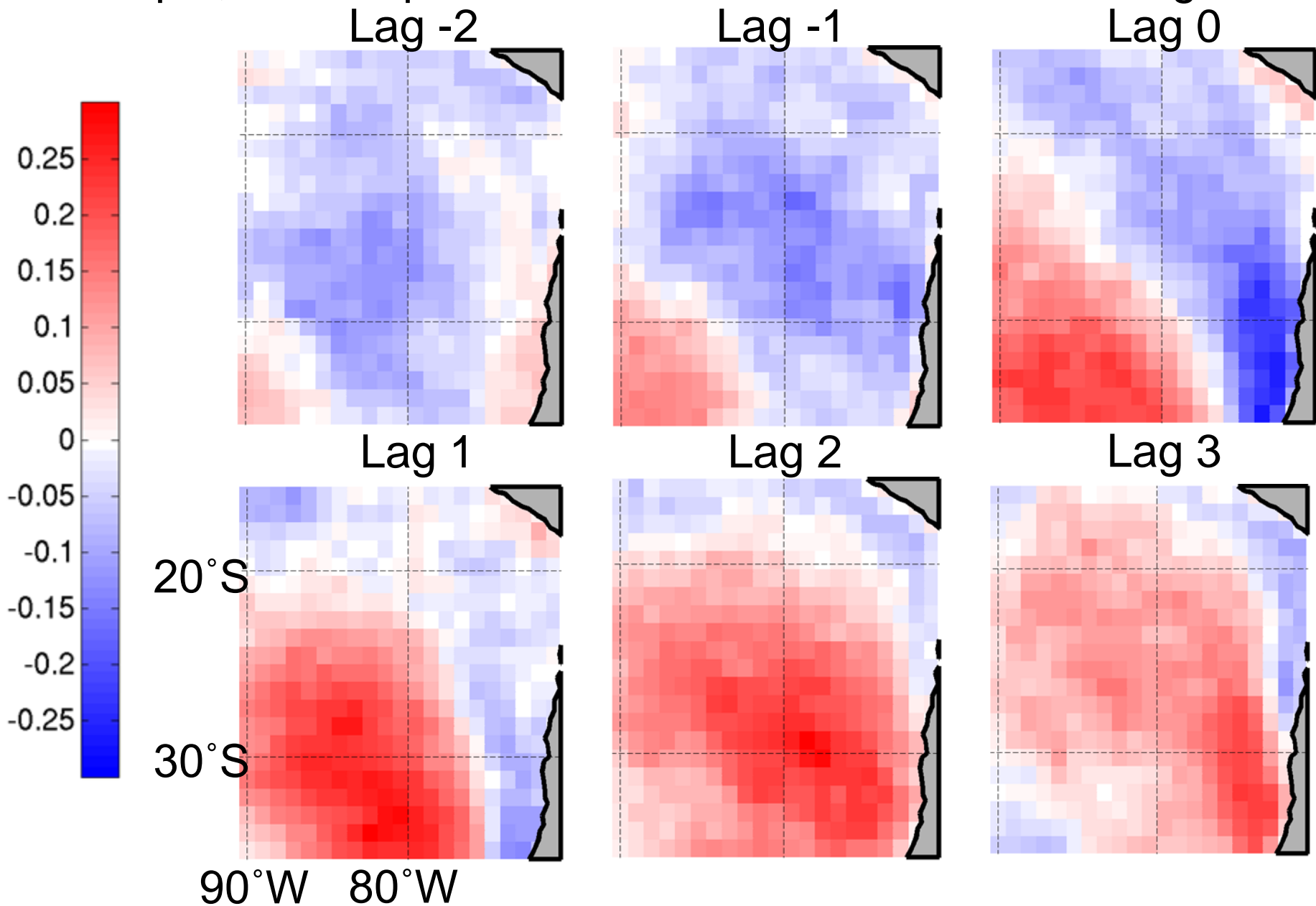


LWP



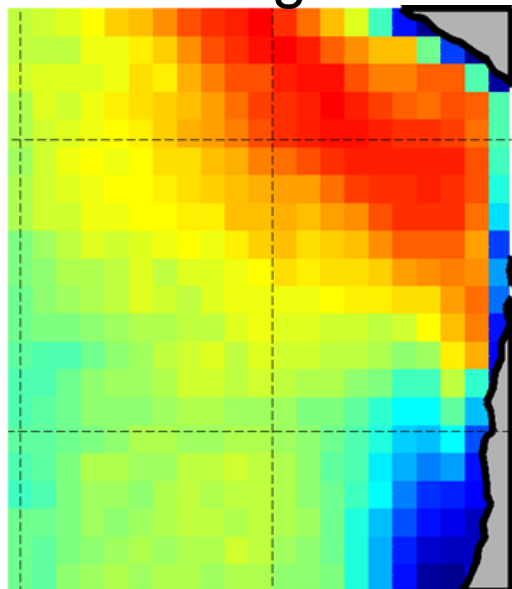
- Large scale response of small scale variables
- Stability composite difference plot not very similar to CF, large scale appears more similar to Neff and LWP
- LWP negatively correlated with Neff?

Zoom back into Sc region: lag composites give more of the story
Example, CF composite difference on SHS index and lags

