Modeling and dynamical aspects of the Chilean low-level coastal jet

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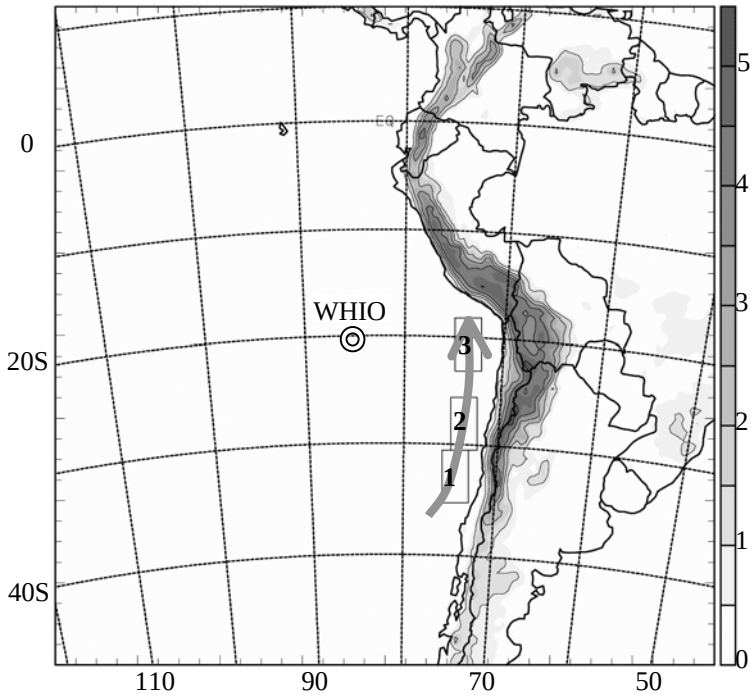
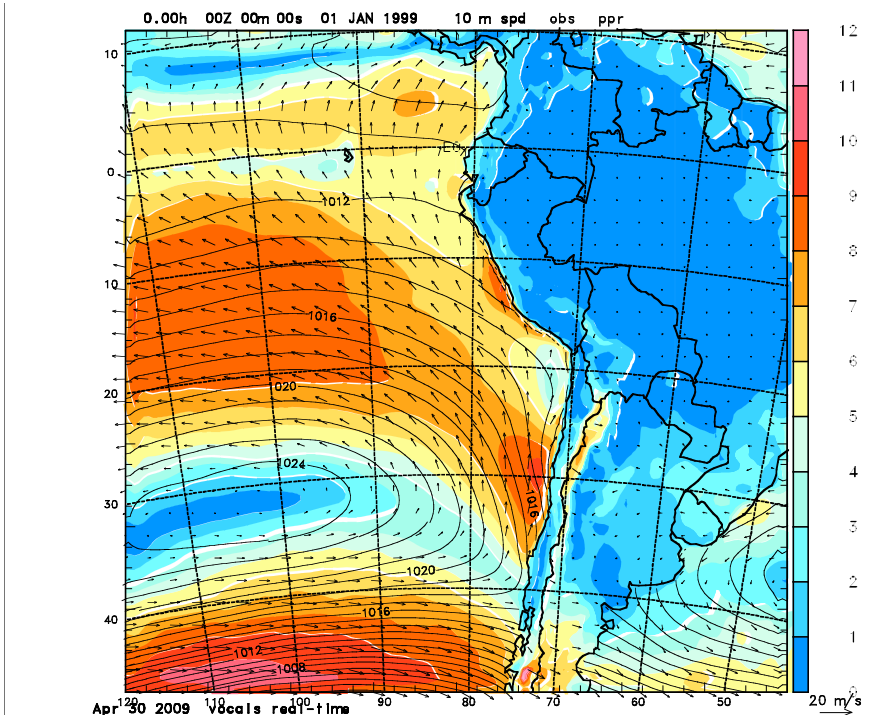
Objectives and Datasets

- Objectives:
  - –Deepening understanding of the dynamics and modeling issues of the CLLCJ.
  - –Examining synoptic forcing, terrain forcing and land-sea differential heating effects on CLLCJ.
- Datasets:
  - –QuikSCAT surface winds (0.25ºx0.25º)
  - –WHIO buoy data
  - –COAMPS real-time forecast (151x151x45; Δx = 45 km)
  - – COAMPS sensitivity simulations (199 x 199 x 60; Δx = 15 km).

