A satellite image showing a coastal jet off the coast of Peru. The image displays a dark, narrow band of water extending from the coast, surrounded by lighter, more turbulent waters. The text is overlaid on the image.

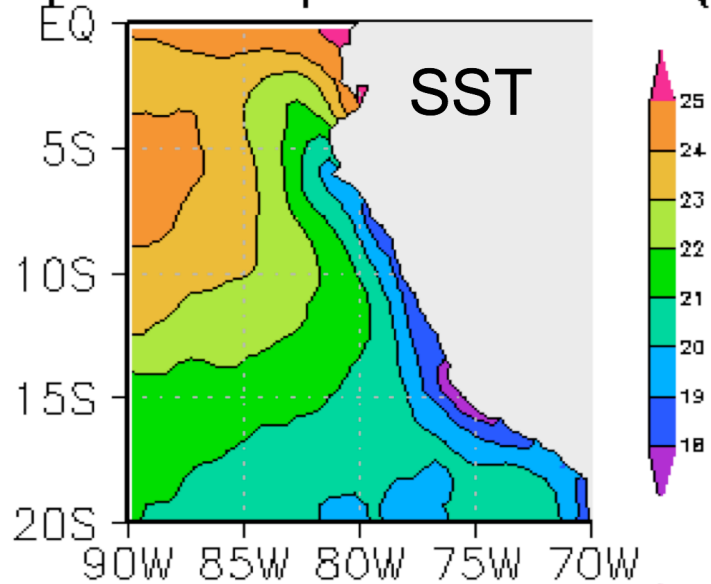
Coastal jet off Perú: Atmospheric measurements and modeling

K. Takahashi, K. Latínez, J. Quijano, Y. Silva
RV Olaya
Instituto Geofísico del Perú

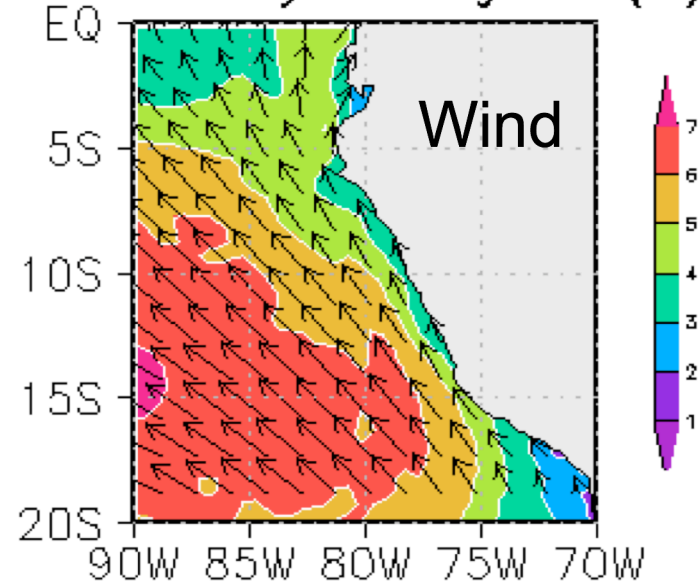
P. Condor (ROJ/IGP), L. Vásquez (IMARPE),
B. Dewitte (IRD)

Multi-year average off Peru

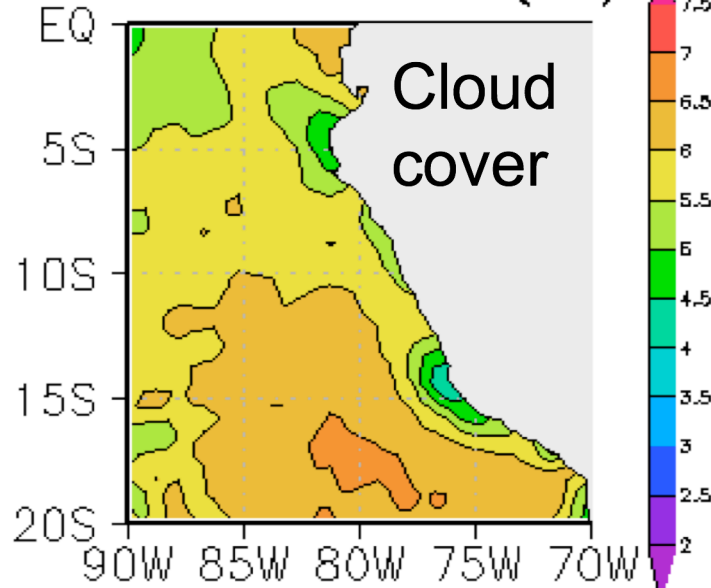
Temperatura superficial del mar (C)



