COAMPS Real-Time Forecast for VOCALS-Rex

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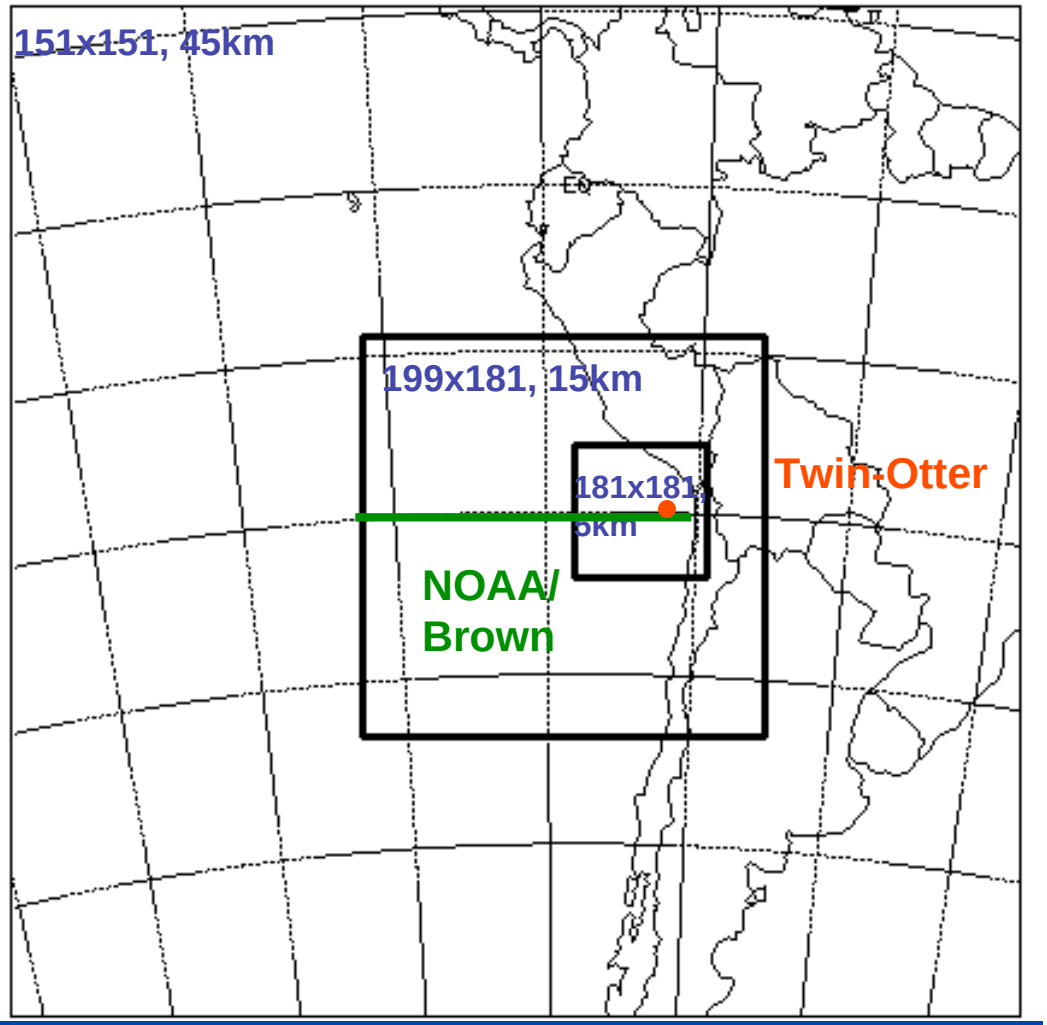
Objective:

1. **Evaluate COAMPS forecast using the field data**
2. **Identify important mesoscale forcing and/or unique marine boundary layer structure**

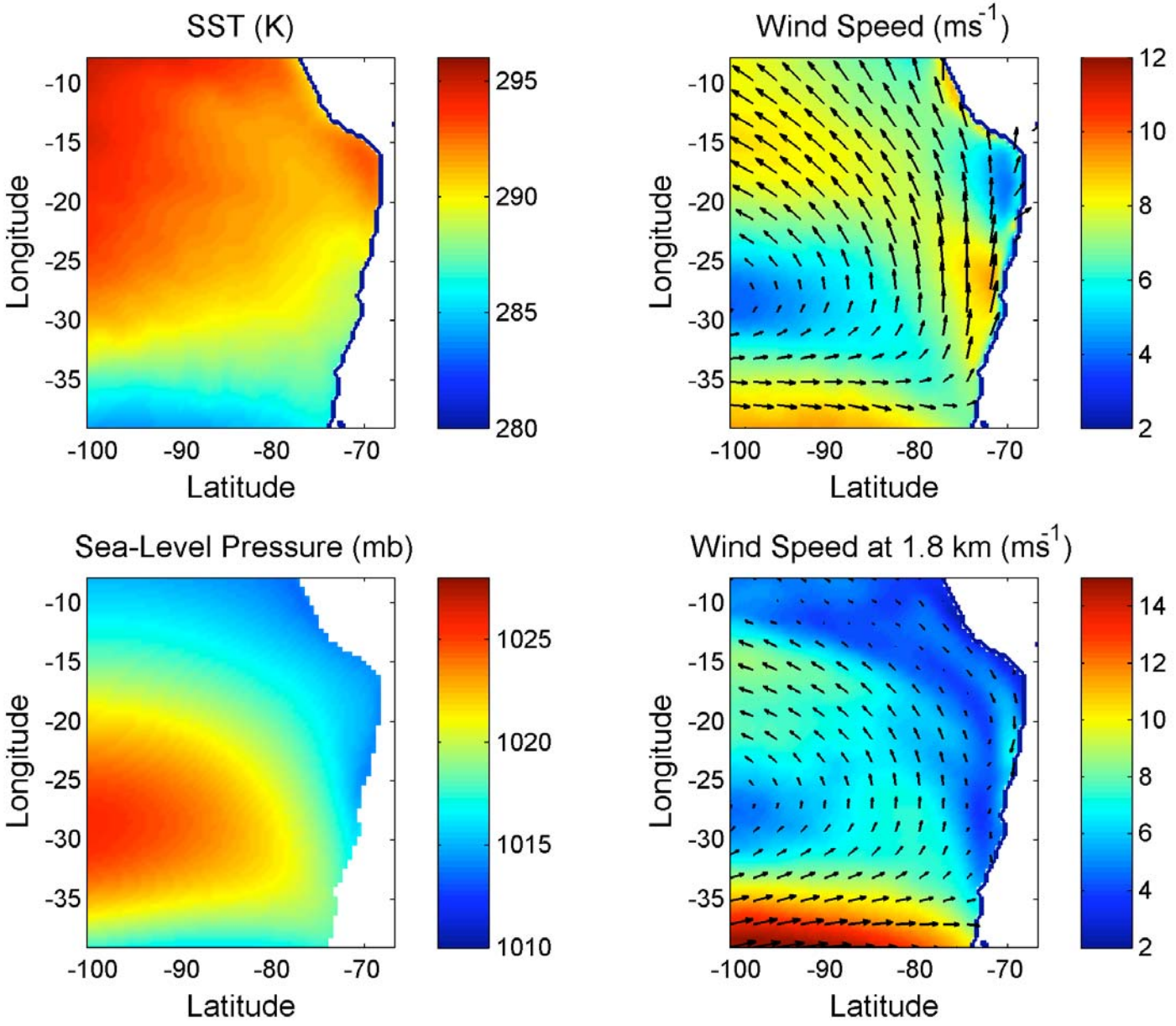
COAMPS VOCALS-Rex Real-Time Forecast (Oct 20 – Nov 29 2008)