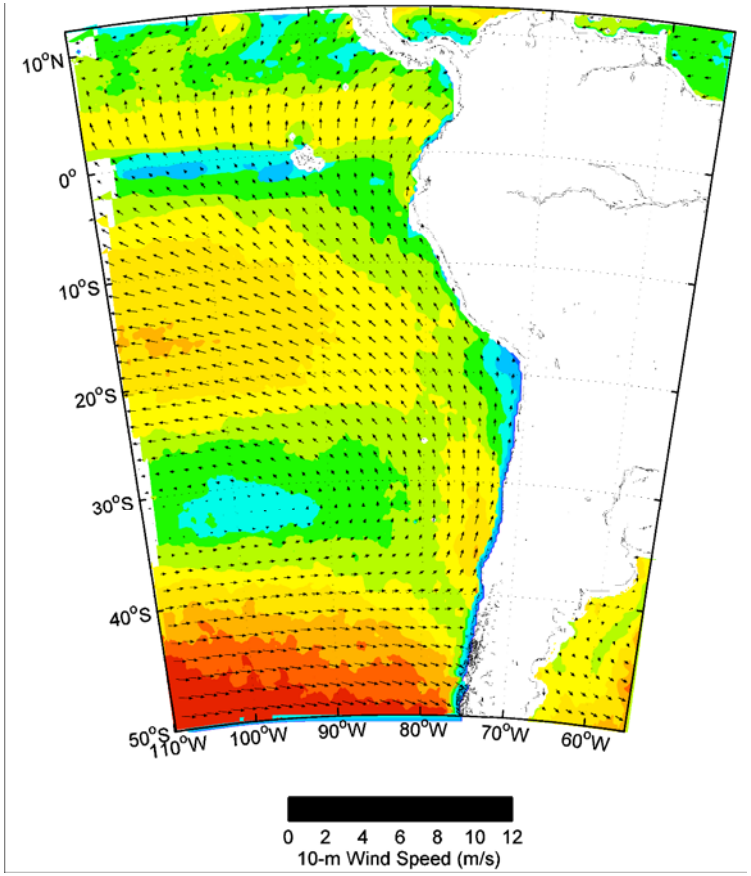


Model validation: COAMPS Real-time Forecast and QuikSCAT Comparison

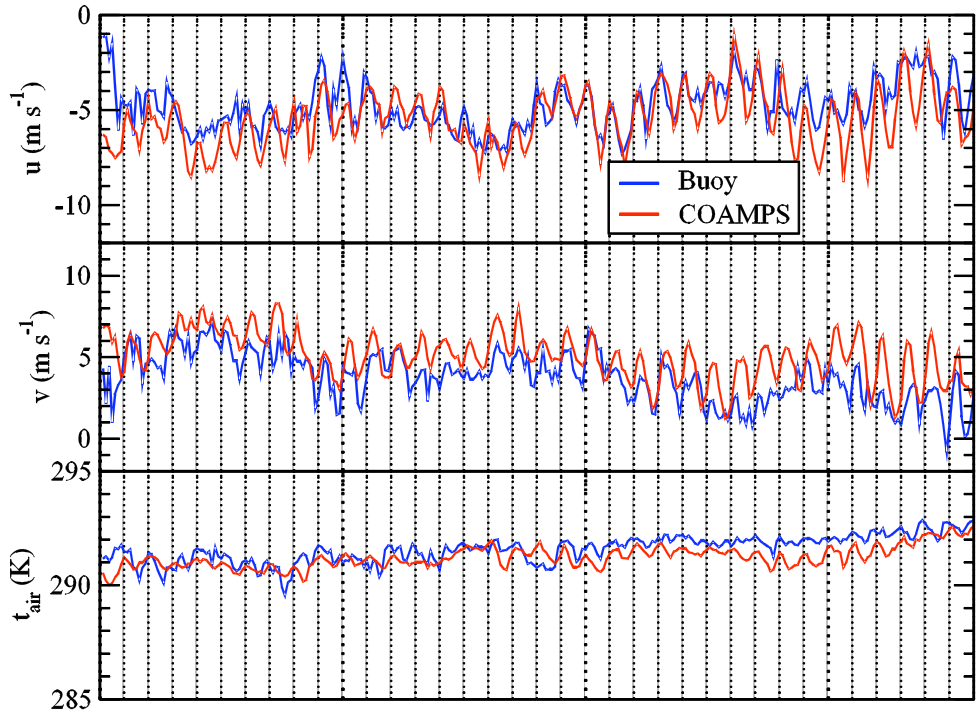
COAMPS 10-m winds and surface pressure (10/20/2008-11/30/2008)