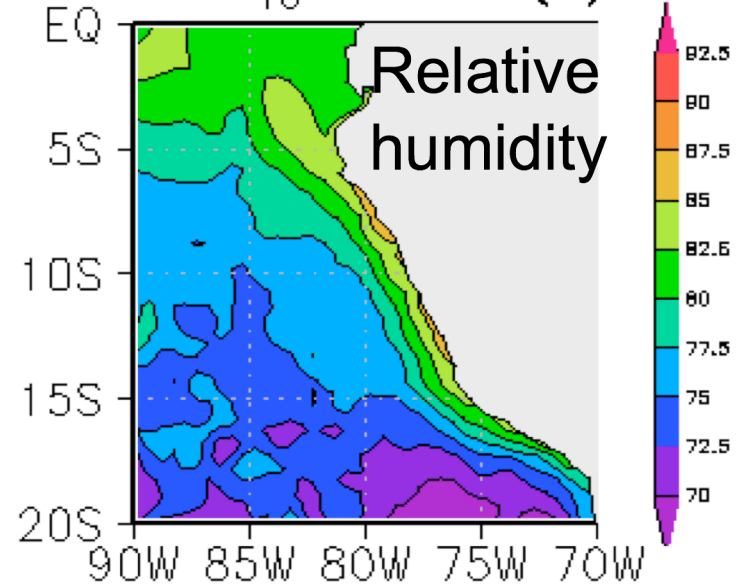
Vector viento y su magnitud (m/s)



Cobertura nubosa (oct)



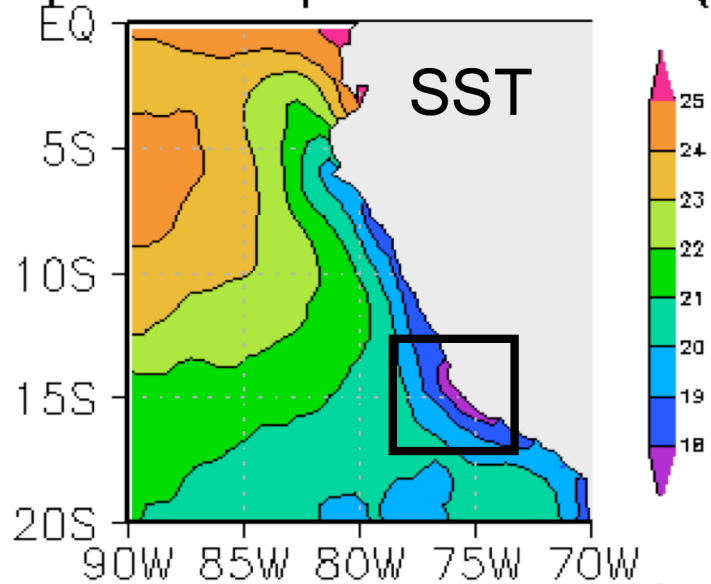
Humedad relativa (%)