COAMPS: Coupled Ocean-Atmosphere Mesoscale Prediction System

- Atmospheric forecast only
- Three nests: 45, 15, 5 km
- 45 Vertical levels (25 levels below 2 km)
- Second domain covers VOCALS-Rex area
- Twice daily 48 hours forecast
- 4 Stream Fu-Liou radiation
- TKE prediction mixing parameterization
- Results on UCAR/EOL
- Focus on grid 2 (15 km)



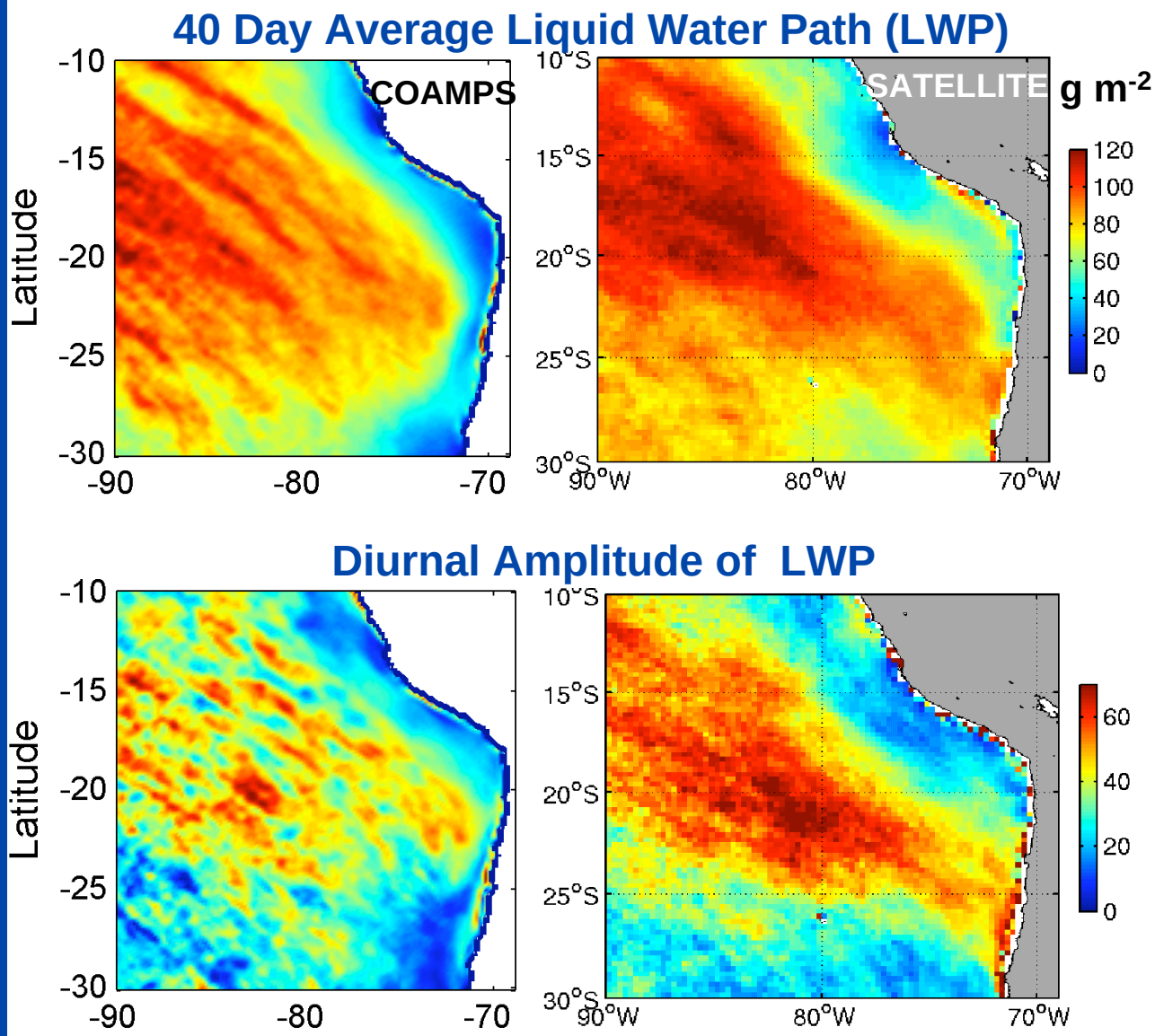
COAMPS VOCALS-Rex Real-Time Forecast Average Large-Scale Conditions (Oct 20 – Nov 29, 2008)



Regional Comparison with Satellite Data

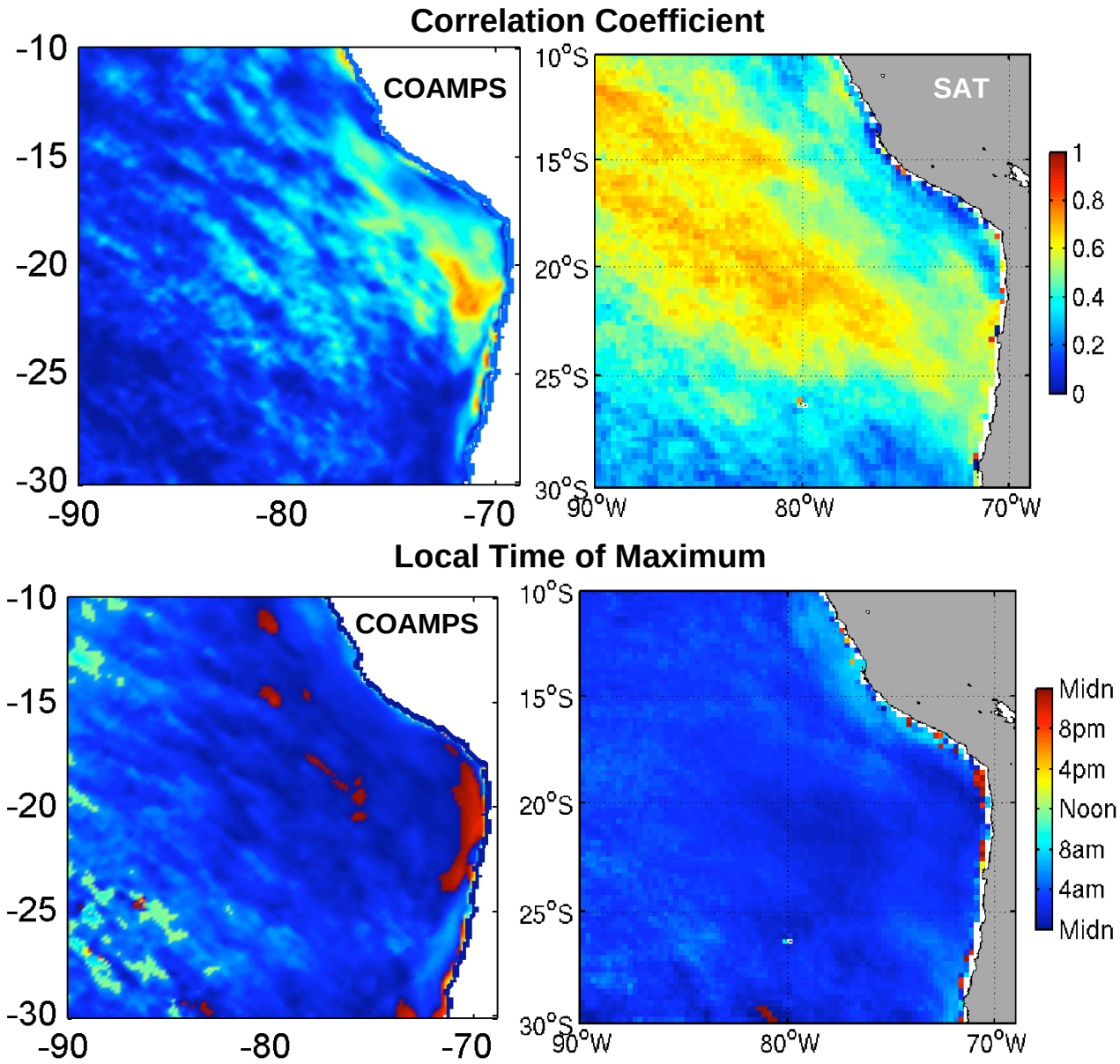
Cloud Variability

- Large cloud cover over the open ocean
- Less clouds along the coast due to stronger subsidence.
- Diurnal variation of low-level clouds is significant.
- Clouds off the coast at 25S- 30S are collocated with the LLJ.
- The discontinuity in COAMPS is likely due to a lack of shallow cumulus parameterization.