QuikSCAT 10-m winds (10/20/2008-11/30/2008)



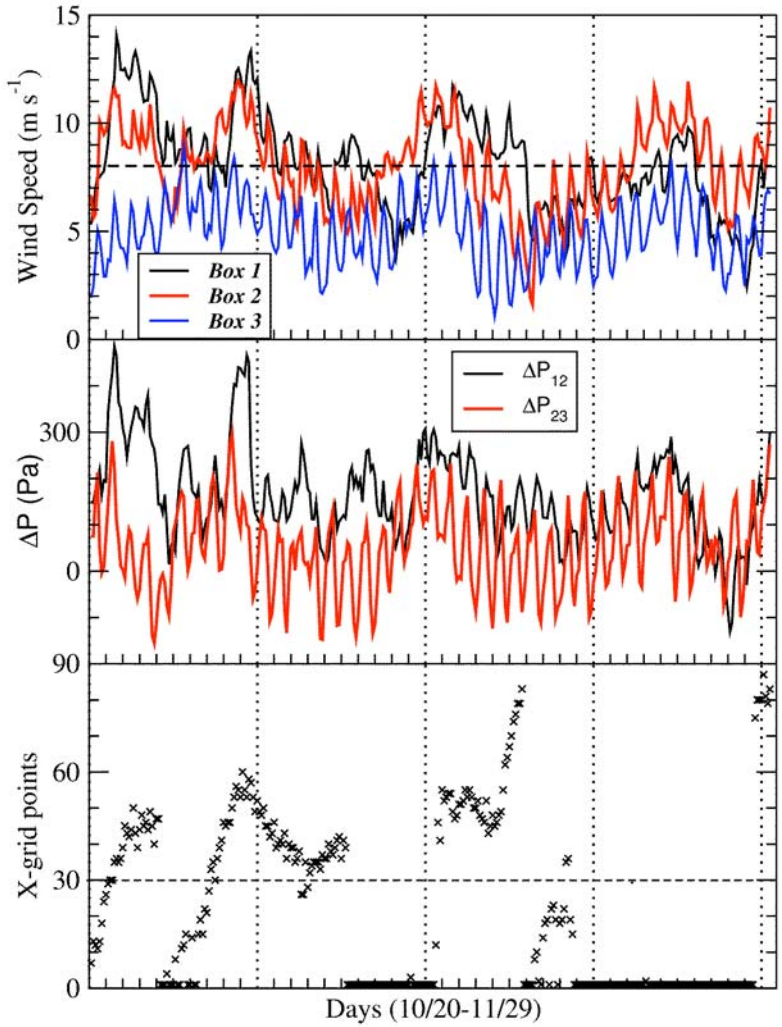
Model validation: COAMPS Real-time Forecast and WHIO Buoy Comparison

