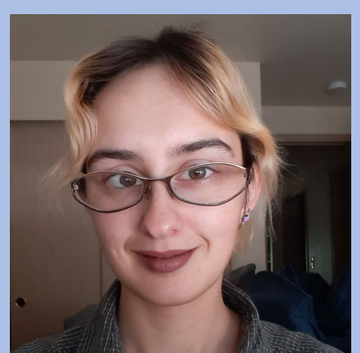
Marine heat waves in the Chile-Peru Eastern Boundary Upwelling System:

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



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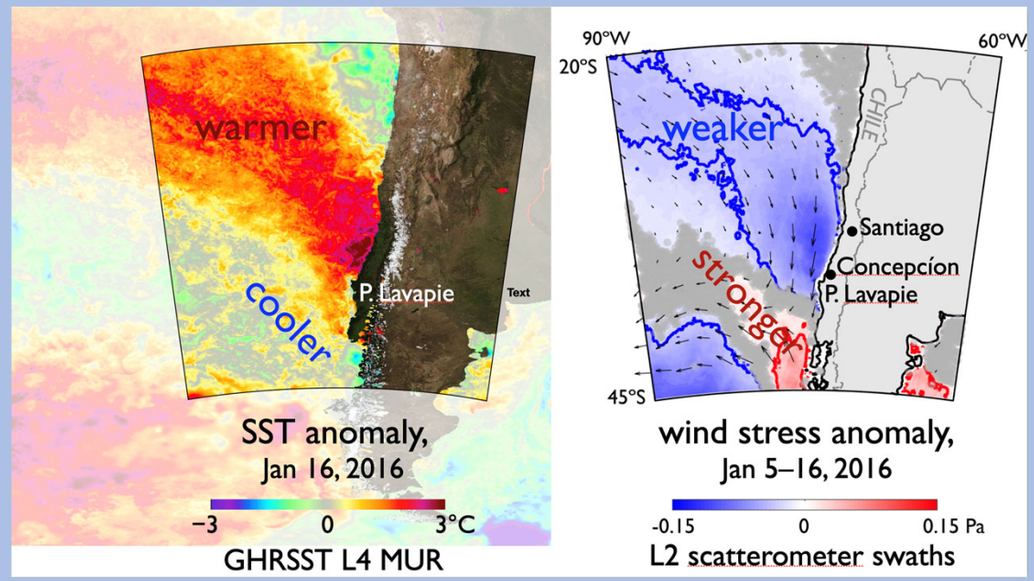
Marine heat waves (MHWs) affected the Chile-Peru System (CPS) in 2014-2016 and 2019-2020

Background:

- The relationship between warm (cold) SST and weak (strong) wind stress anomalies in the California Current System (CCS) during MHWs has also been observed in the CPS

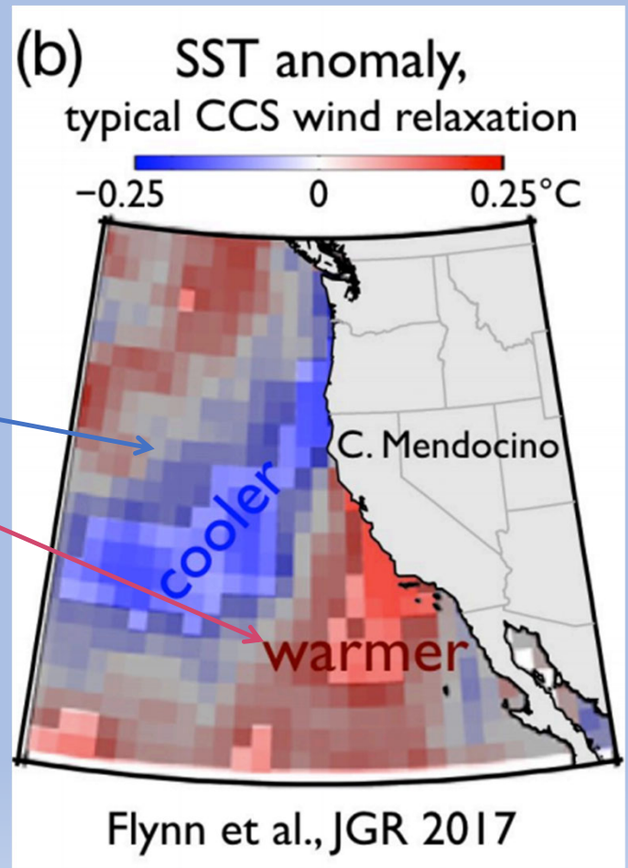
- Similar dipole structures in wind stress and sea surface temperature (SST) as Fewings and Brown 2019 observed in the CCS