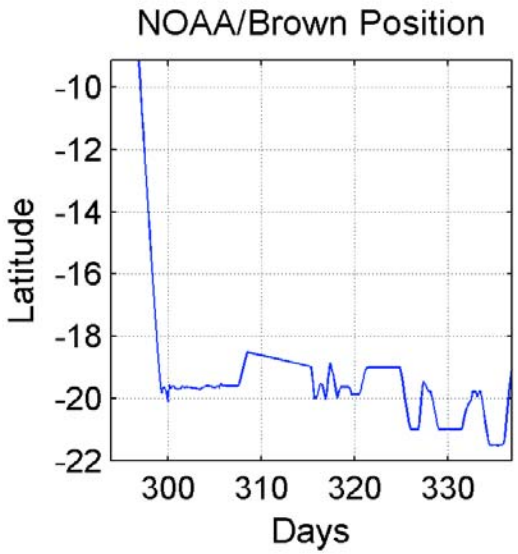


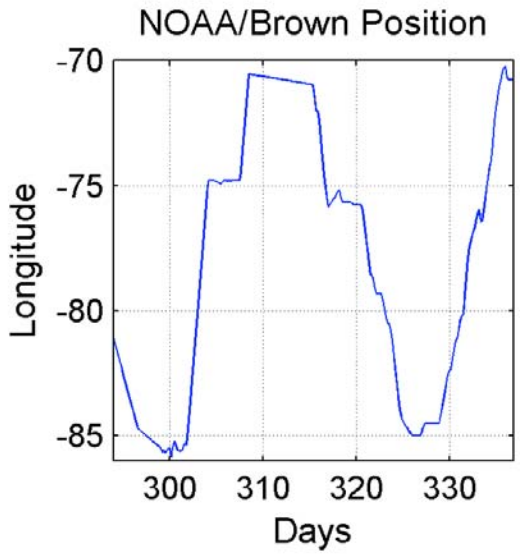
Regional Comparison with Satellite Data

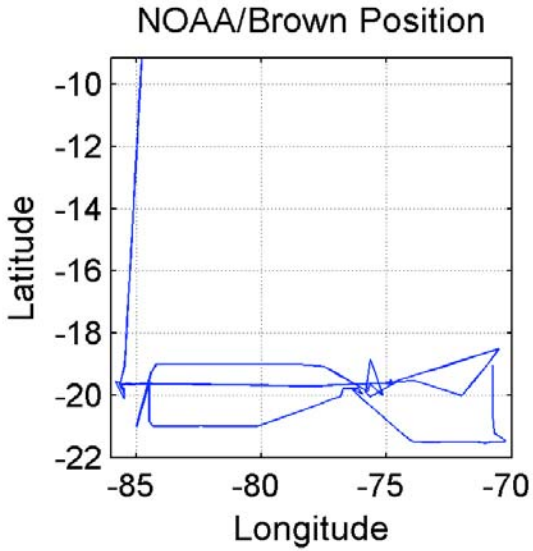
- The diurnal correlation coefficient of COAMPS is significantly less than the satellite data except near the coast.
- The phases of the diurnal changes of both COAMPS and the satellite data are consistent.