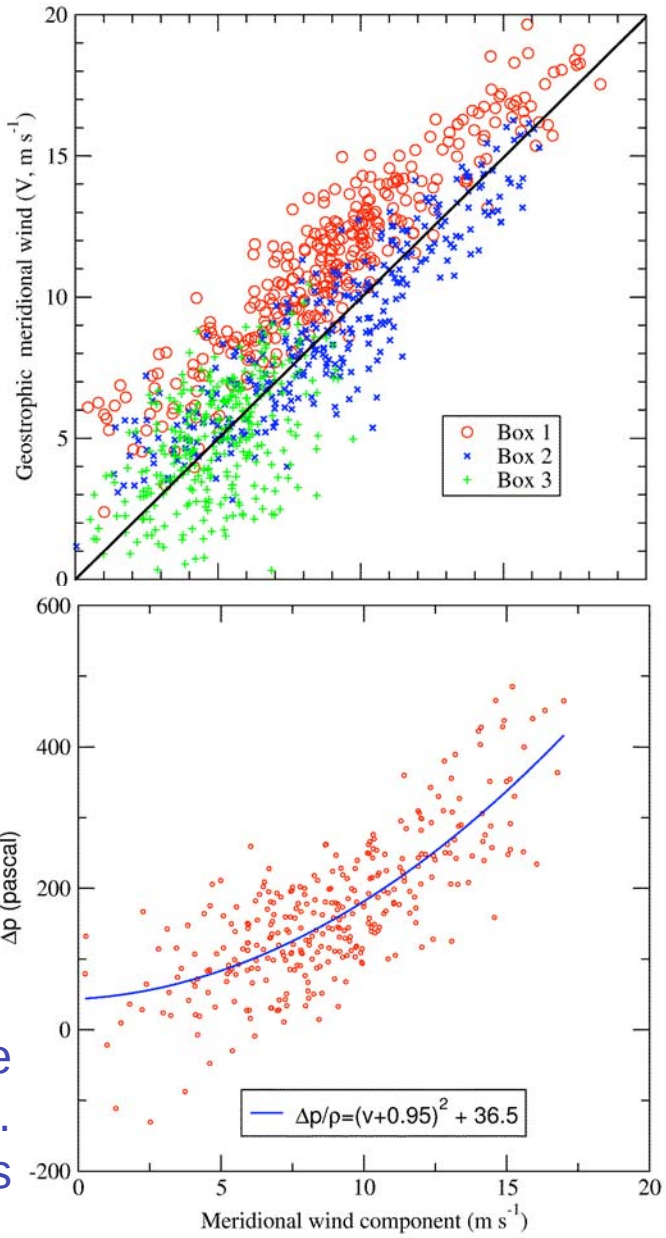


Days (10/25 – 11/30, 2008)