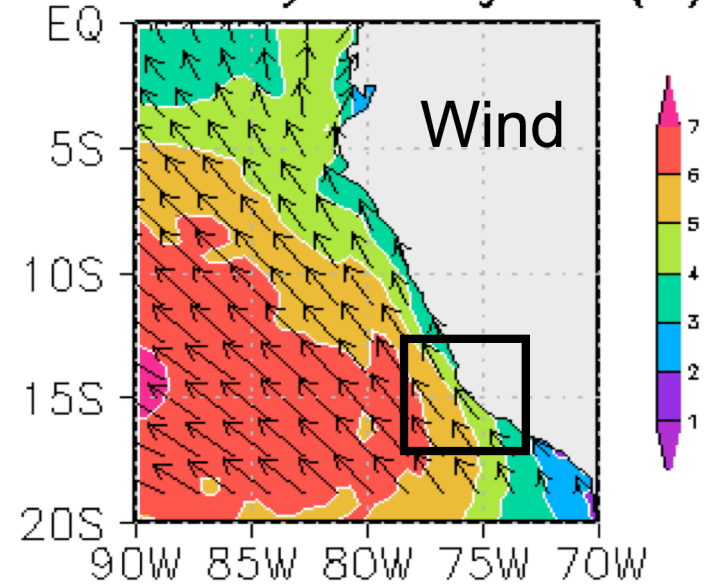
Data: ICOADS

Multi-year average off Peru

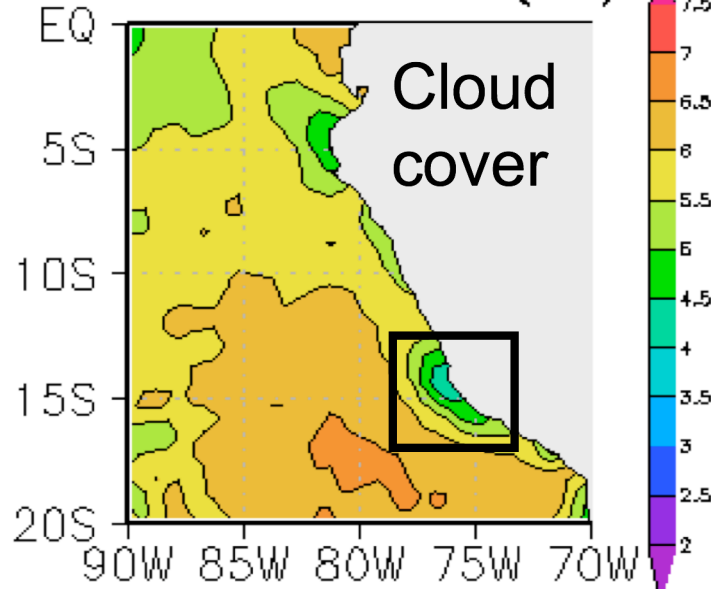
Temperatura superficial del mar (C)



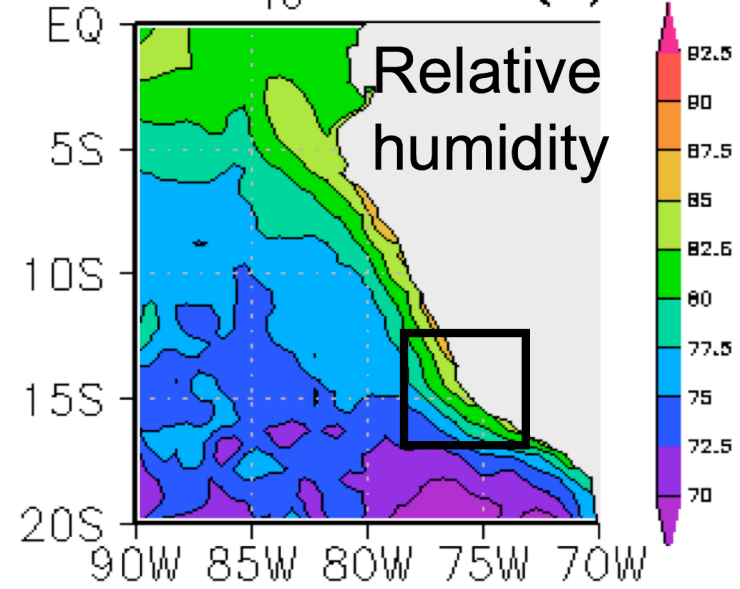
Vector viento y su magnitud (m/s)



Cobertura nubosa (oct)



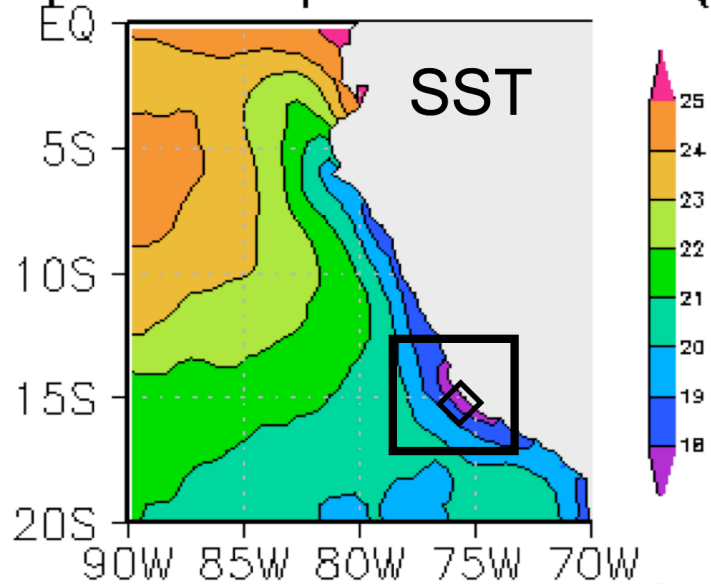
Humedad relativa (%)