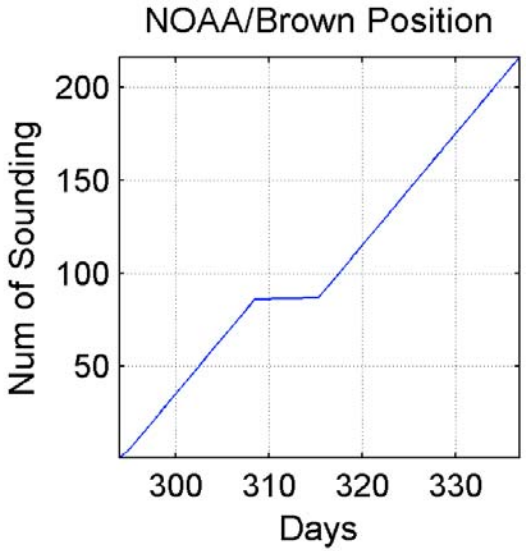


Boundary Layer Structure: Sounding Comparison

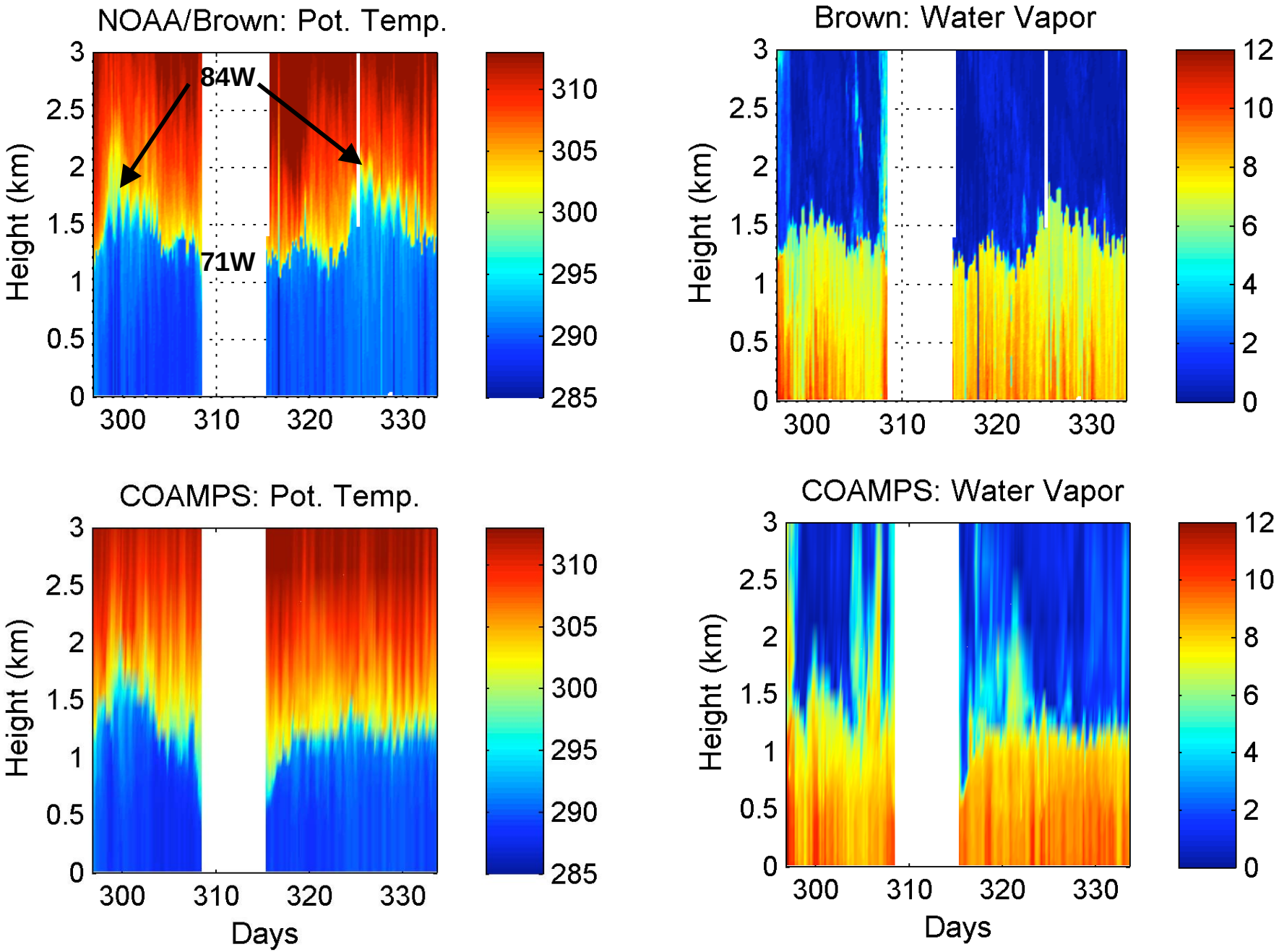




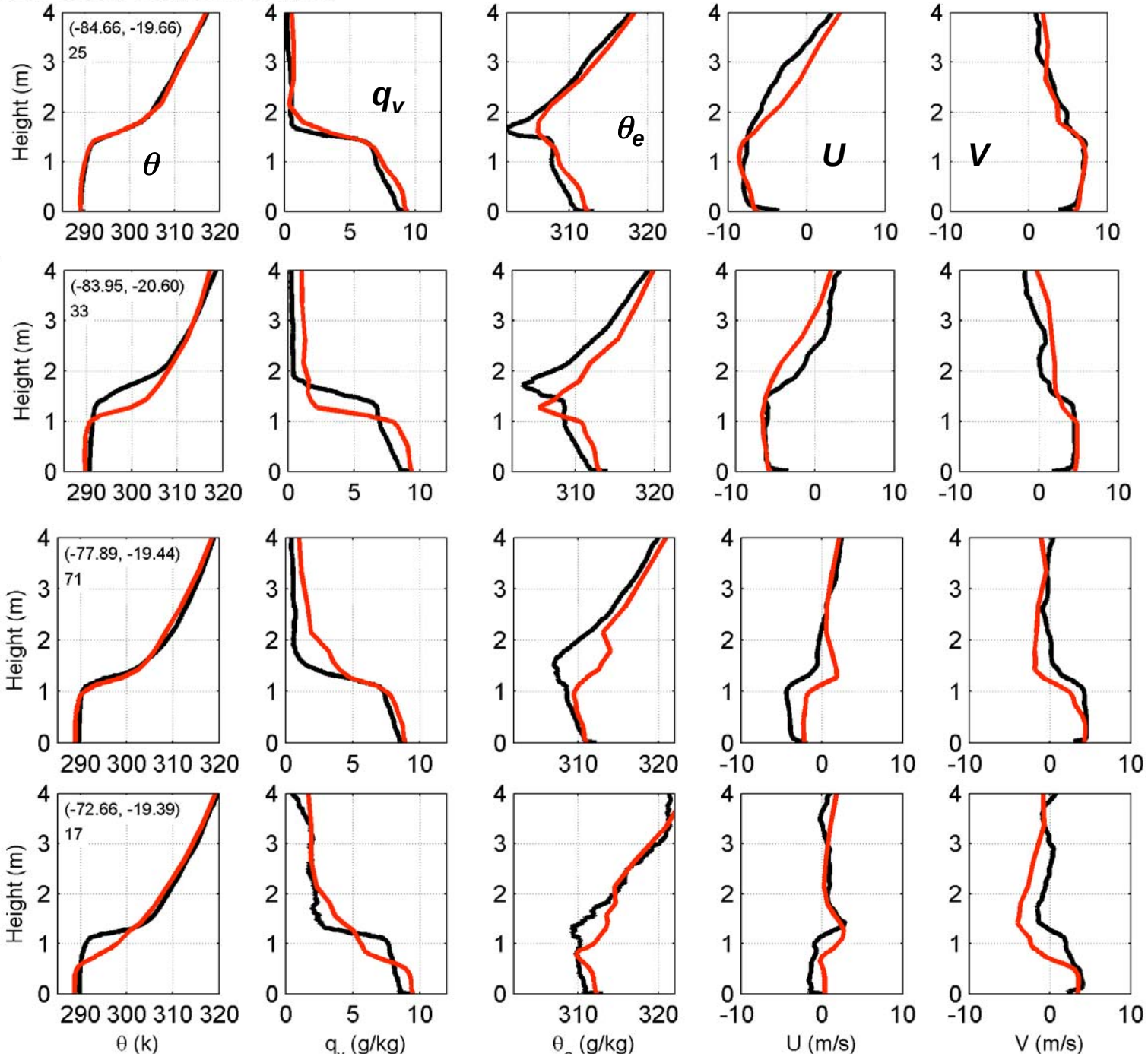


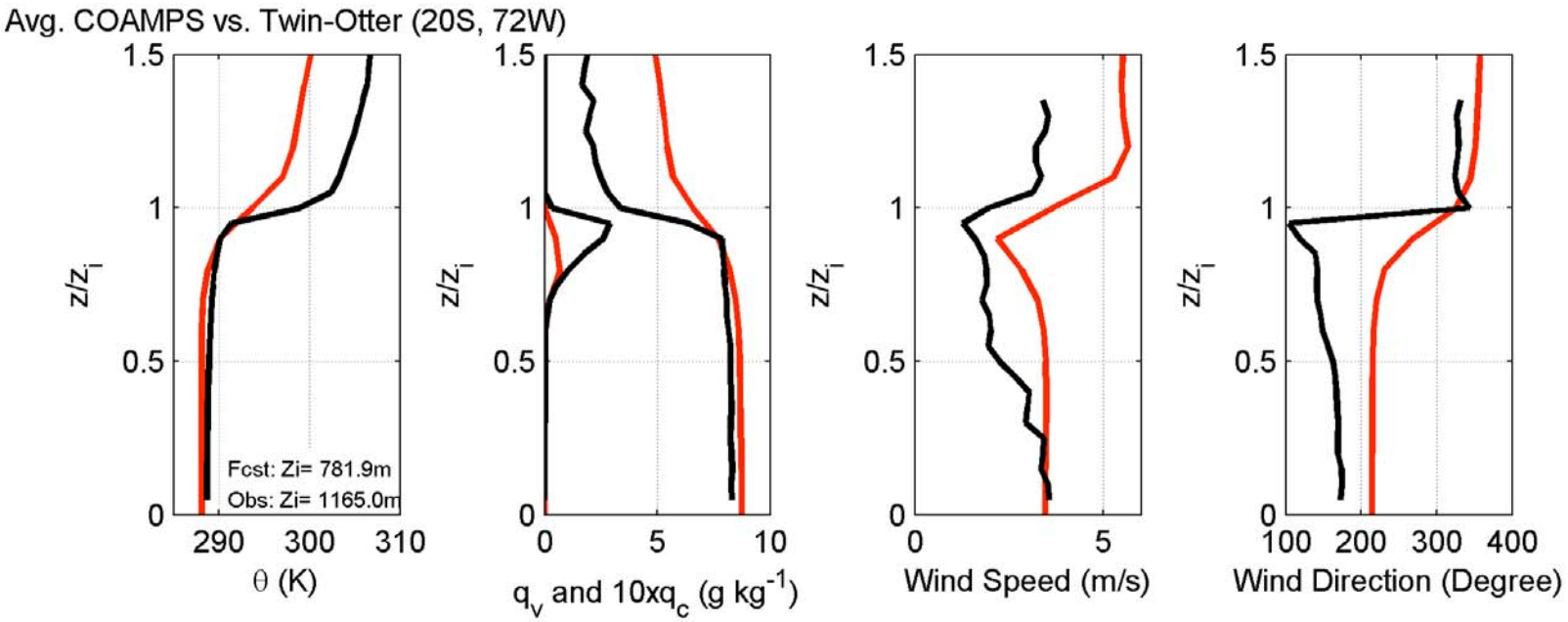


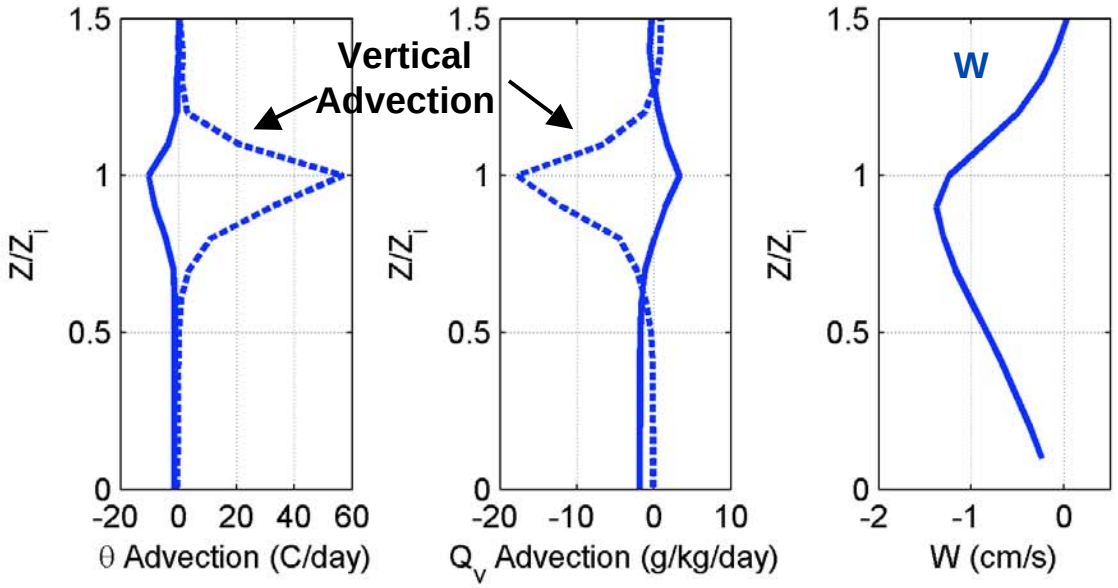
Time-Height Cross-Section: NOAA/Brown vs. COAMPS