Var.	Bias	RMS
U (m/s)	-0.67	1.4
V (m/s)	1.2	1.7
T (K)	-0.34	0.54

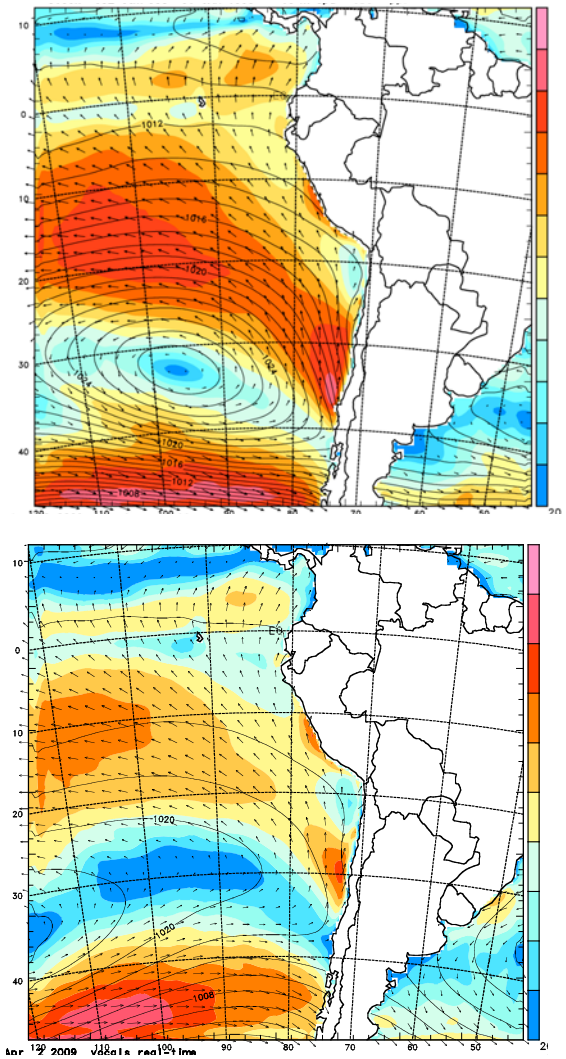
Time Series



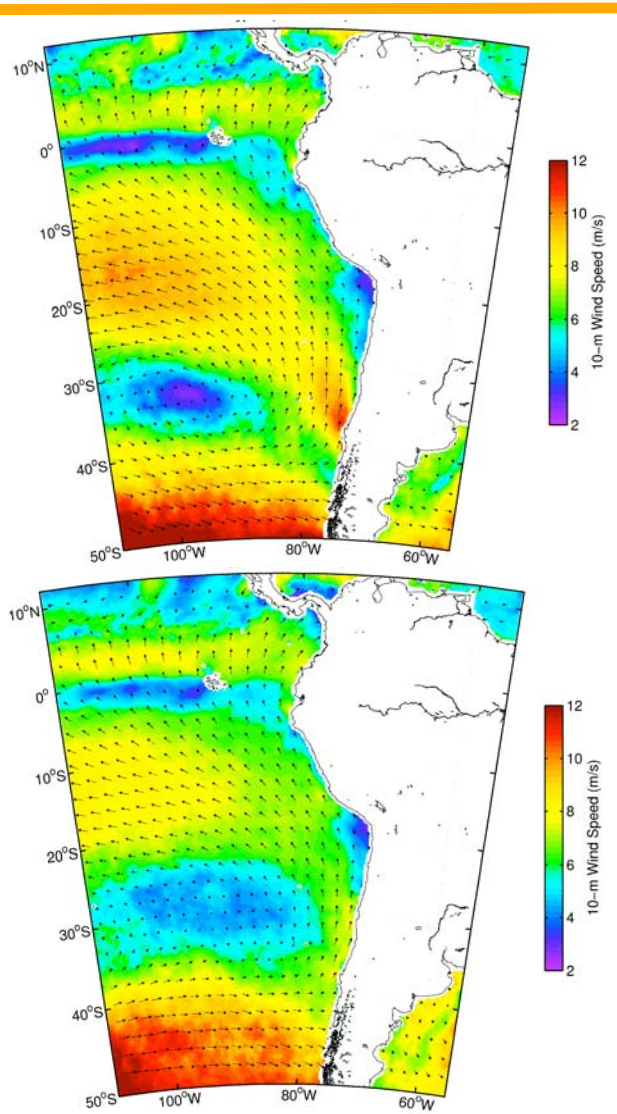


Type I jet: Southeast Pacific High pressure system (SEPH) is close to the Chilean coast. Type II jet: weak synoptic forcing or SEPH is far away (i.e., west of 100º W).