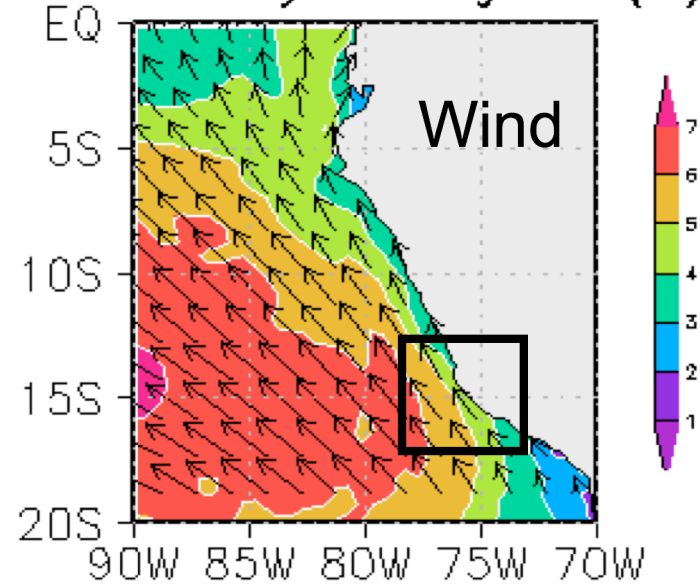
Data: ICOADS

Multi-year average off Peru

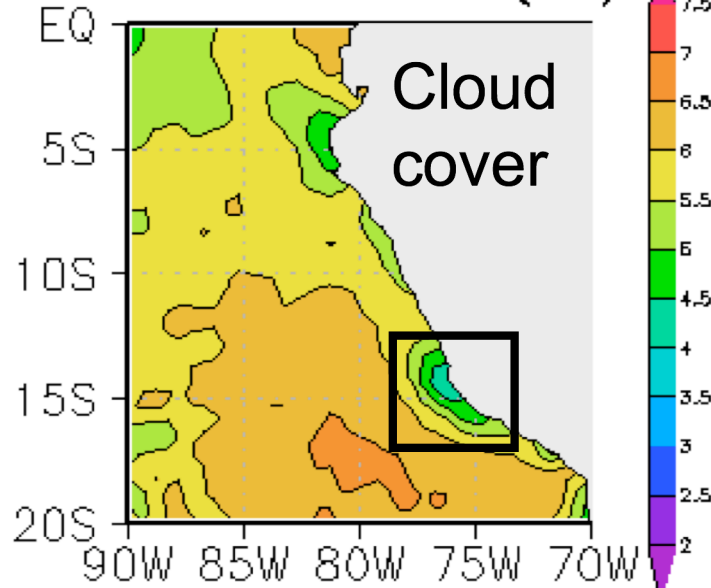
Temperatura superficial del mar (C)



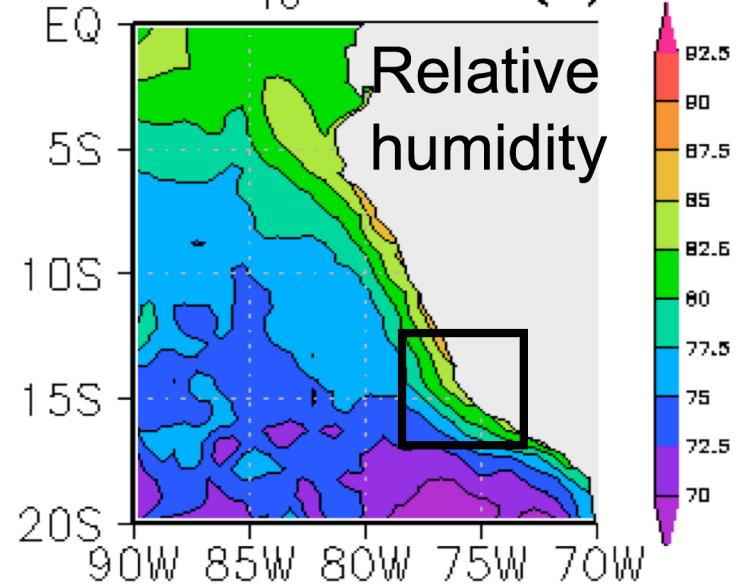
Vector viento y su magnitud (m/s)



Cobertura nubosa (oct)