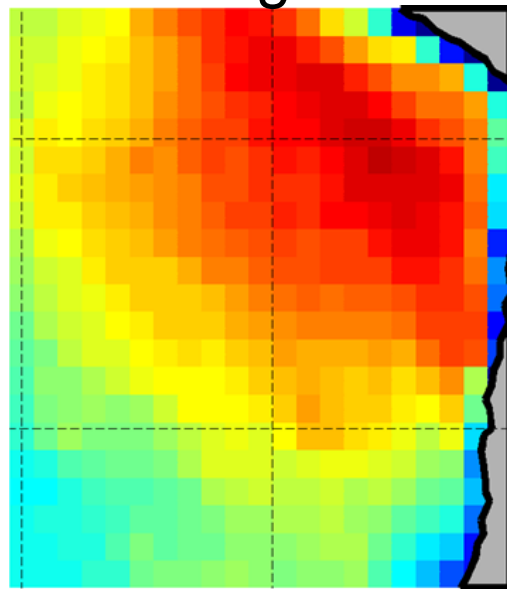


CF on SHS index, just the positive

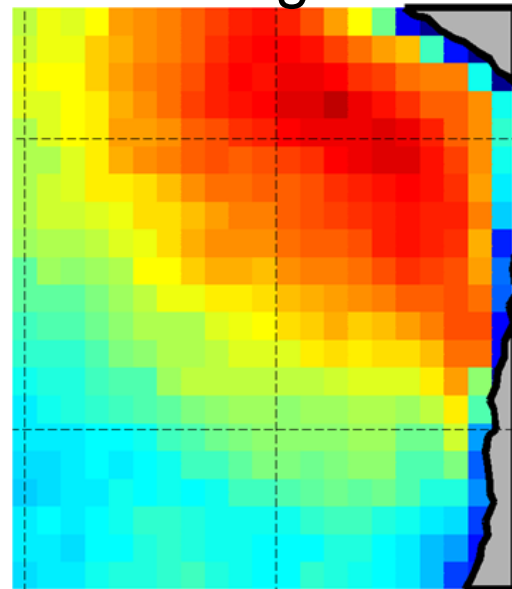
Lag 0



Lag 2

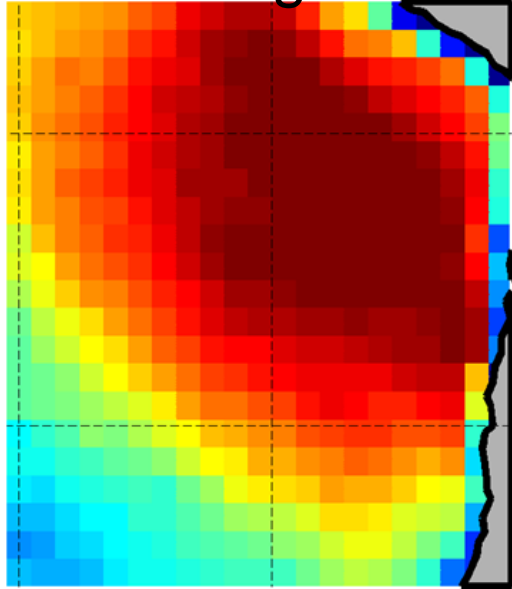


