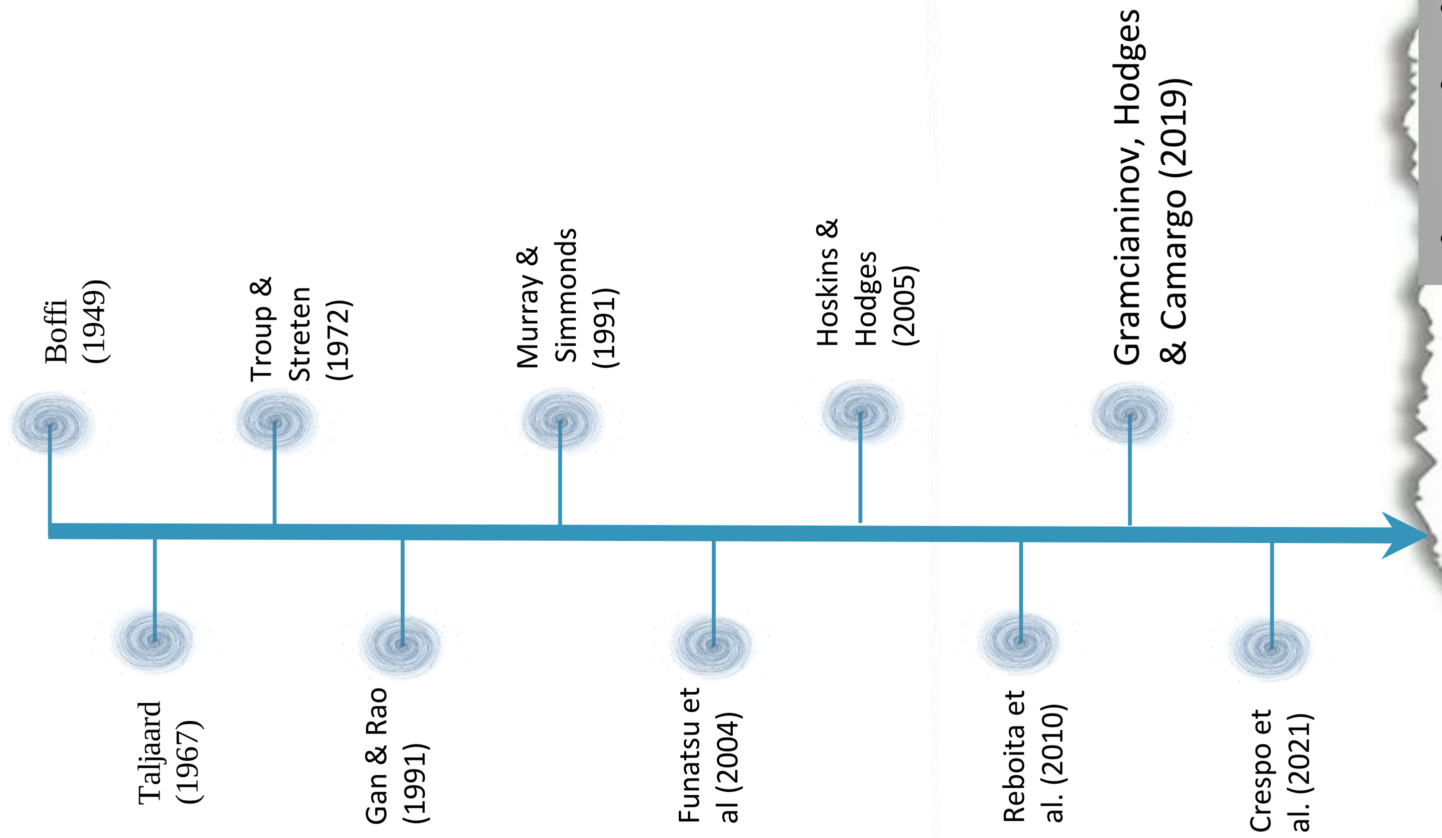
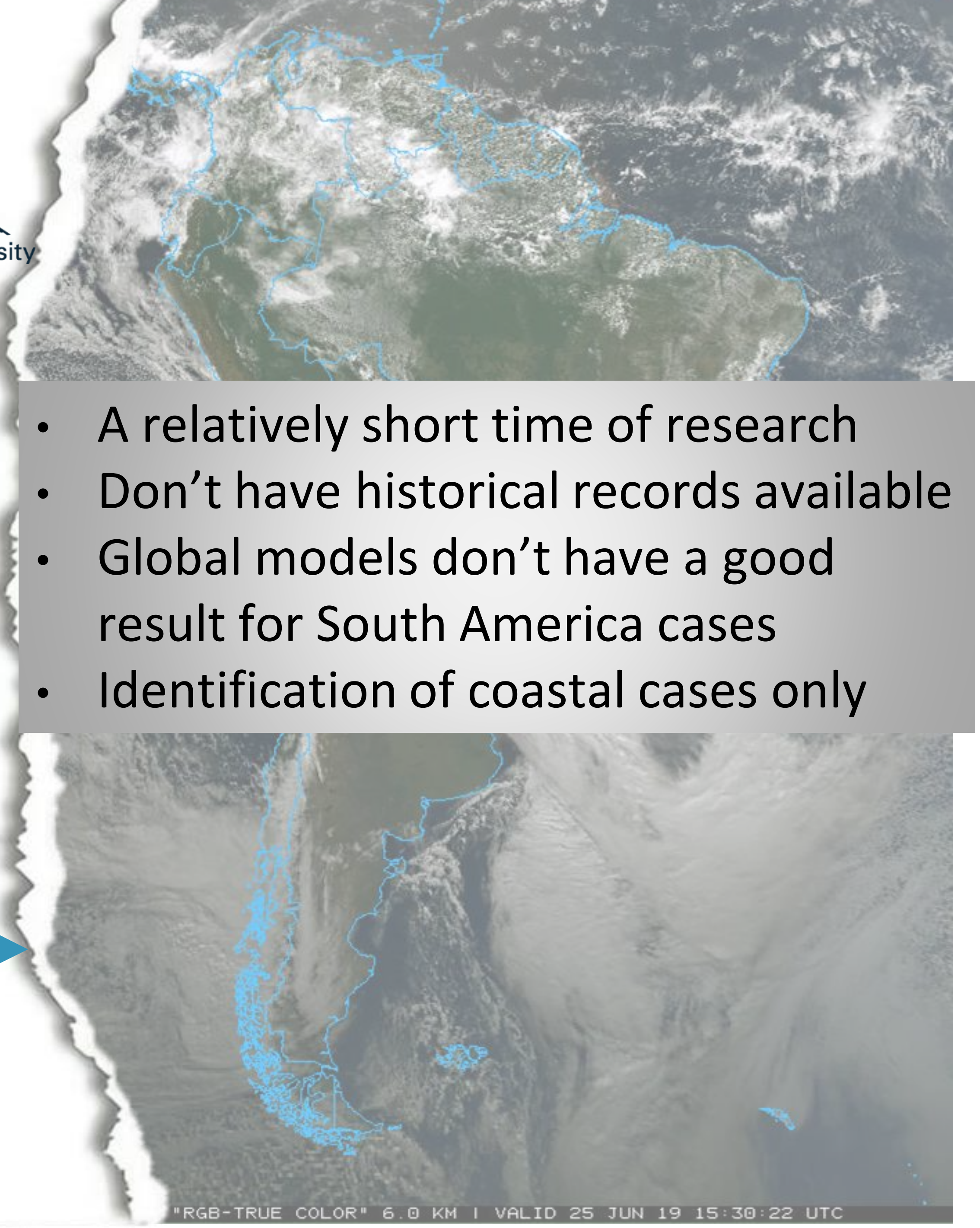
An inter-comparison of South America synoptic-scale storms between two sources of datasets