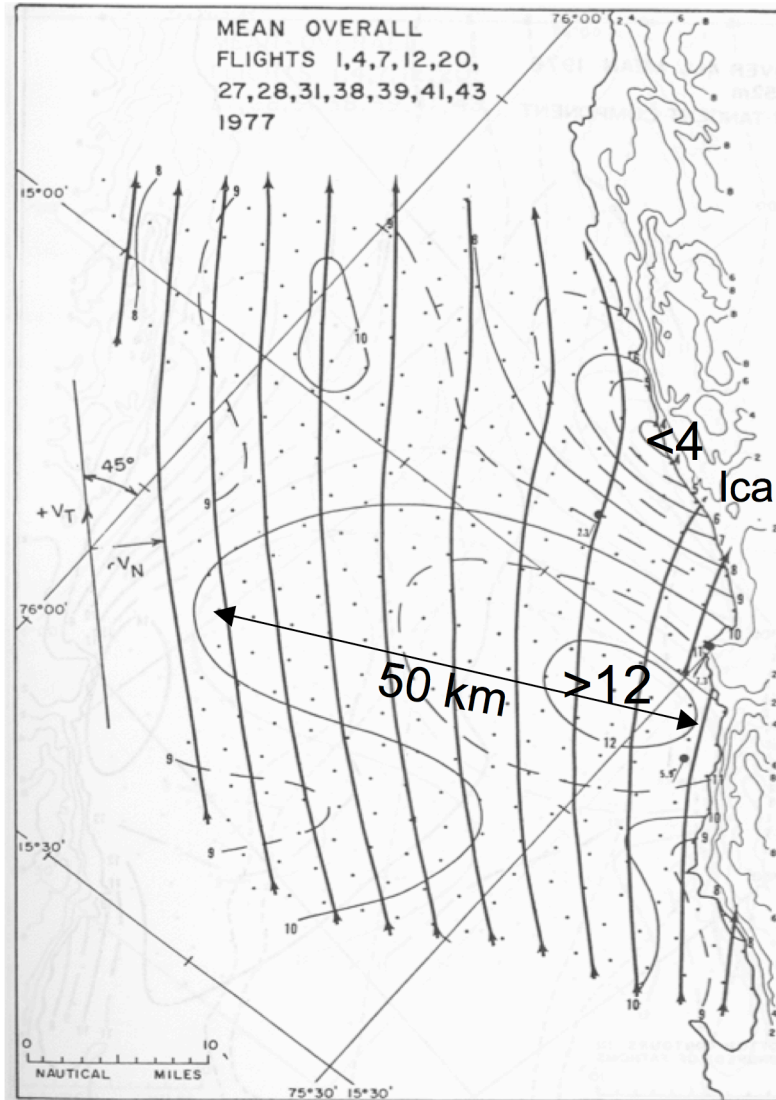
Humedad relativa (%)