Lag 4

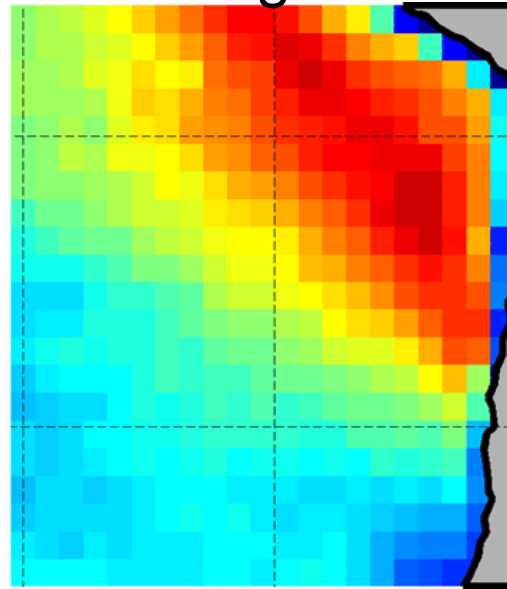


CF on α PC1, just the positive

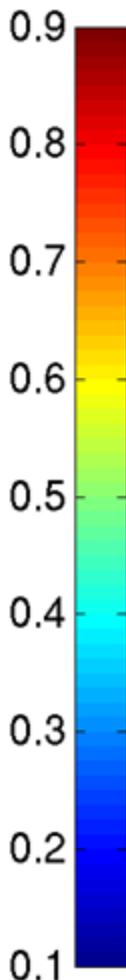
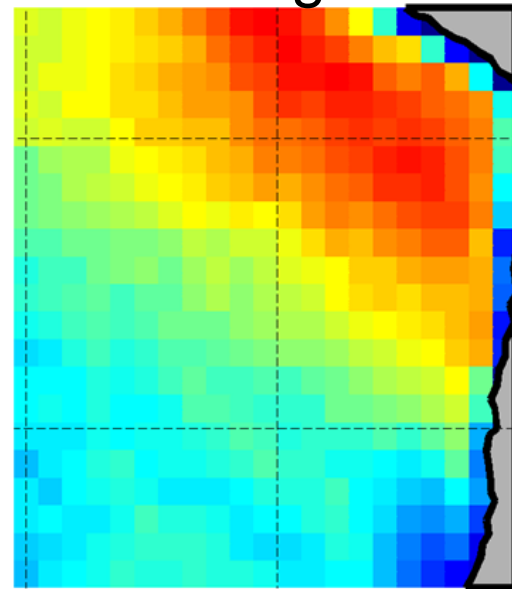
Lag 0



