Marine heat waves in the Chile-Peru Eastern Boundary Upwelling System:

rates of change in sea-surface temperature anomalies near a major upwelling center

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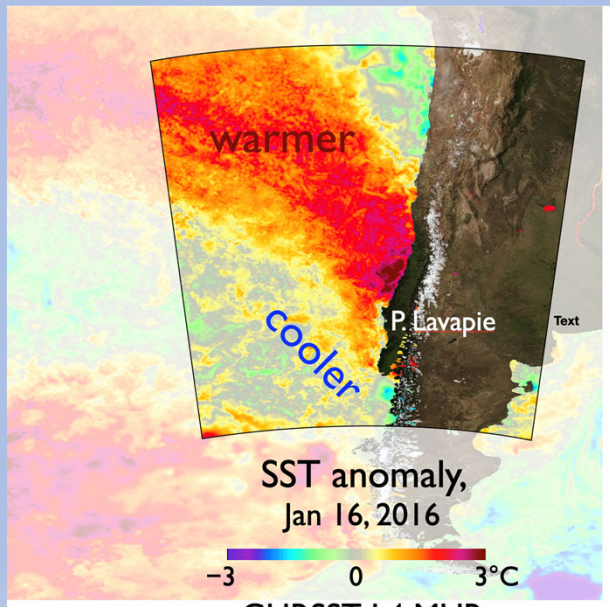
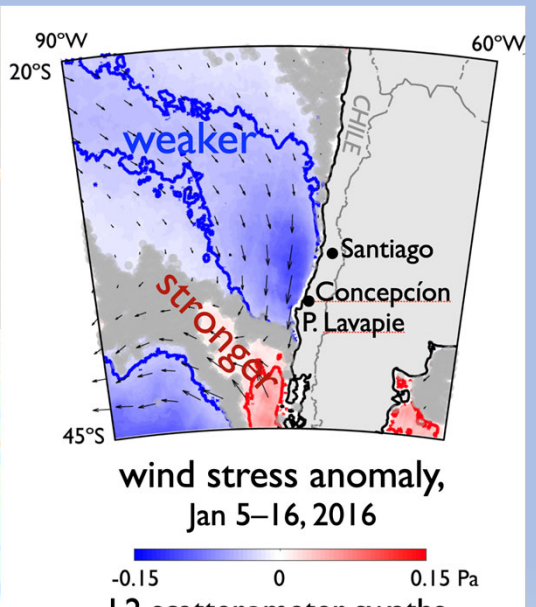
Marine heat waves (MHWs) affected the Chile-Peru System (CPS) in 2014-2016 and 2019-2020

Background:

- The relationship between SST and wind stress anomalies in the California Current System (CCS) during MHWs have also been observed in the CPS
- Similar dipole structures as in Fewings and Brown 2019

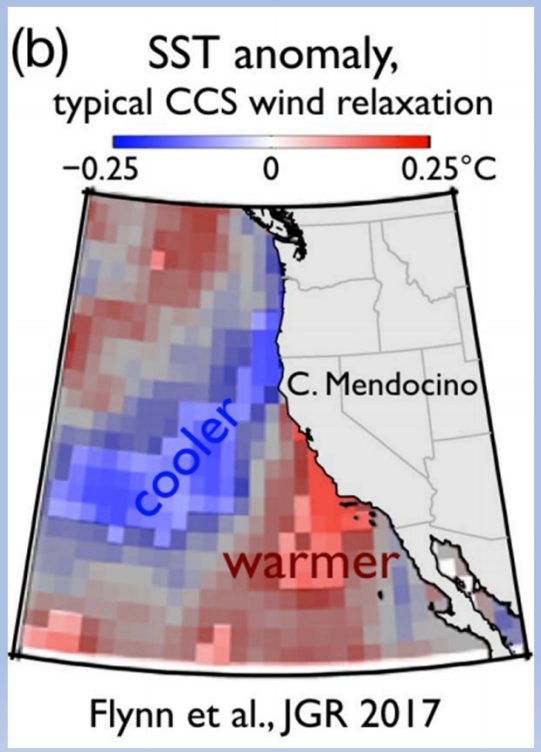




Dominant forcing mechanisms of the surface ocean heat budget in the CPS during MHWs are not well defined.