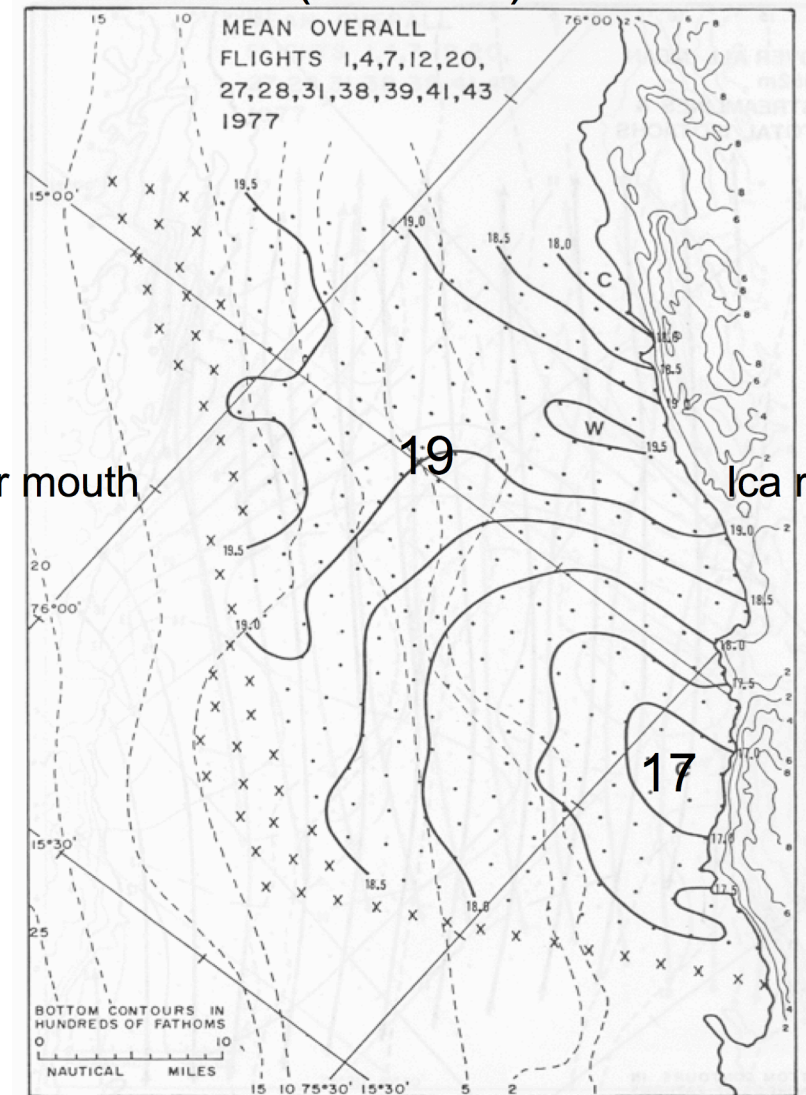
Data: ICOADS

JOINT-II project (1976-77)

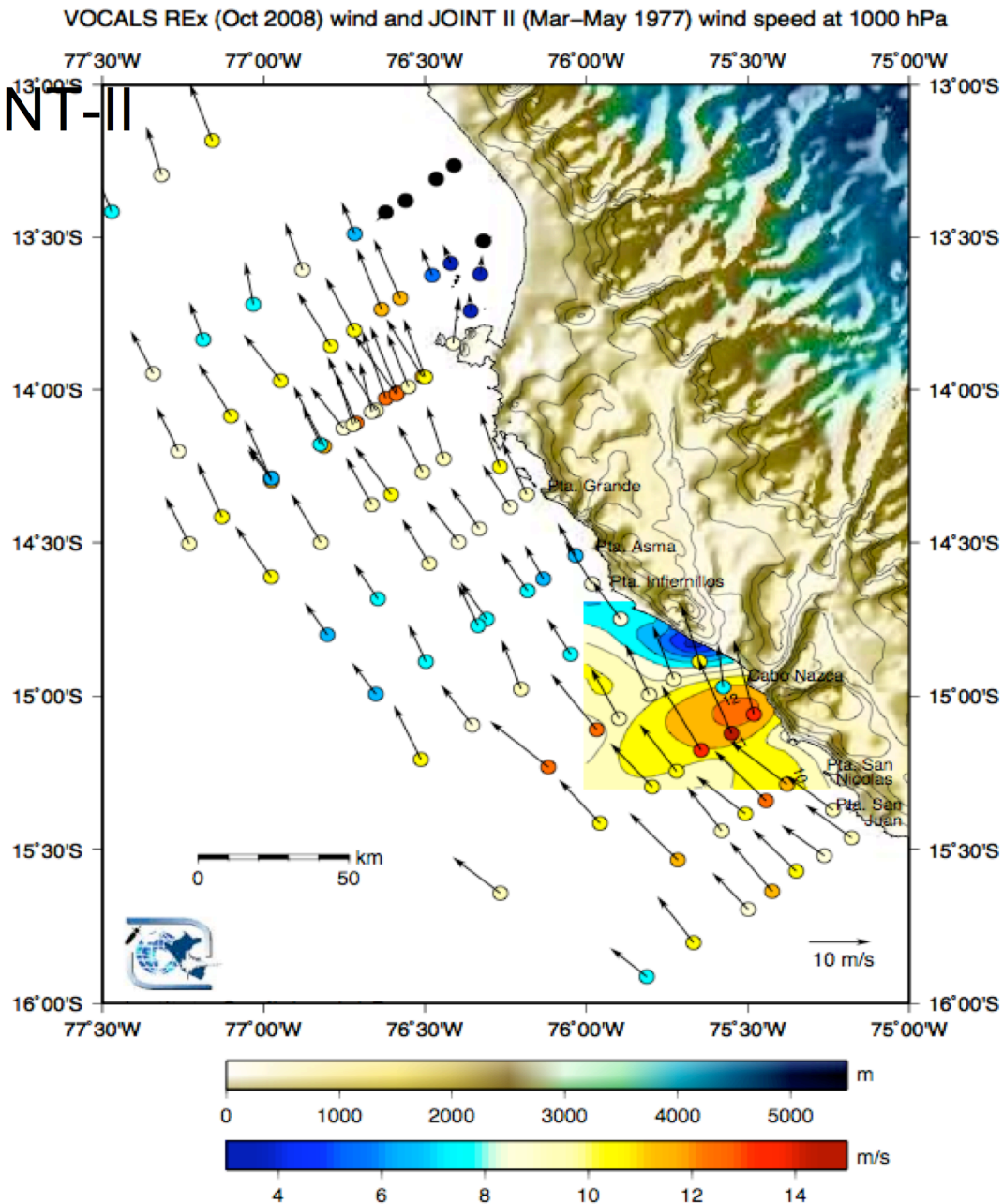
Wind at 152 m
(MAM'77)