Lag 2

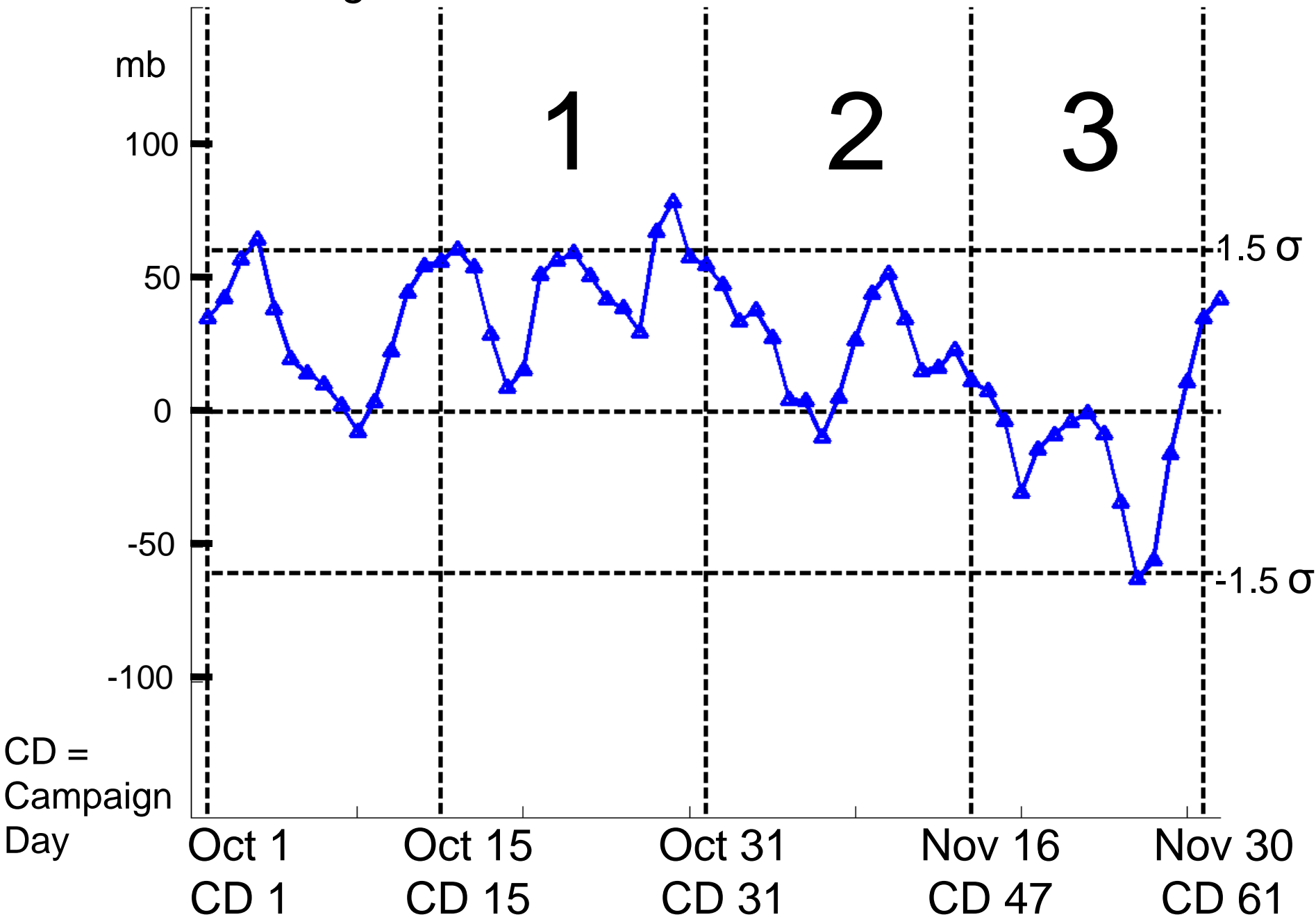


Lag 4

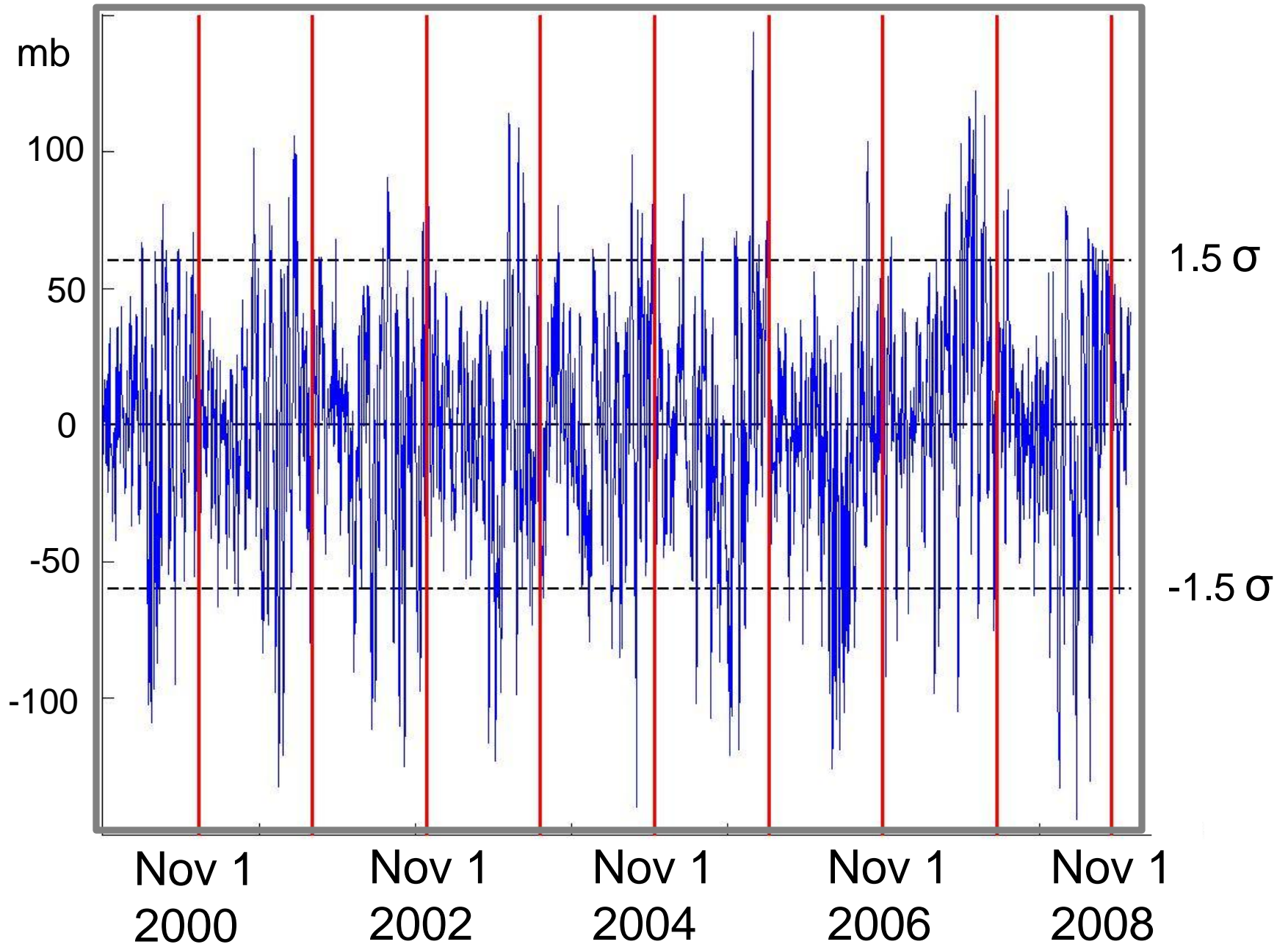


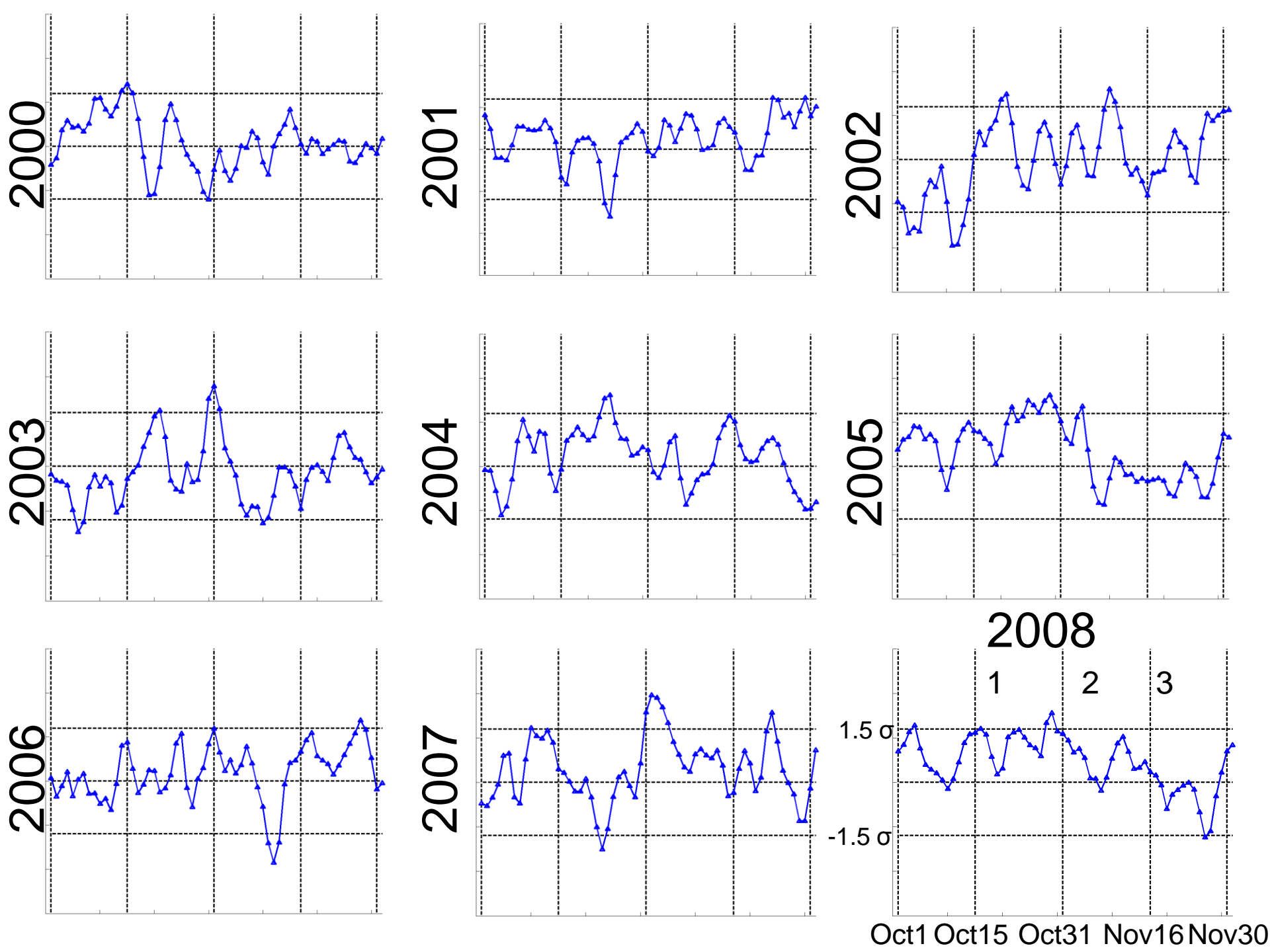
SHS index during VOCALS

Thomas Toniazzo's regimes



SHS index





Summary

- Cloud variables composited onto the SHS index show interesting regional patterns. There is some consistency with earlier work (stability, temperature advection), but others (e.g. Nd, LWP) are intriguing and need further study.
- In the REx study region, Nd and LWP are inversely correlated through meteorology
 - difficult to use meteorological variability to constrain the aerosol indirect effects with observations alone
- During VOCALS the SHS index fits well with the synoptic regimes defined by Thomas Toniazzo.
- The SHS index during Oct-Nov tends to see less extremes than other seasons.