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

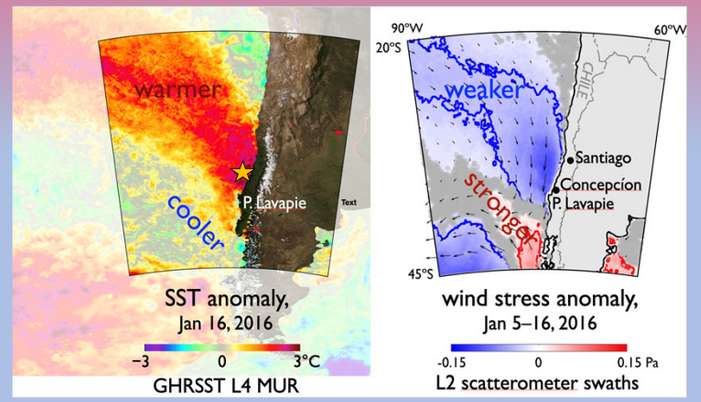
- Dominant forcing mechanisms during wind relaxations in the CCS have been found through analysis of the surface ocean heat budget
  - Surface latent heat flux
  - Decreased entrainment and Ekman pumping at the mixed layer base

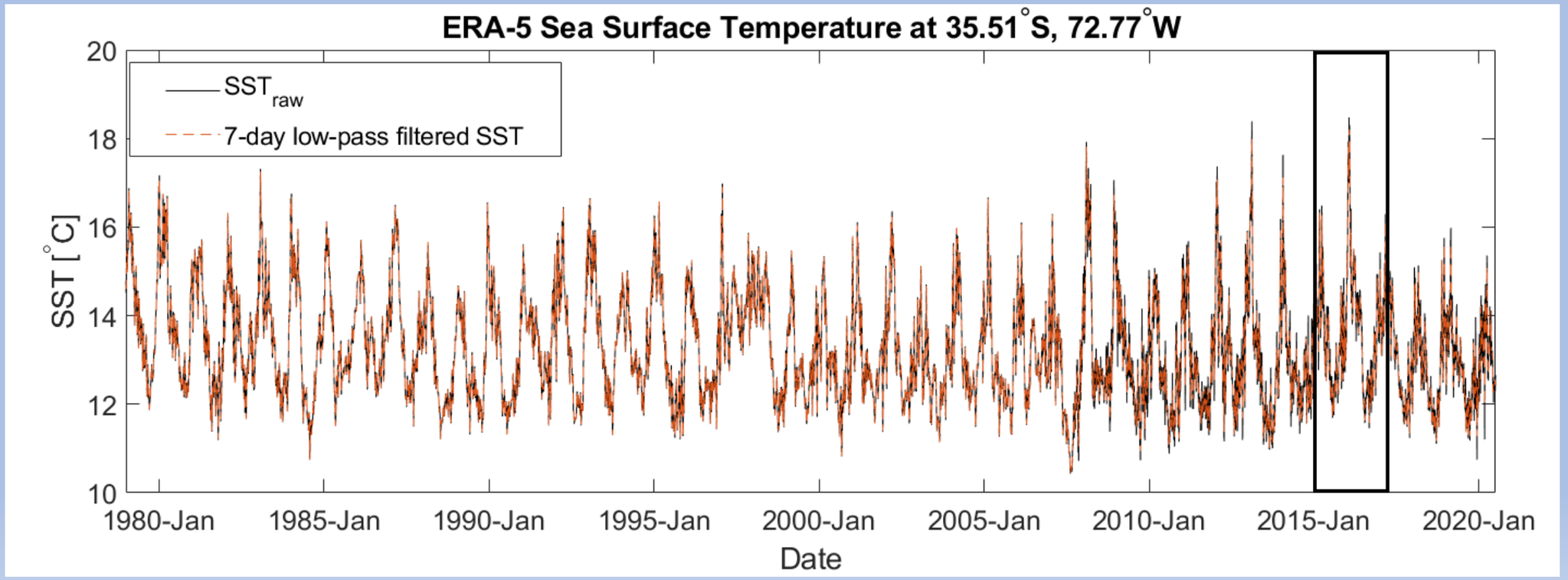
- *Do these processes also drive MHW warming in the CPS?*