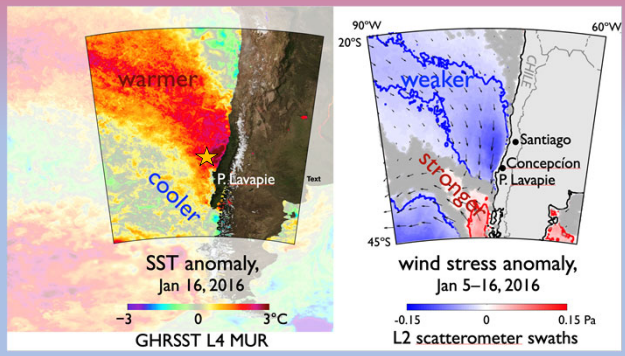
- Dominant forcing mechanisms of wind relaxations in the CCS have been found through analysis of the surface ocean heat budget
  - Surface latent heat flux
  - Decreased entrainment and Ekman pumping at the mixed layer base

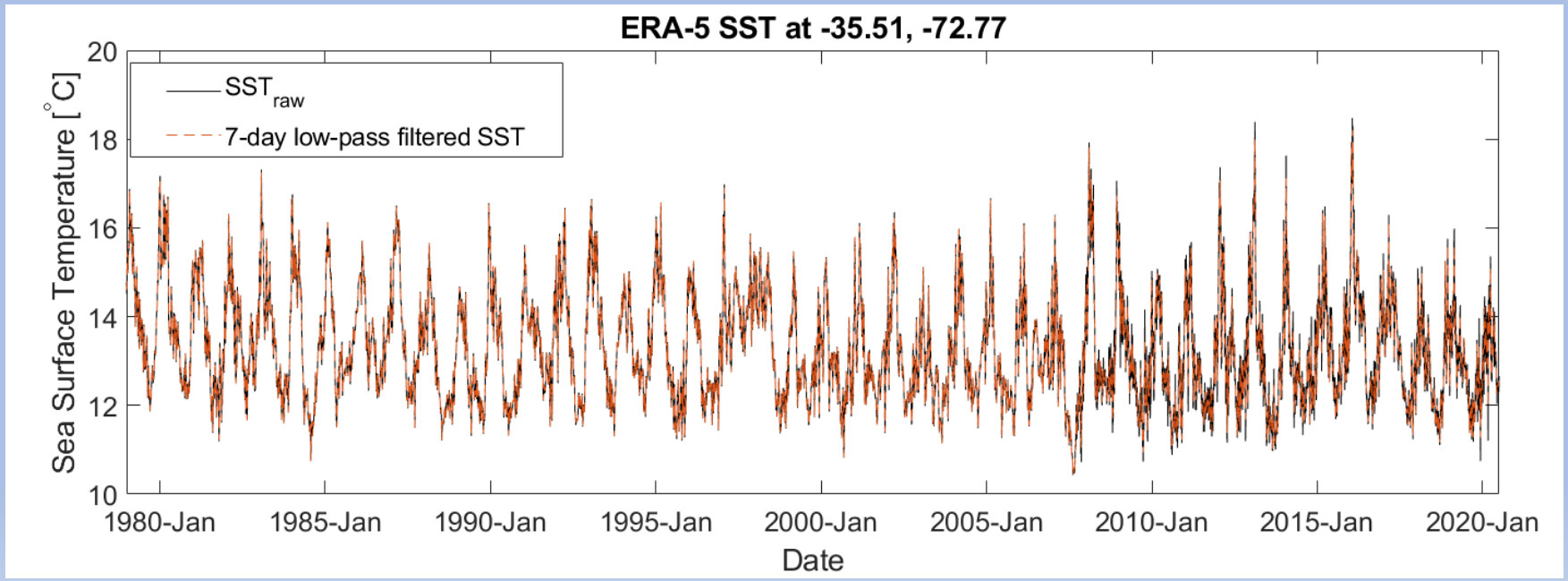
Flynn et al. (2017)



Isolating strong warm anomalies in CPS

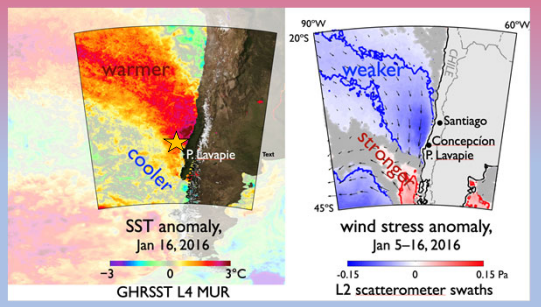
We use SST near **Punta Lavapié upwelling center** from 5th generation European Centre for Medium-Range Weather Forecasts reanalysis (**ERA5**)