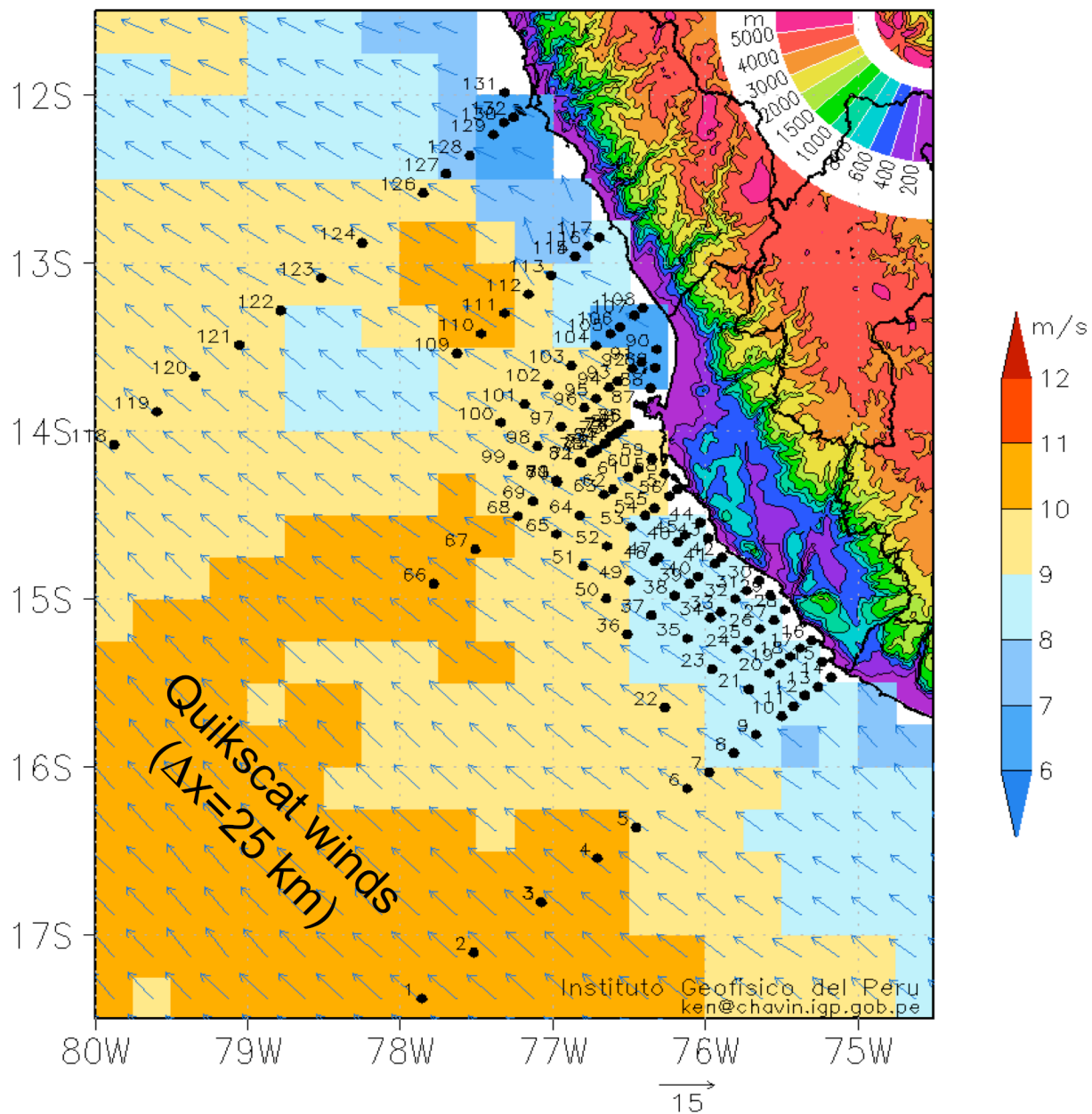
Sea surface temperature
(MAM'77)



VOCALS & JOINT-II



VOCALS-Rex Peru (Oct 5-17, 2008)
 Radiosounding locations with topography (m) and mean
 QuikScat winds (m/s) for the week of Oct 5-18, 2008