Isolating strong warm anomalies in CPS, Part 1

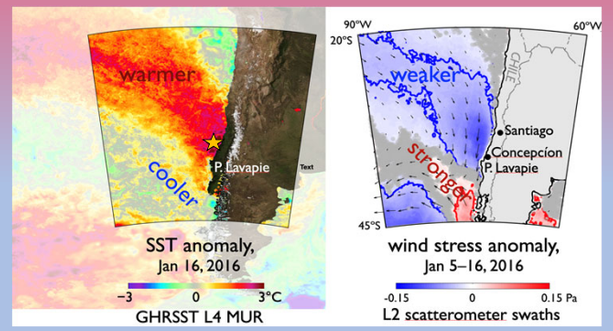
We use SST near **Punta Lavapié upwelling center** from 5th generation European Centre for Medium-Range Weather Forecasts reanalysis (**ERA5**)

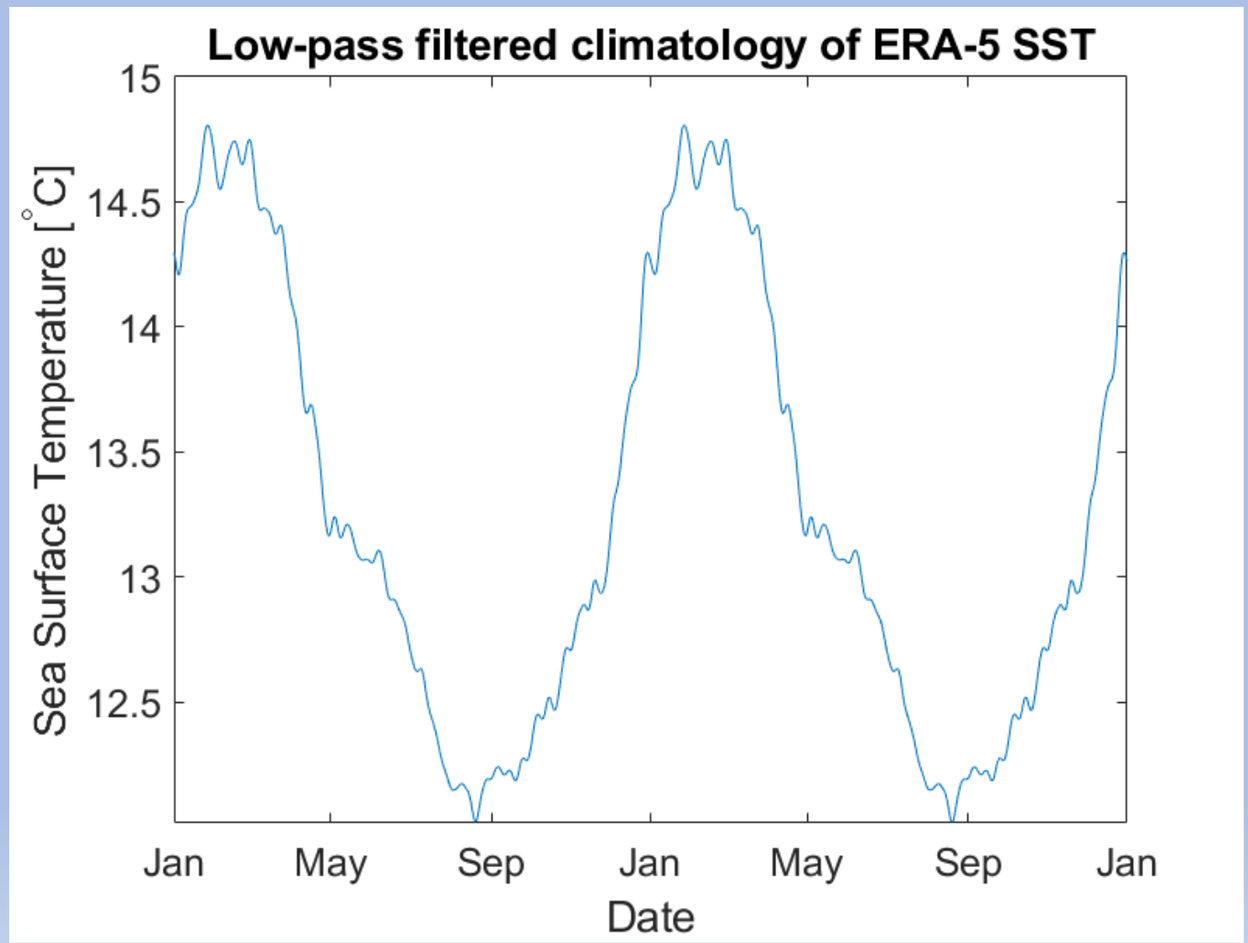


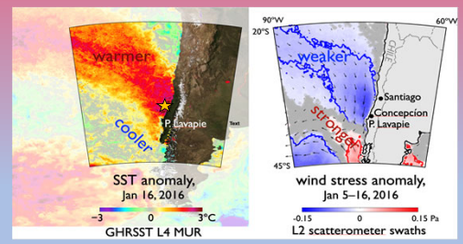


Isolating strong warm anomalies in CPS, Part 2

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

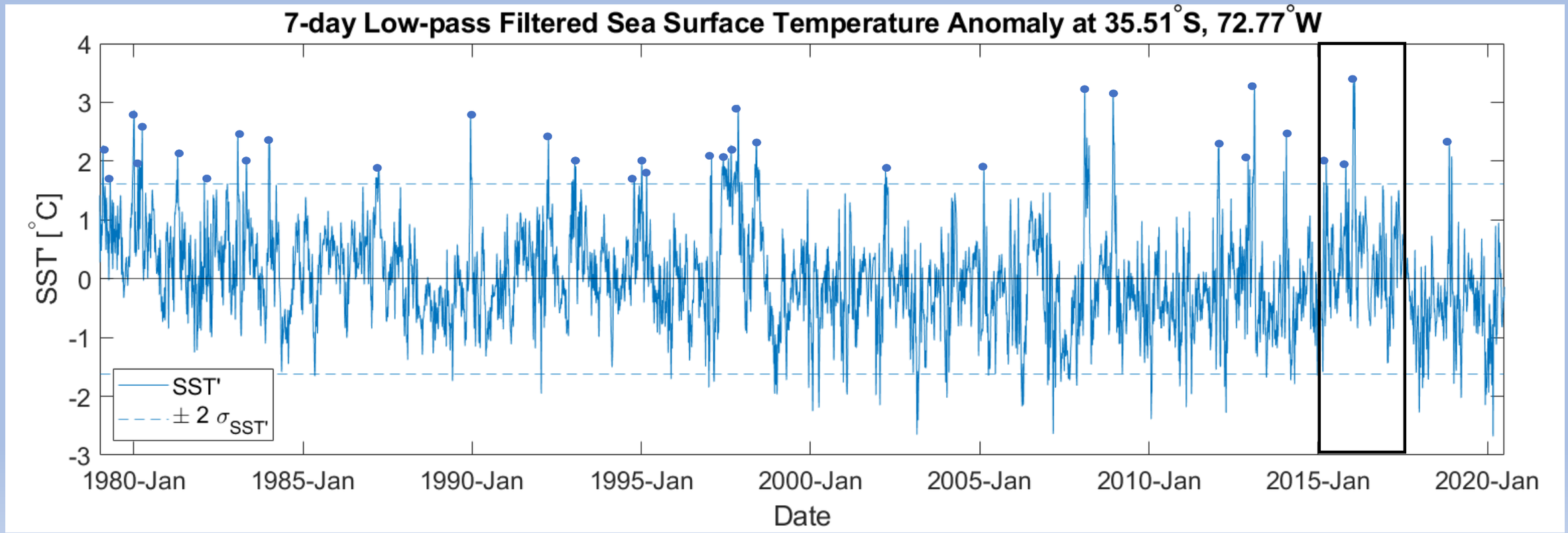