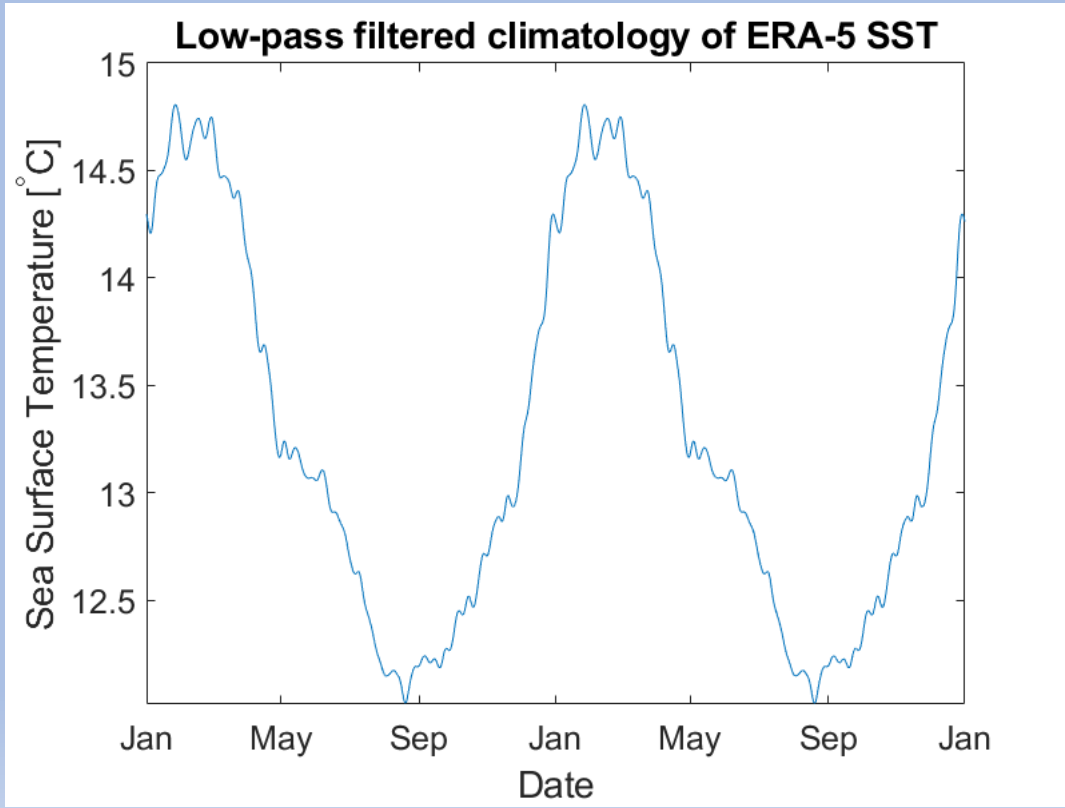




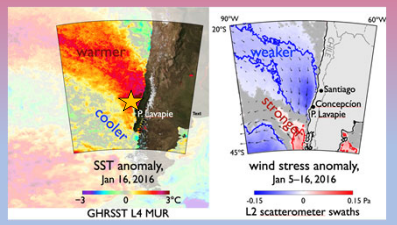
Isolating strong warm anomalies in CPS

First, we calculate the **climatological annual cycle**

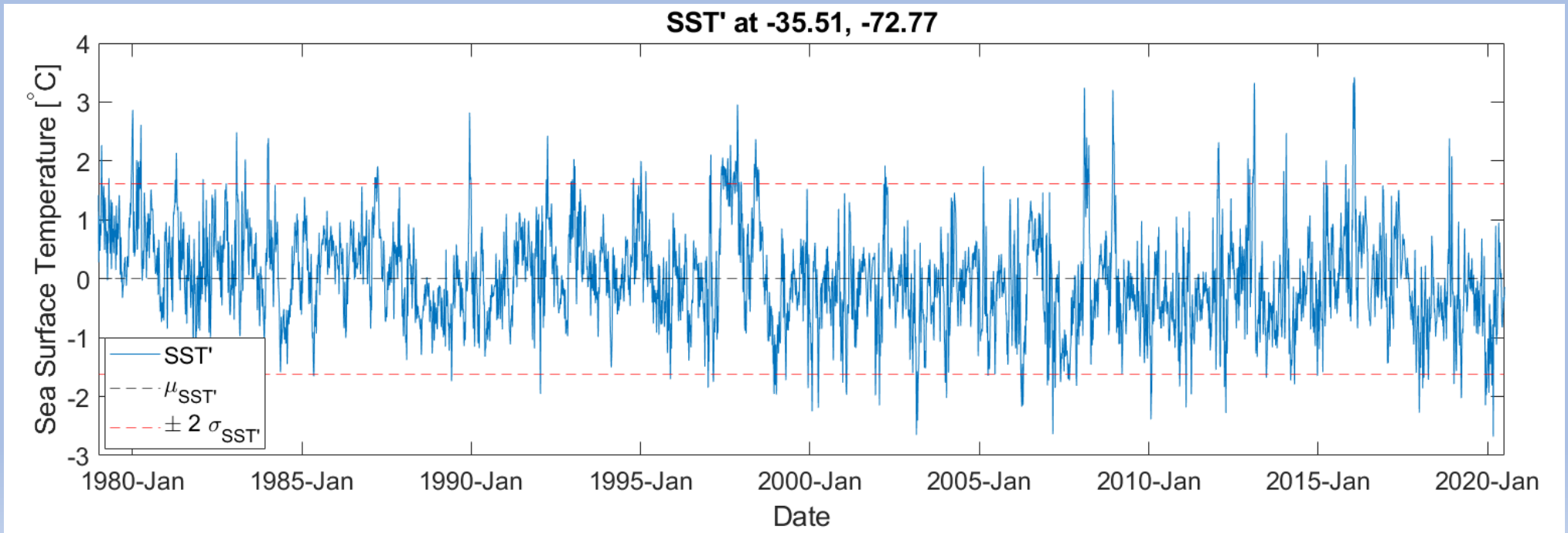