Composite COAMPS and NOAA Sondes

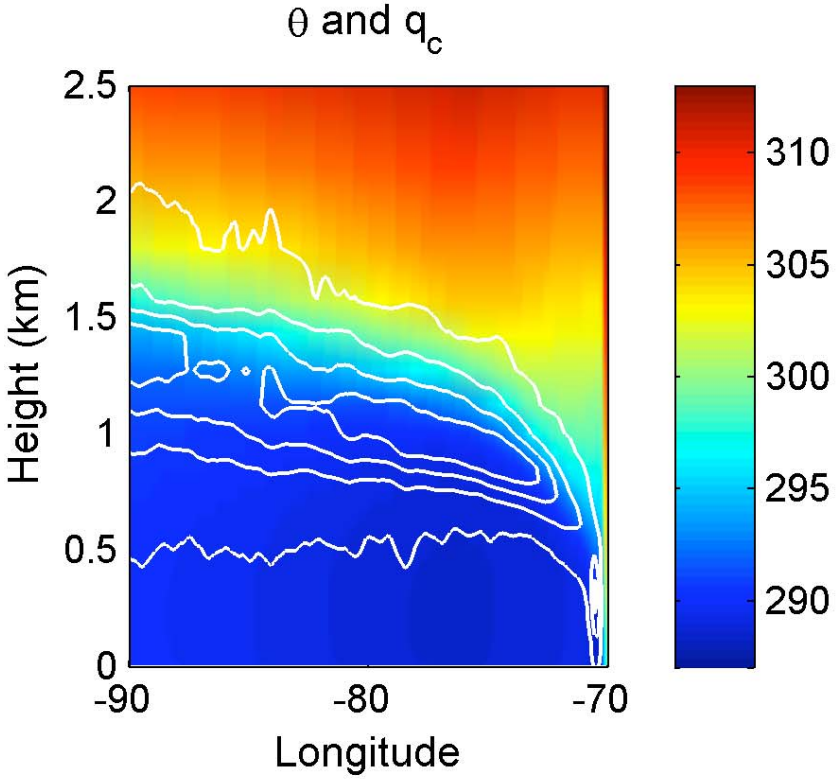


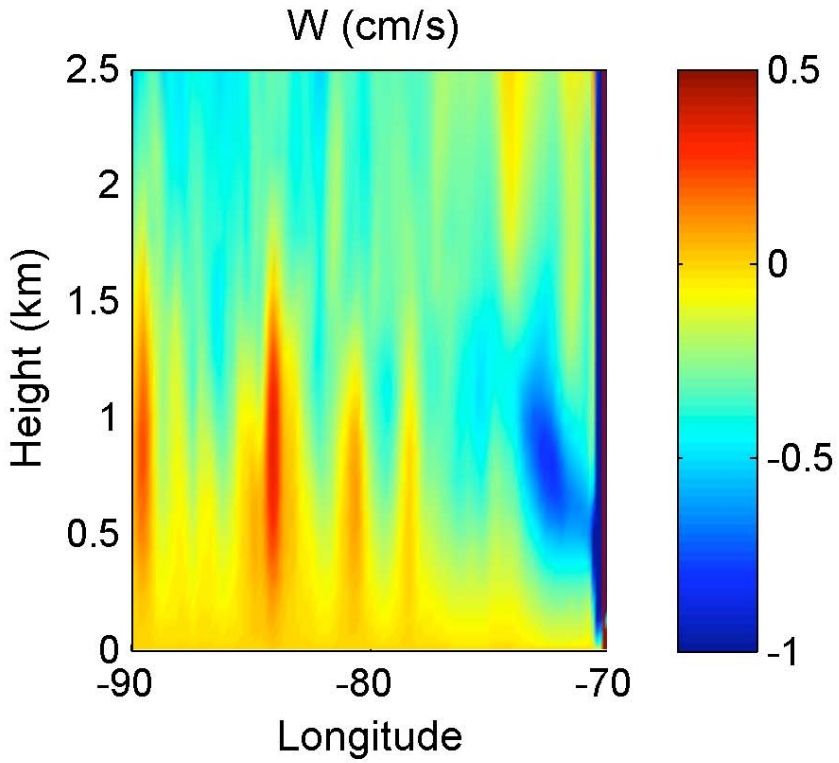




- There is a sharp wind direction reversal across the inversion.
- COAMPS PBL height is significantly lower.
- Vertical advection is a dominant diabatic heating source within the inversion.