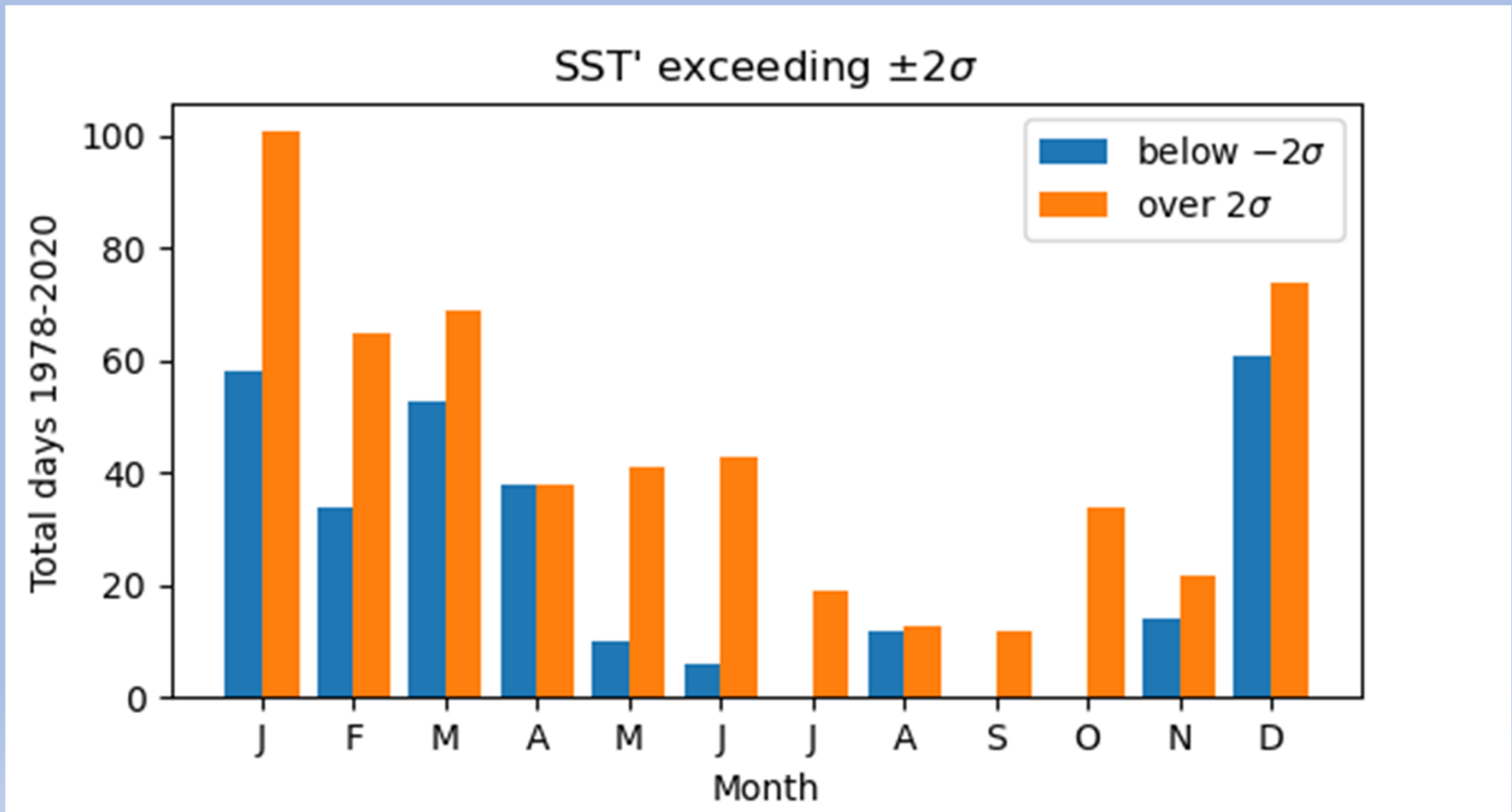
Isolating strong warm anomalies in CPS, Part 3

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



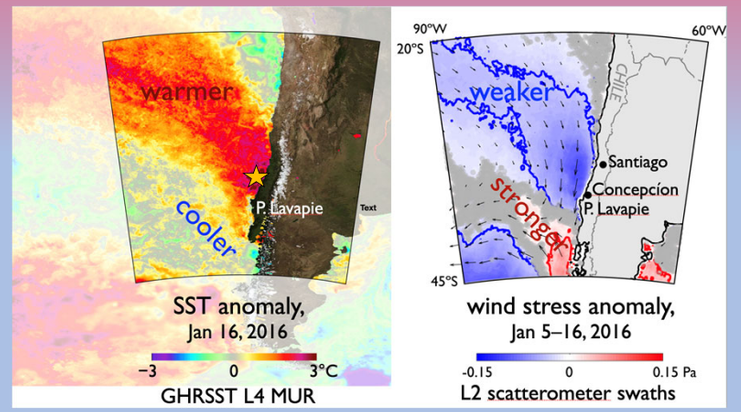
Isolating strong warm anomalies in CPS, Part 4