Large-scale flow conditions and CLLCJ

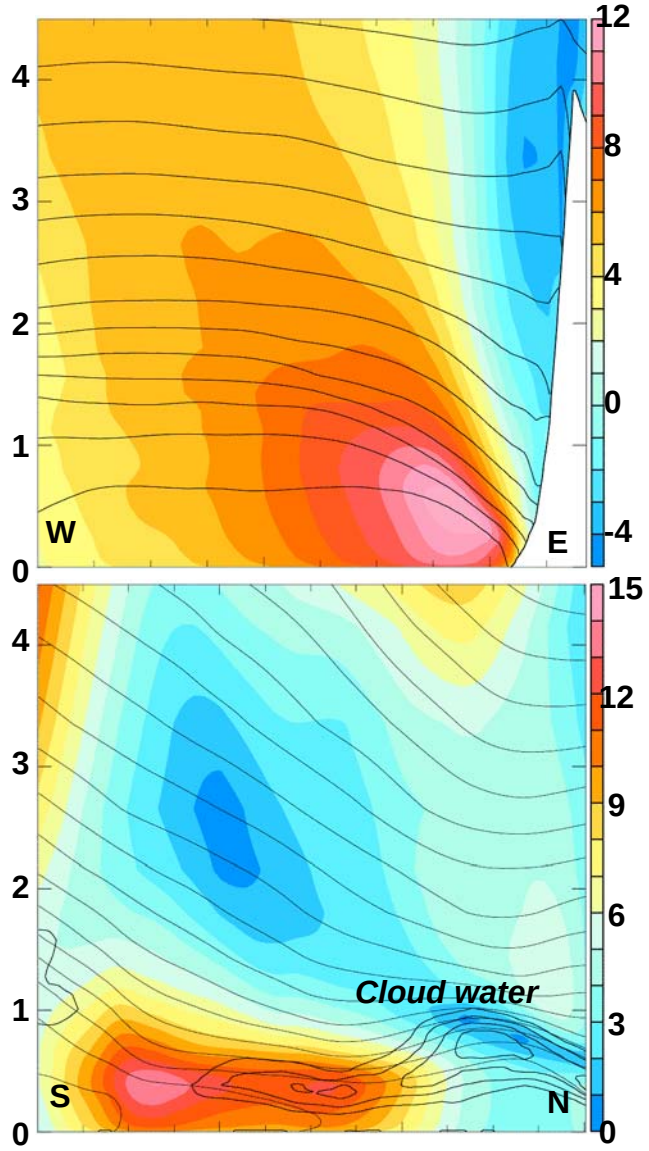


COAMPS 10-m winds and surface pressure averaged over a) type I and b) type II jet periods

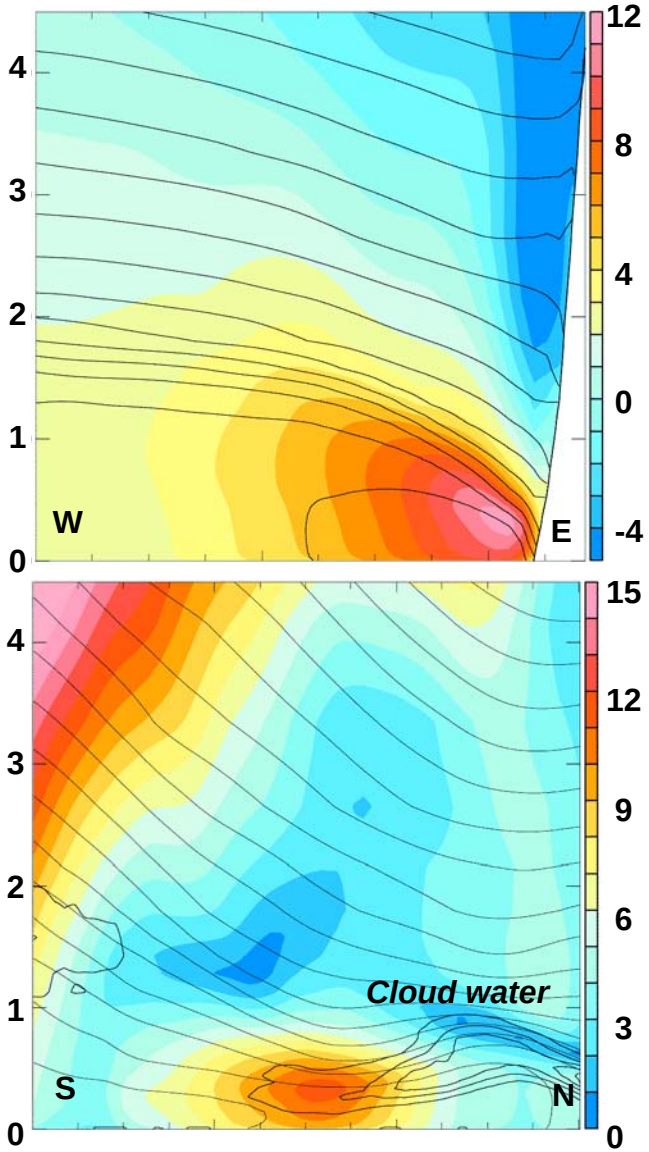


QuikSCAT 10-m winds and surface pressure averaged over a) type I and b) type II jet periods