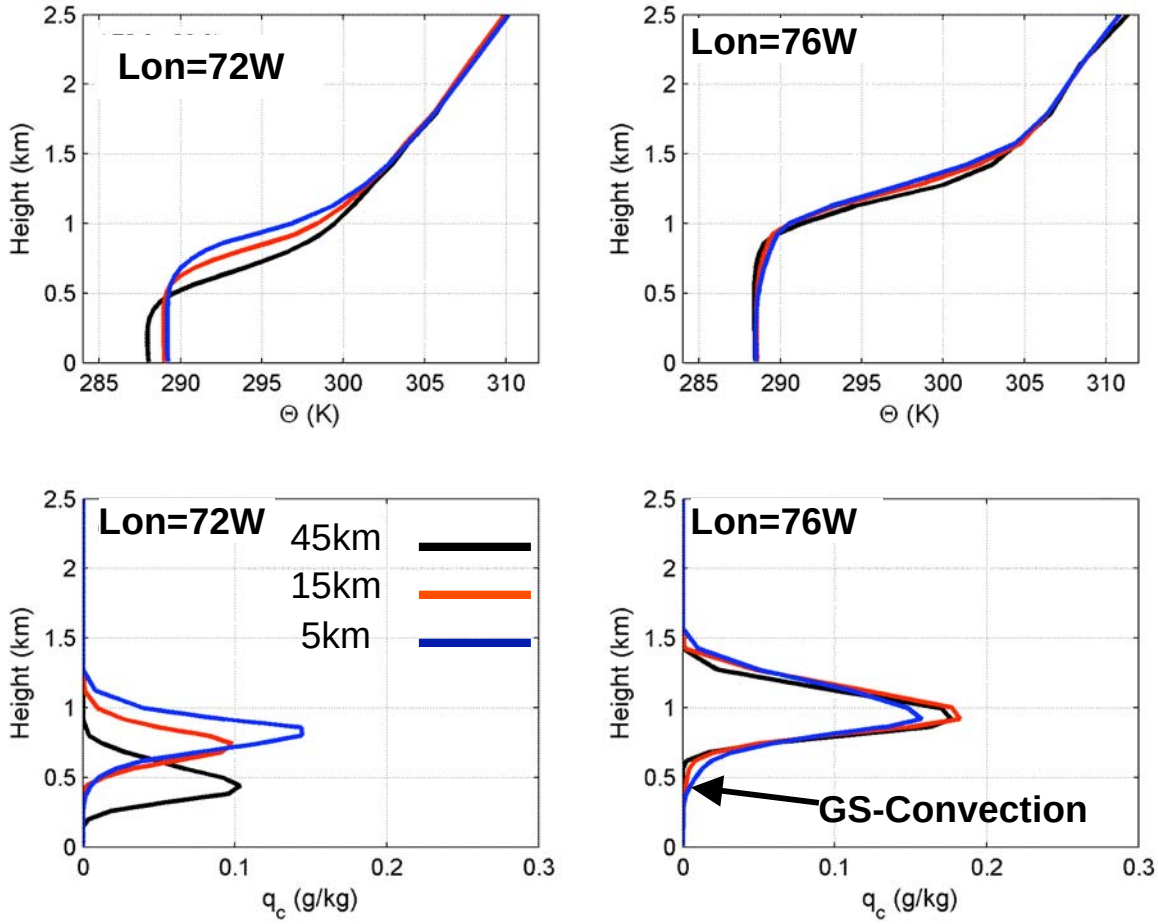
Longitude-Height Cross-section





- **Are coastal MBL heights are significantly suppressed by the downward motion?**

Comparison of Different Grids

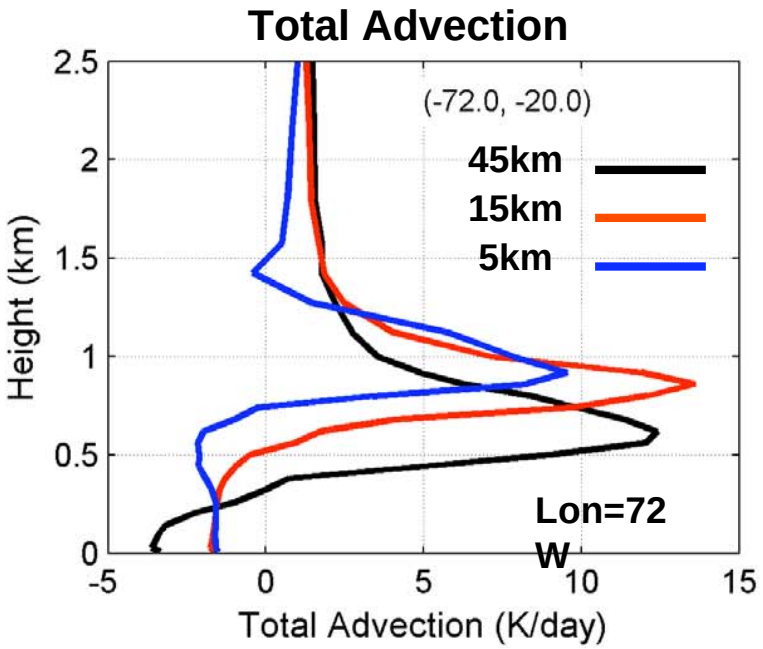


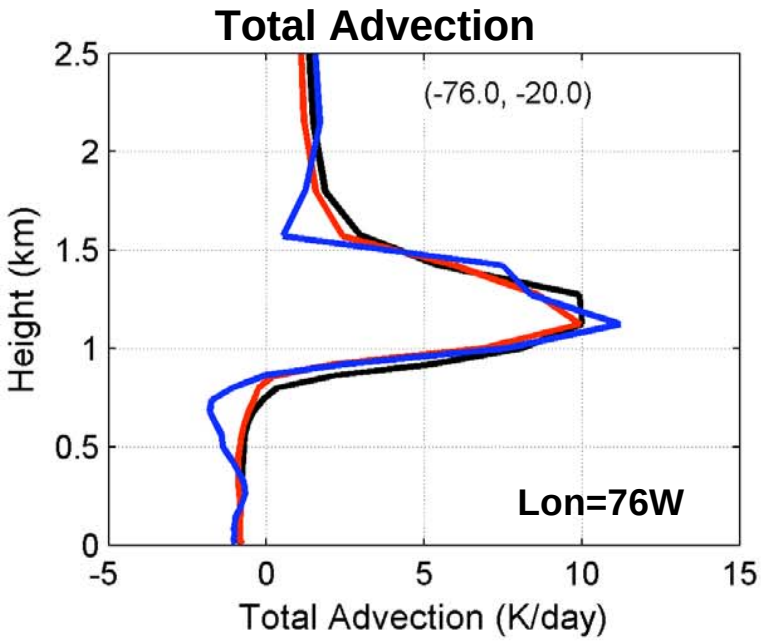
- BL heights are very different for different grids close to the coast
- Finer grids give higher BL heights
- BL heights are similar over open ocean away from the coast

Summary

- The objective is to identify the strength and weakness area of the COAMPS in predicting MBL structure over open oceans and coastal regions.
- Good BL structure over open oceans, but BL heights are slightly lower.
- The boundary layer height near the coast is about 300-400 m lower than the observed. Coarse horizontal resolution partly contributes to this deficiency.
- Strong shear occur across the inversion along the coast, wind direction being reversed from southerly to northerly.
- The phase of the cloud diurnal cycle is consistent with the satellite derived; its magnitude and areal extension is significantly less. This weakness is likely related to the lack of shallow convection parameterization; vertical resolution may also be a issue.