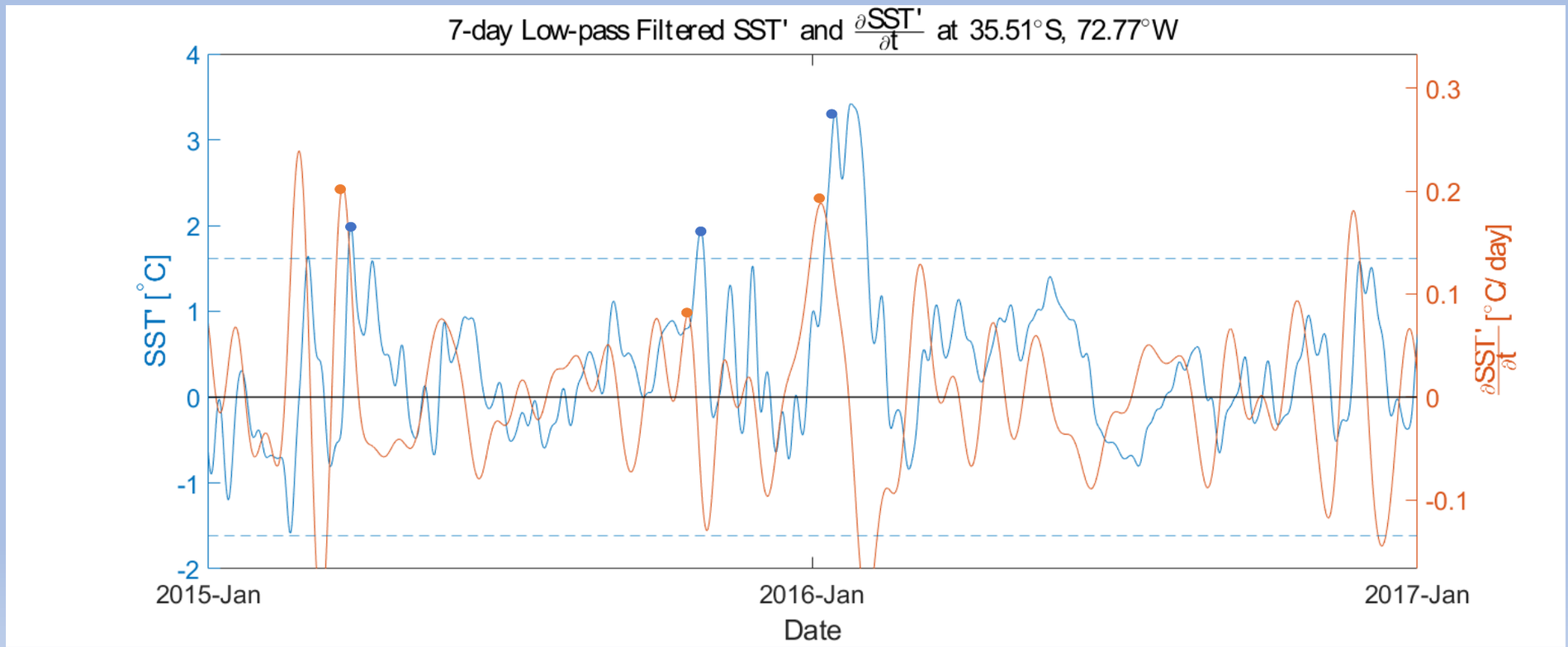
Strong warm (and cold) anomalies occur most often in **December through March**



Calculating rates of anomalous warming

Estimate time derivative of the temperature anomaly, SST’,
to determine time periods of warming leading to peaks in SST’





Future Work:

•Sea surface mixed layer heat budget for each period of anomalous warming 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, and Argo floats

What do we hypothesize finding?

- Different forcing mechanisms in northern and southern SST anomaly regions
- Warming in northern region mimics CCS southern region forcing mechanisms:
    - Decreased entrainment and Ekman pumping at mixed layer base
    - Additional warming driven by advection of SST gradients