Luthiene Dalanhese[2]*; Thales Costa[3] ; Matthew LaPlante [1], S.-Y. Simon Wang [1,2].

- A relatively short time of research
- Don't have historical records available
- Global models don't have a good result for South America cases
- Identification of coastal cases only





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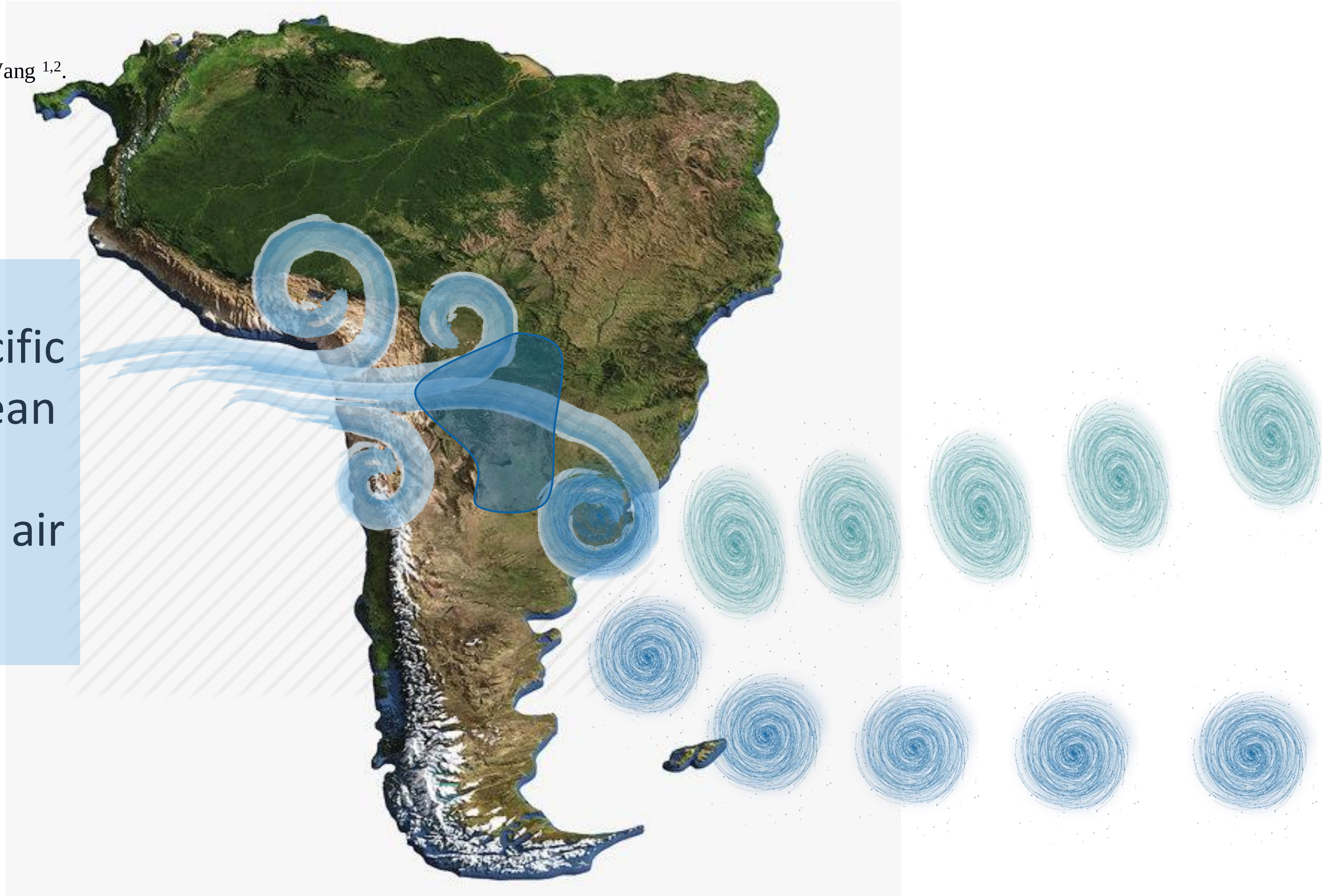
- ✓ SST difference between Pacific Ocean and South Atlantic Ocean
- ✓ Comprising + stretching of air layer at Andes Lee side