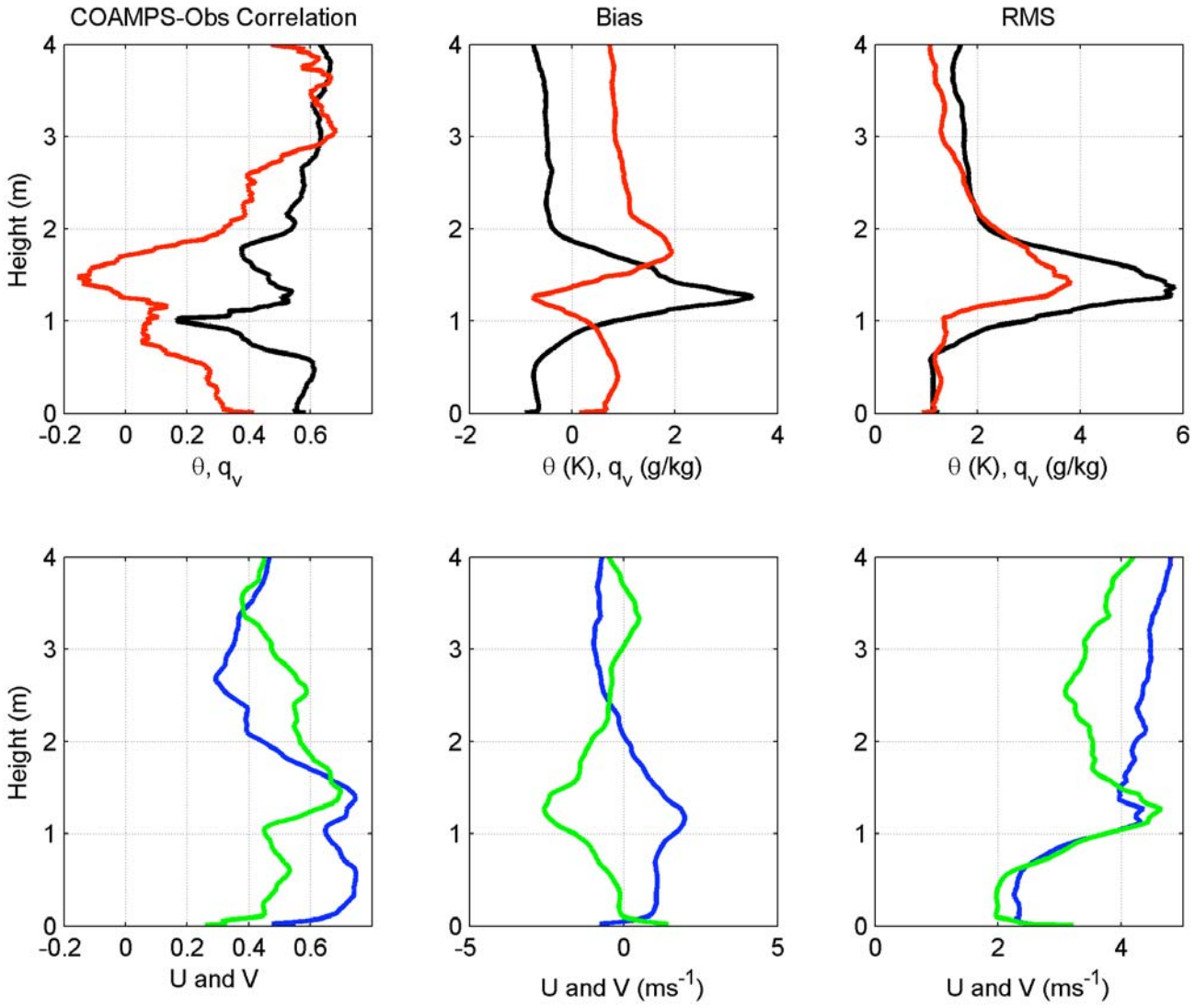
Comparison of Different Grids

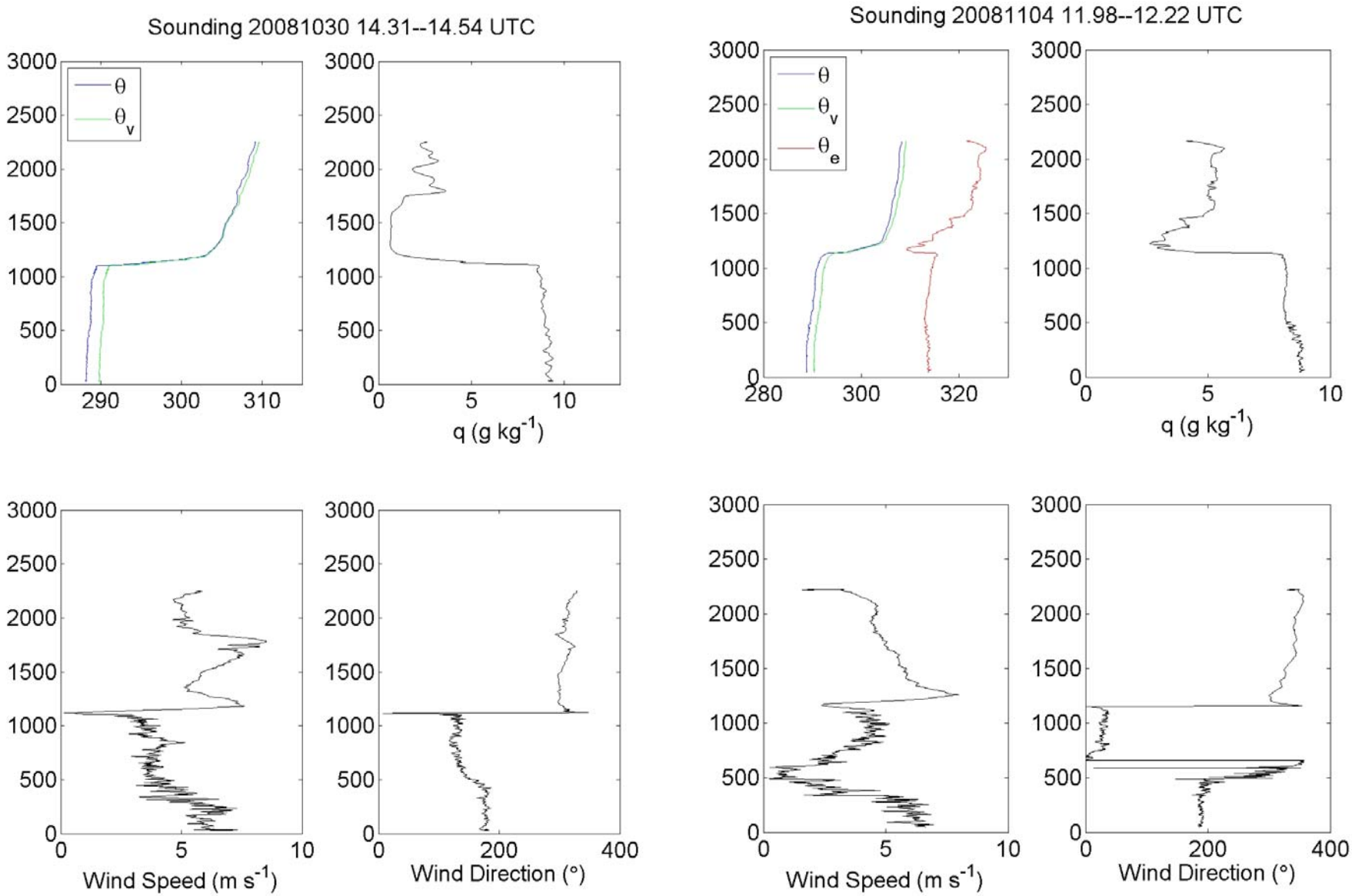




- **Horizontal advection in 45 km grid gives most cooling in the lower MBL**
- **The subsidence warming in the 5km is weakest.**