Isolating strong warm anomalies in CPS

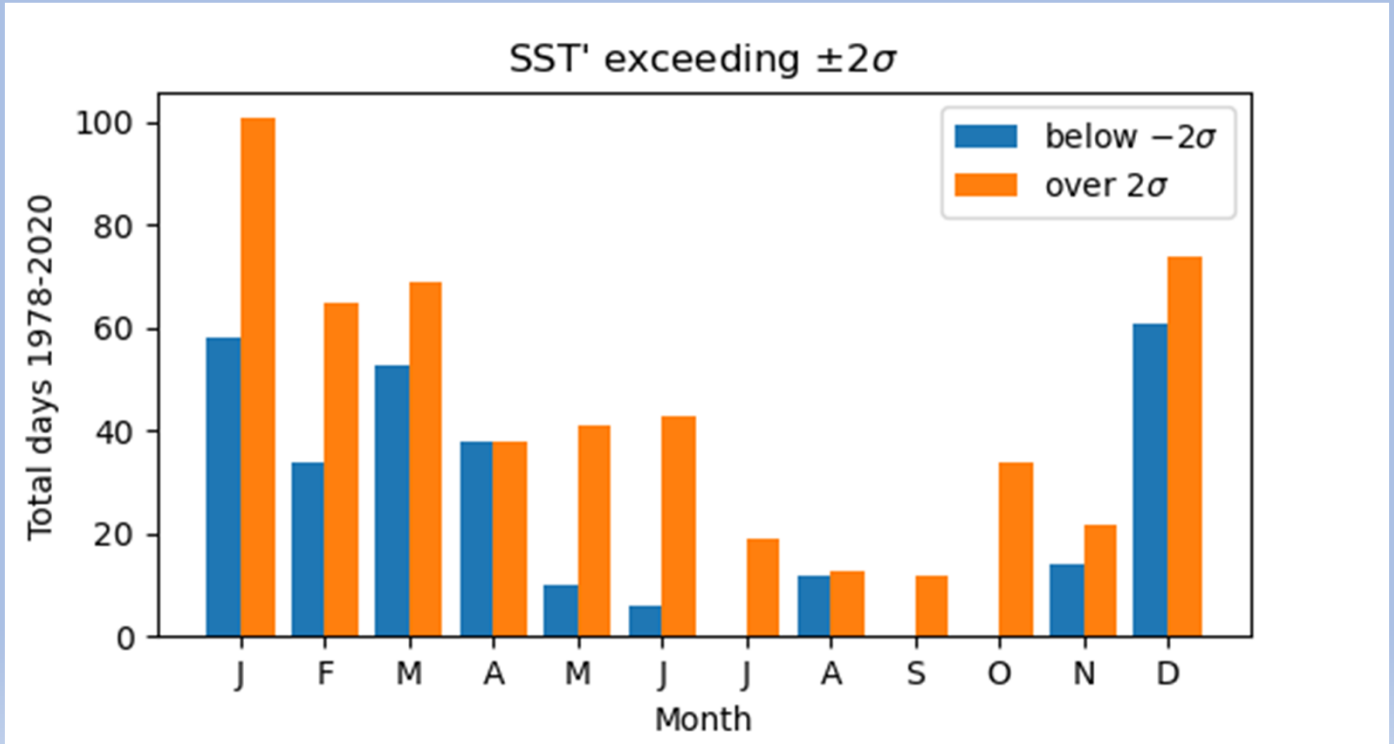


We focus on periods of intense warm anomalies where **SST' exceeds two standard deviations** from the mean