Cross and along-shore sections for two types of CLLCJ

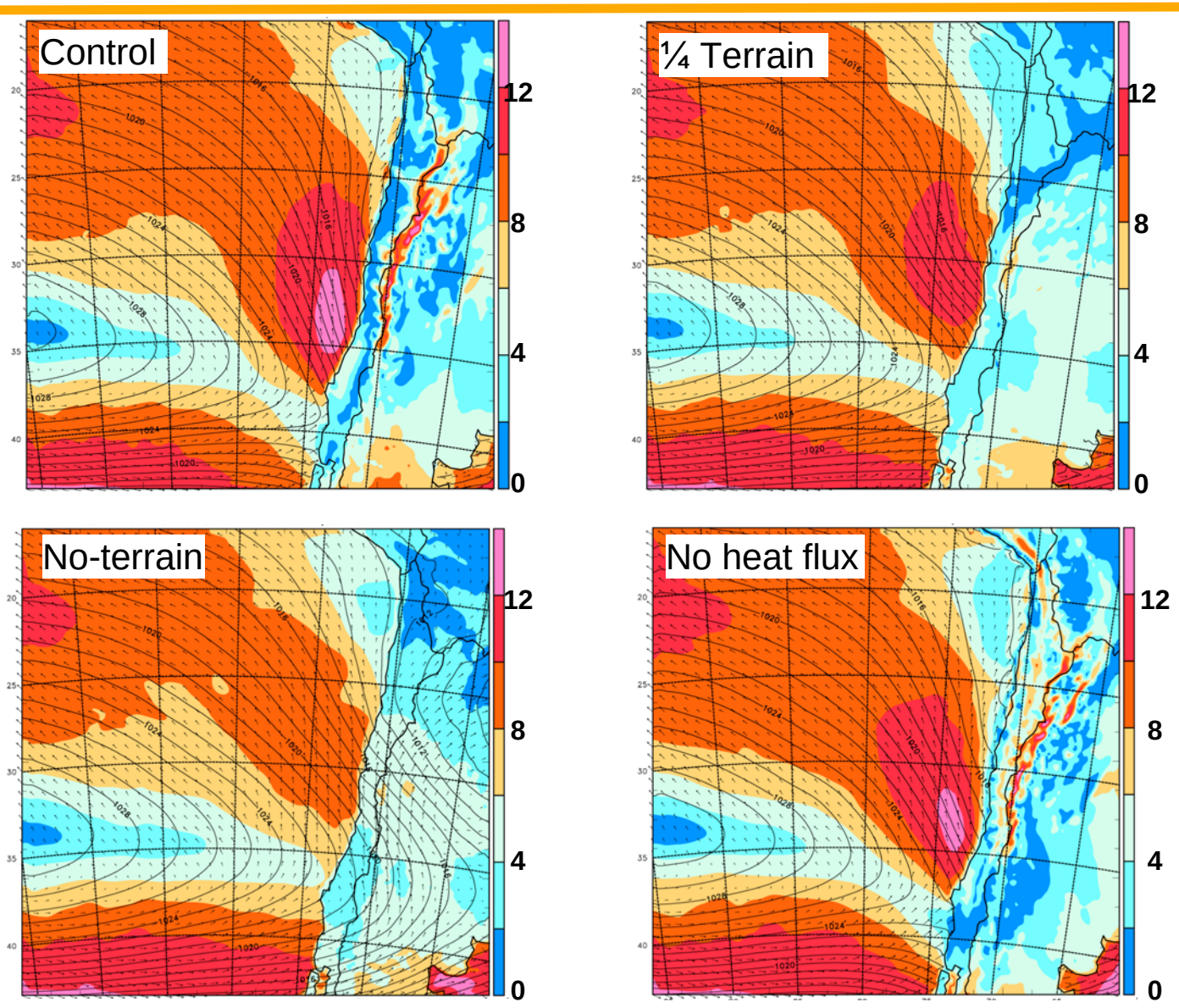


Cross- and along-shore cross sections of wind speed and isentropes for type I jet.