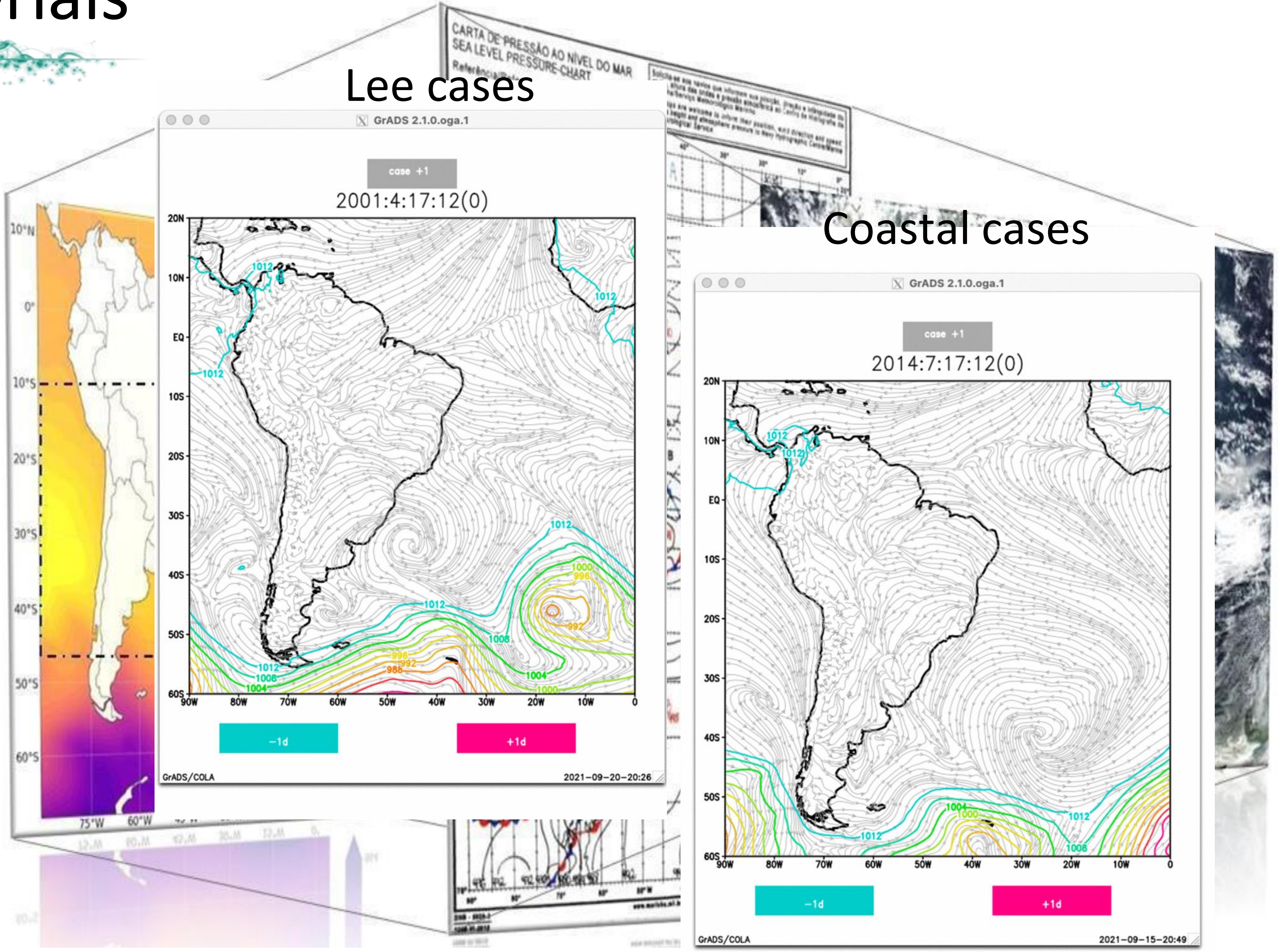
Methods and Materials

- Brazilian Navy synoptics charts from 2010 to 2020.