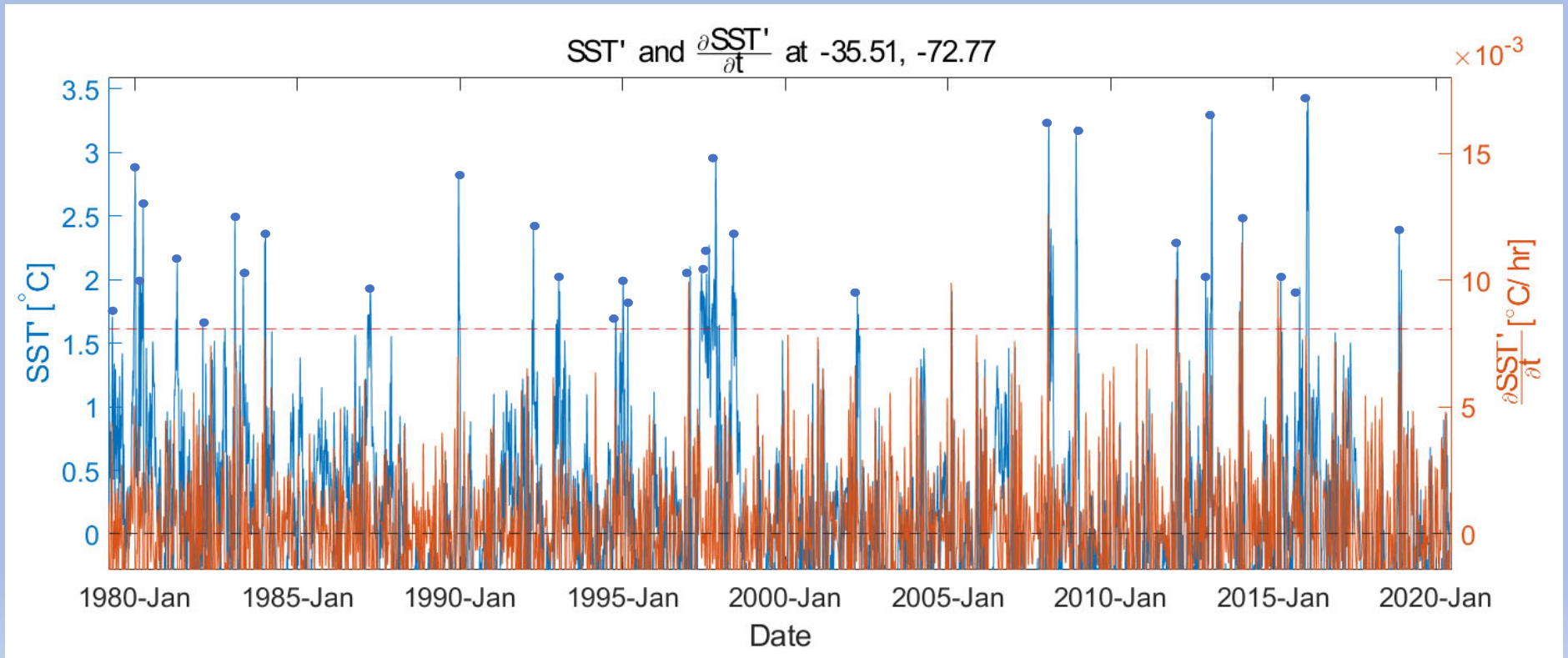
Isolating strong warm anomalies in CPS

Strong warm (and cold) anomalies occur most often in **December through March**

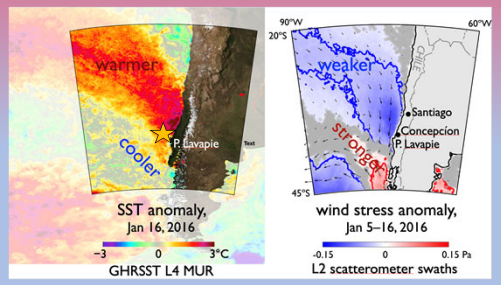


Calculating rates of anomalous warming

Estimate time derivative of the temperature anomaly, SST’