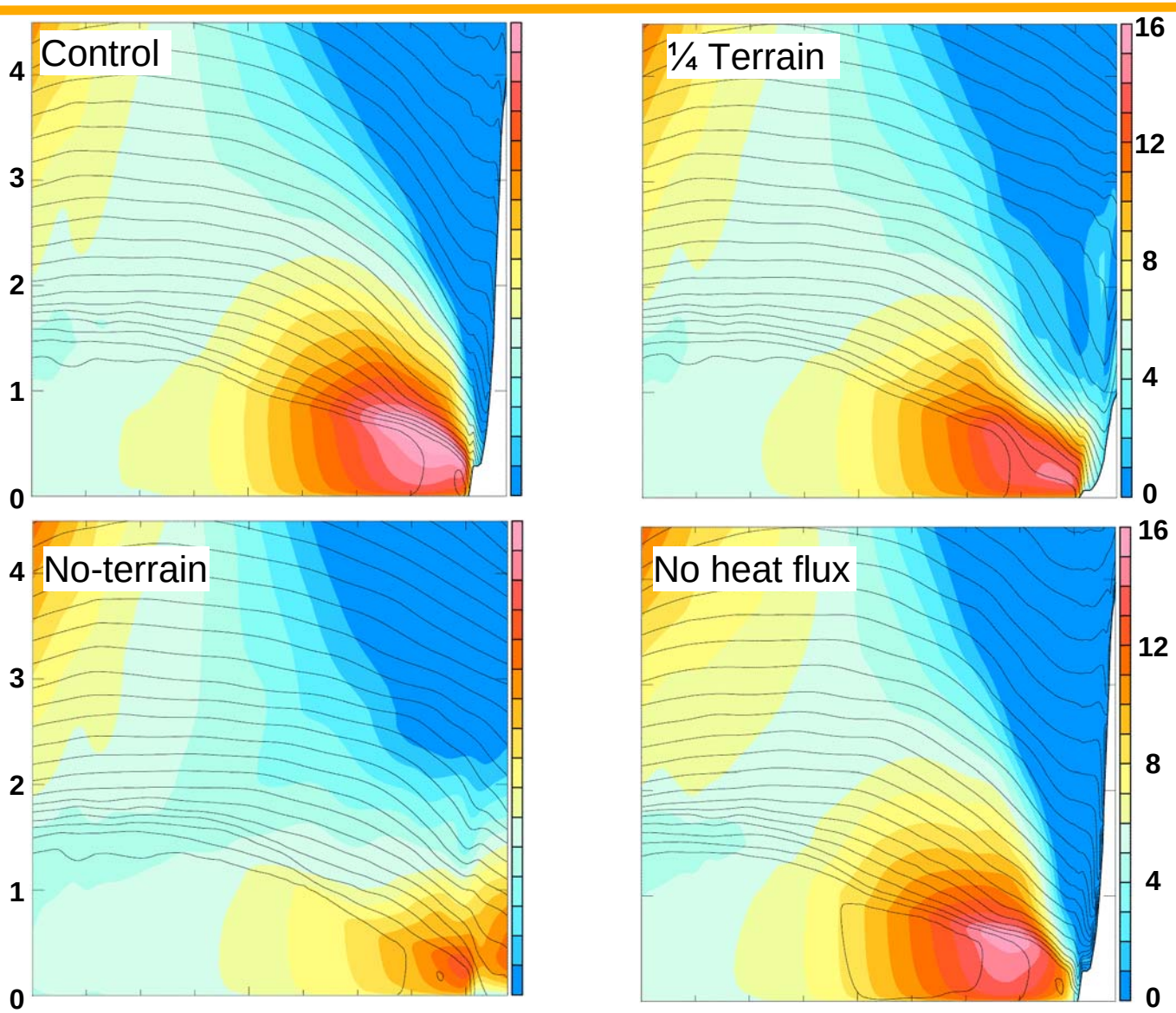
Cross- and along-shore cross sections of wind speed and isentropes for type II jet.

Sensitivity tests (10/22-10/23/08)



24-h mean surface winds and pressure from a group of four sensitivity simulations.

Sensitivity tests (10/22-10/23/08)



Cross-shore vertical sections of meridional winds and isentropes from the same four sensitivity simulations.

Conclusions

- CLLCJ is substantially longer and stronger when synoptic forcing is strong (i.e., SEPH is close to shore).
- CLLCJ is sub-geostrophic in its entrance region and super-geostrophic in its exit region.
- The Andes play an essential role in enhancing CLLCJ by creating a mesoscale coastal high between 35^{o}-40^{o} S.
- Land-sea differential heating tends to strengthen CLLCJ by enhancing the coastal baroclinicity. Overall, the land-sea differential heating impact on CLLCJ is secondary relative to the Andes.