- ERA 5 daily data: SLP and U and V components of wind.

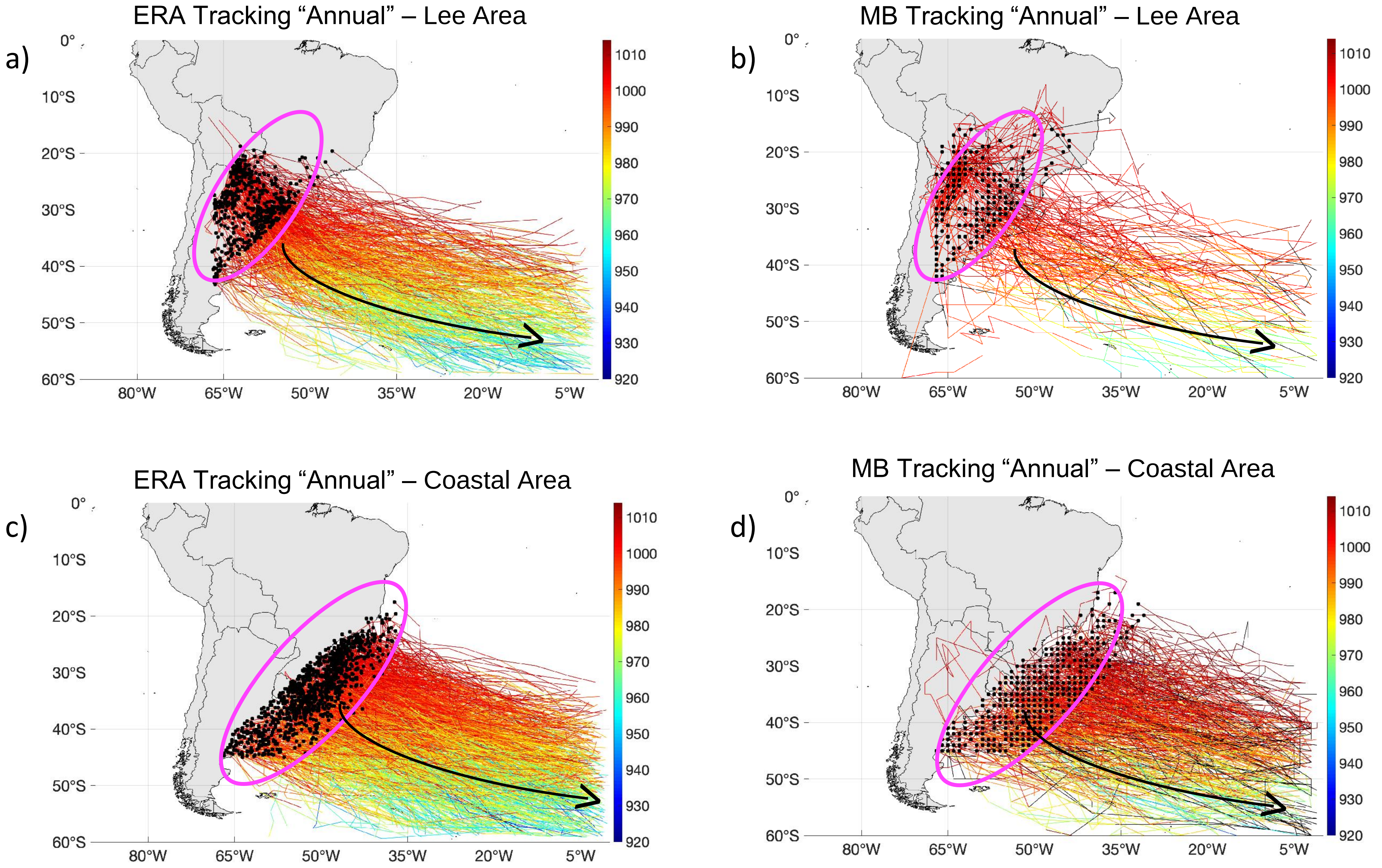
Criteria

- Have a closed isobar
- At least 4 days of lifecycle
- Continue in a logical path
- Interact in somehow with the coastal line