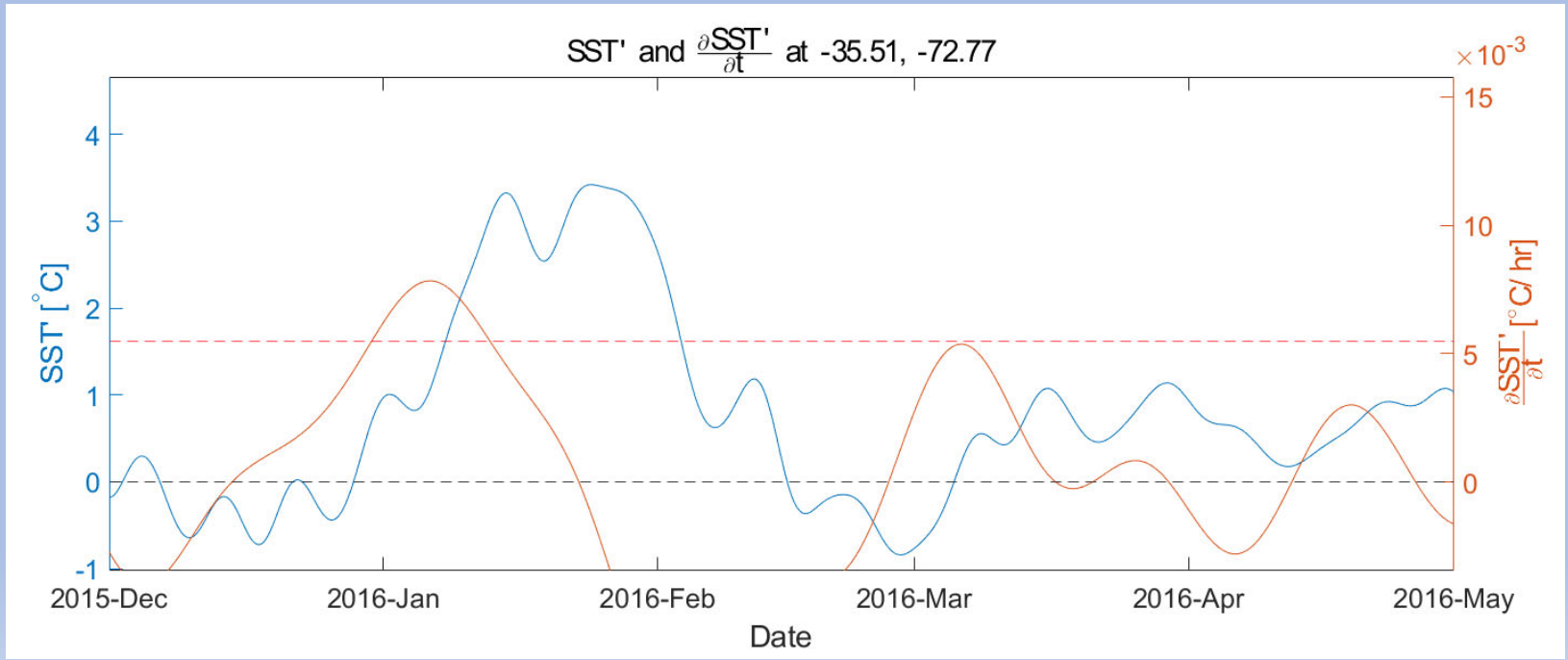


Calculating rates of anomalous warming



Peaks in $\frac{\partial SST'}{\partial t}$ **lead** peaks in SST'

3-week low-pass filtered to show total warming that contributes to strong warm anomaly in proposal



Future Work:

•Sea surface mixed layer heat budget following Flynn et al. 2017; Fewings and Brown 2019

•Examine which terms are dominant leading to warmest periods

•Utilize satellite ocean vector wind data, ERA5 and satellite-derived air-sea heat fluxes OAFlux and SeaFlux

What do I hypothesize finding?

- Different forcing mechanisms in northern and southern regions
- Warming in northern region mimics CCS equatorward forcing mechanisms:
  - Decreased entrainment and Ekman pumping at mixed layer base
  - With additional warming driven by:
    - Advection of SST gradients from warmer regions/equator
    - Changes in cloudiness