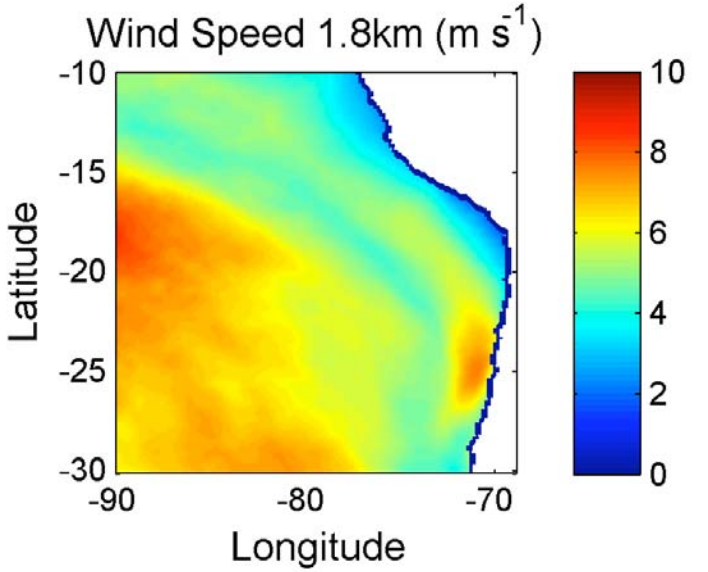
NOAA/Brown vs. COAMPS Scatter Plots

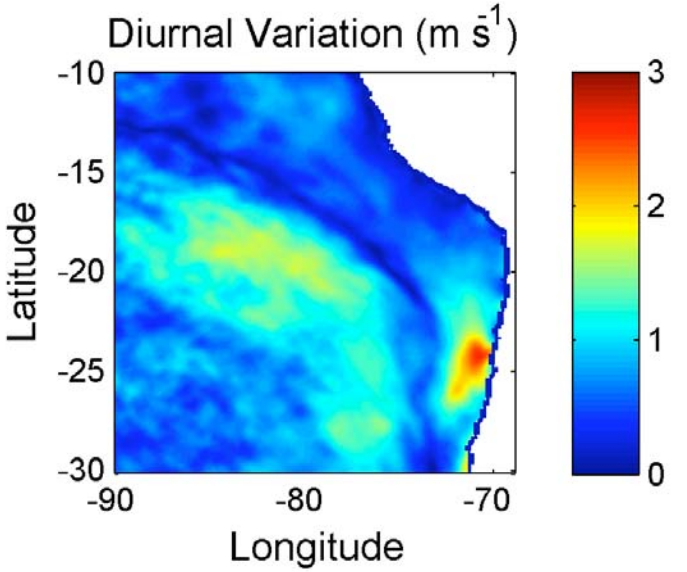


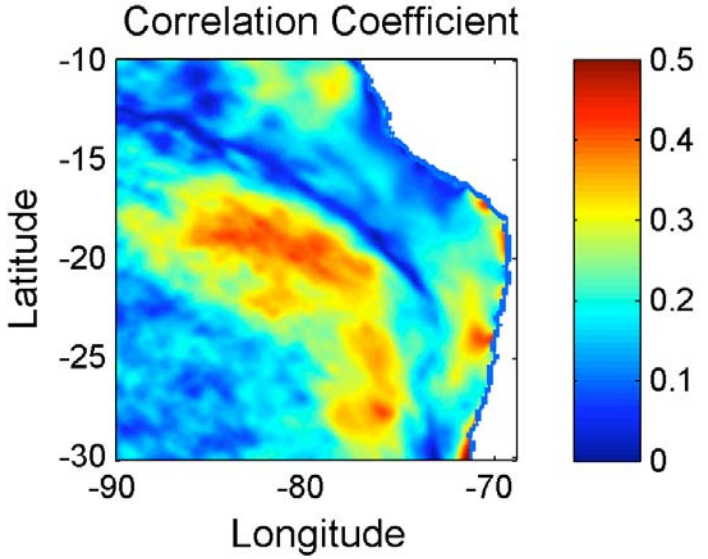


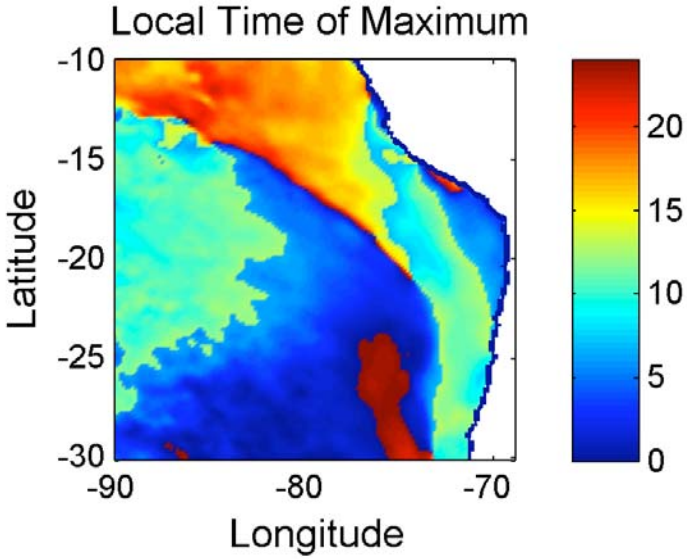
NPS Twin-Otter soundings around point Alpha (72W, 20S)

Winds above PBL (1.8 m)



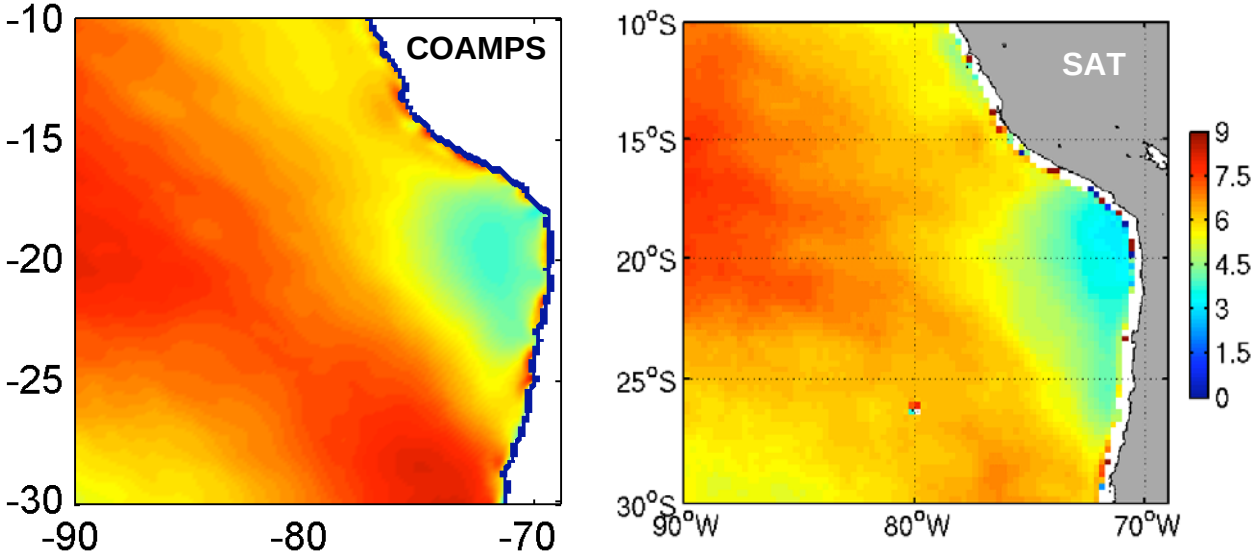






Regional Comparison with Satellite Data

Mean Wind Speed



Diurnal Amplitude