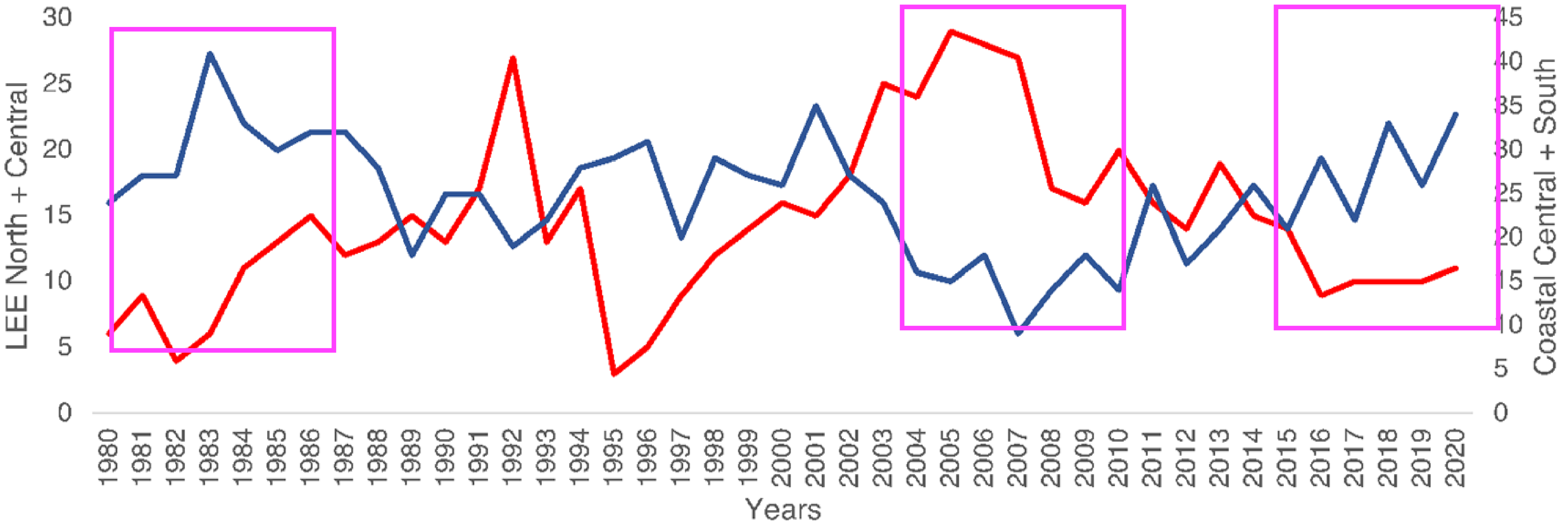


General Climatology of South America-born Cyclones

Annual

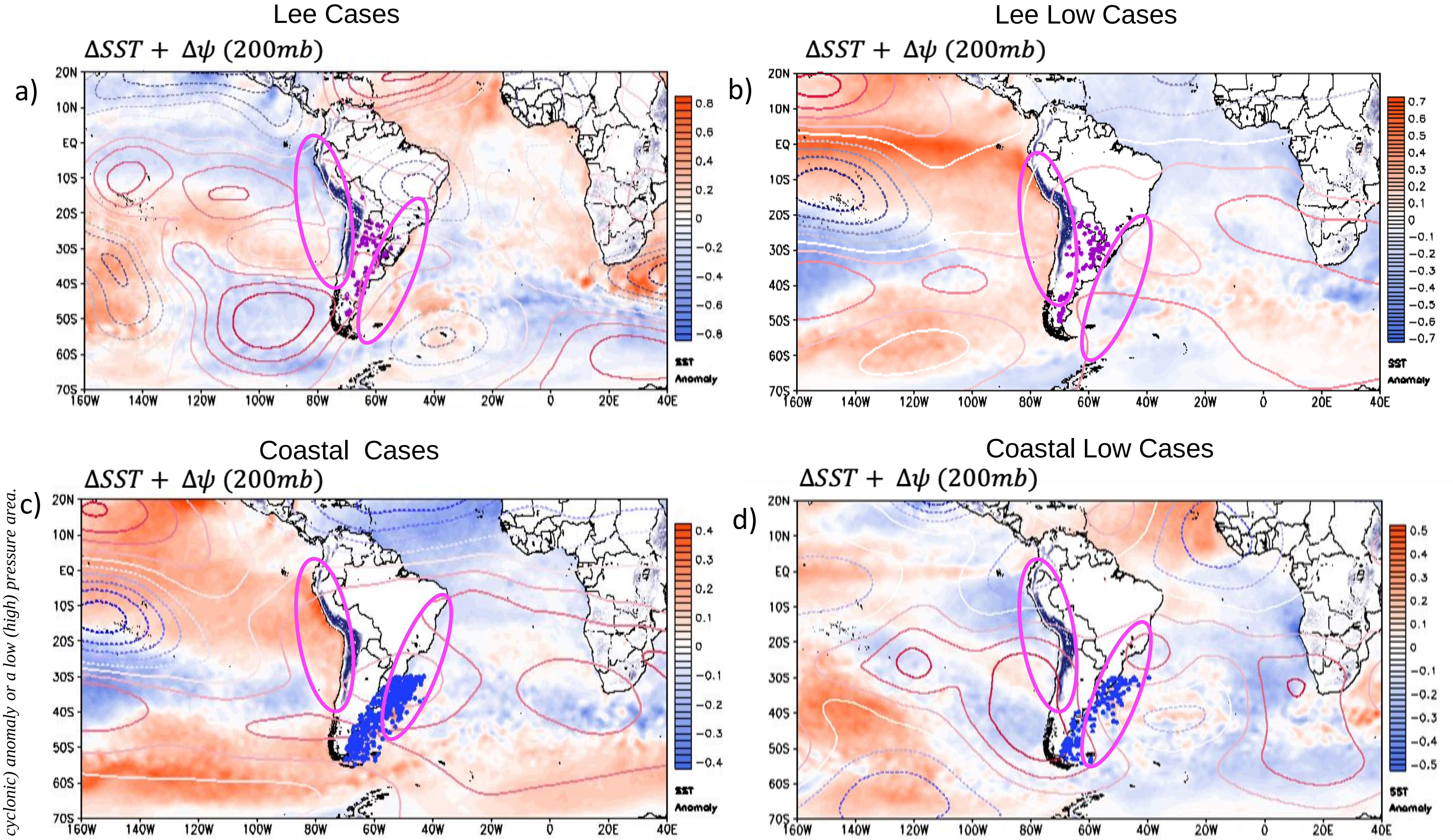


Genesis locations (shown in black dots) of lee (a, b) and coastal (c, d) extratropical cyclones along with storm tracks for ERA5 reanalysis (a, c) and from the Brazilian Navy (b, d) for all cyclones included in this study for Annual analysis.



Annual frequency of ECs for lee (red line) and coastal (blue line) cyclogenesis.

Circulation Features Associated With Lee And Coastal Cyclones

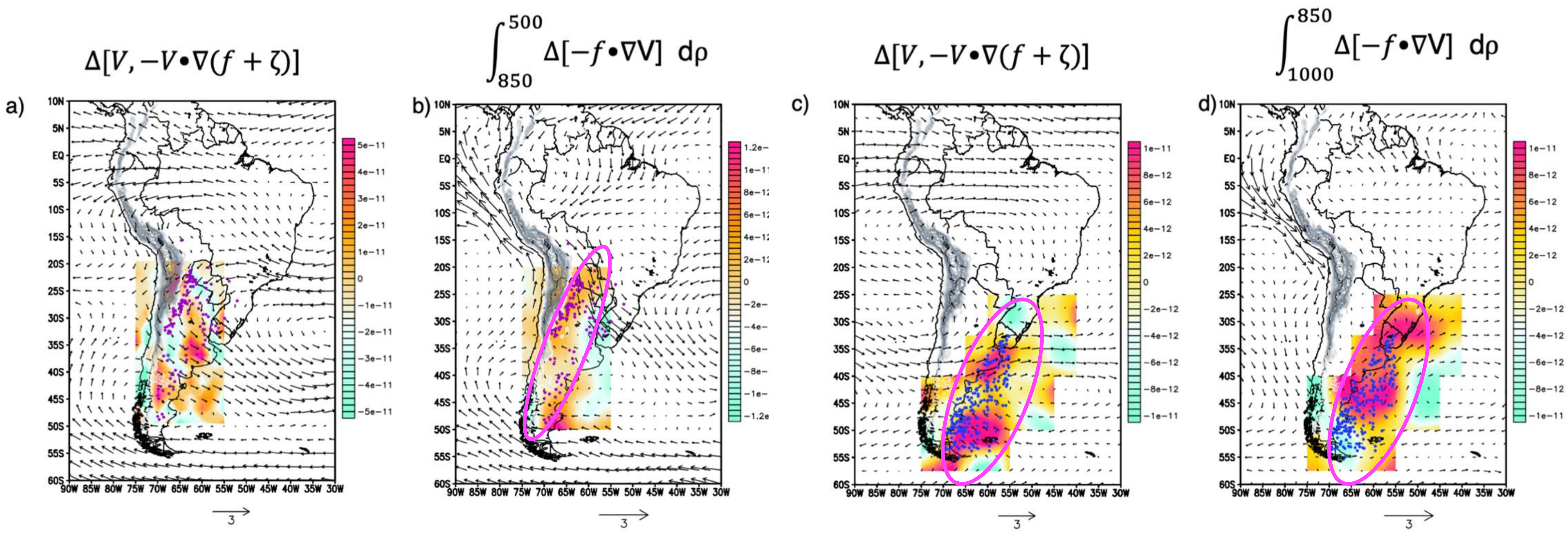


Annual composite stream function anomalies (contours) and SST anomalies (shading) for years with high and low frequencies of lee cyclogenesis (a, b, respectively) and high and low frequencies of coastal cyclogenesis (c, d respectively). Positive (negative) stream function values in the southern hemisphere indicate a cyclonic (anti-cyclonic) anomaly or a low (high) pressure area.

Mechanisms Driving the Lee and Coastal Cyclogenesis Variations

Lee Cases

Coastal Cases



Sections of vorticity advection and vortex stretching are presented. Vorticity advection analysis (figure 7a, c) averaged for the upper troposphere (500 hPa) across 38°S 24°S with 500 hPa wind vectors. Vortex stretching analysis figure 7b, d) or the lower troposphere from 850–500 hPa across 38°S 24°S for lee cases (figure 7b) and from 1000–850 hPa for coastal cases figure 7d) with 850 hPa wind vectors.

Conclusion

1. A climatology of South American cyclones is developed to analyze general cyclone characteristics and to update existing knowledge of these storms.
2. El Niño and local atmospheric circulation anomalies impact the relative frequencies of lee and coastal cyclogenesis
3. Lee cyclogenesis is mostly facilitated by vortex stretching associated with the Andes, while coastal cyclogenesis is more common due to contributions from both vortex stretching and vorticity advection

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