Model mean wind

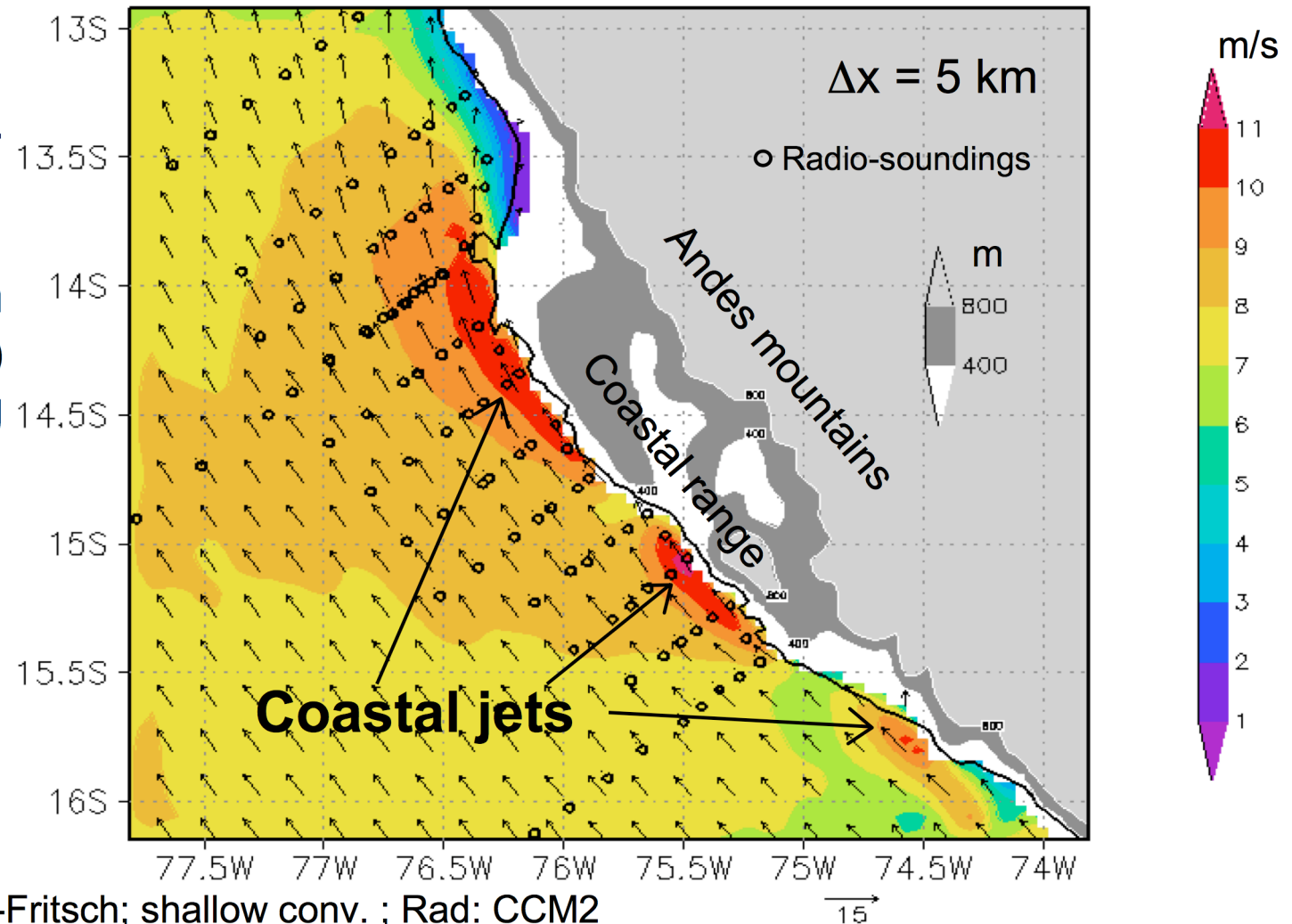
NCAR/PSU MM5 v.
3-7

$\Delta x = 45, 15, 5$ km.

Coastal intensification
(within 50 km)
→ 20% more upwelling

1000 hPa wind for Oct 5-15, 2008

Simulated mean 1000 hPa vector wind and its magnitude (m/s) for Oct 05 00z - Oct 15 00z 2008 and model topography



PBL: Gayno-Seaman; Cu: Kain-Fritsch; shallow conv. ; Rad: CCM2

Model mean wind

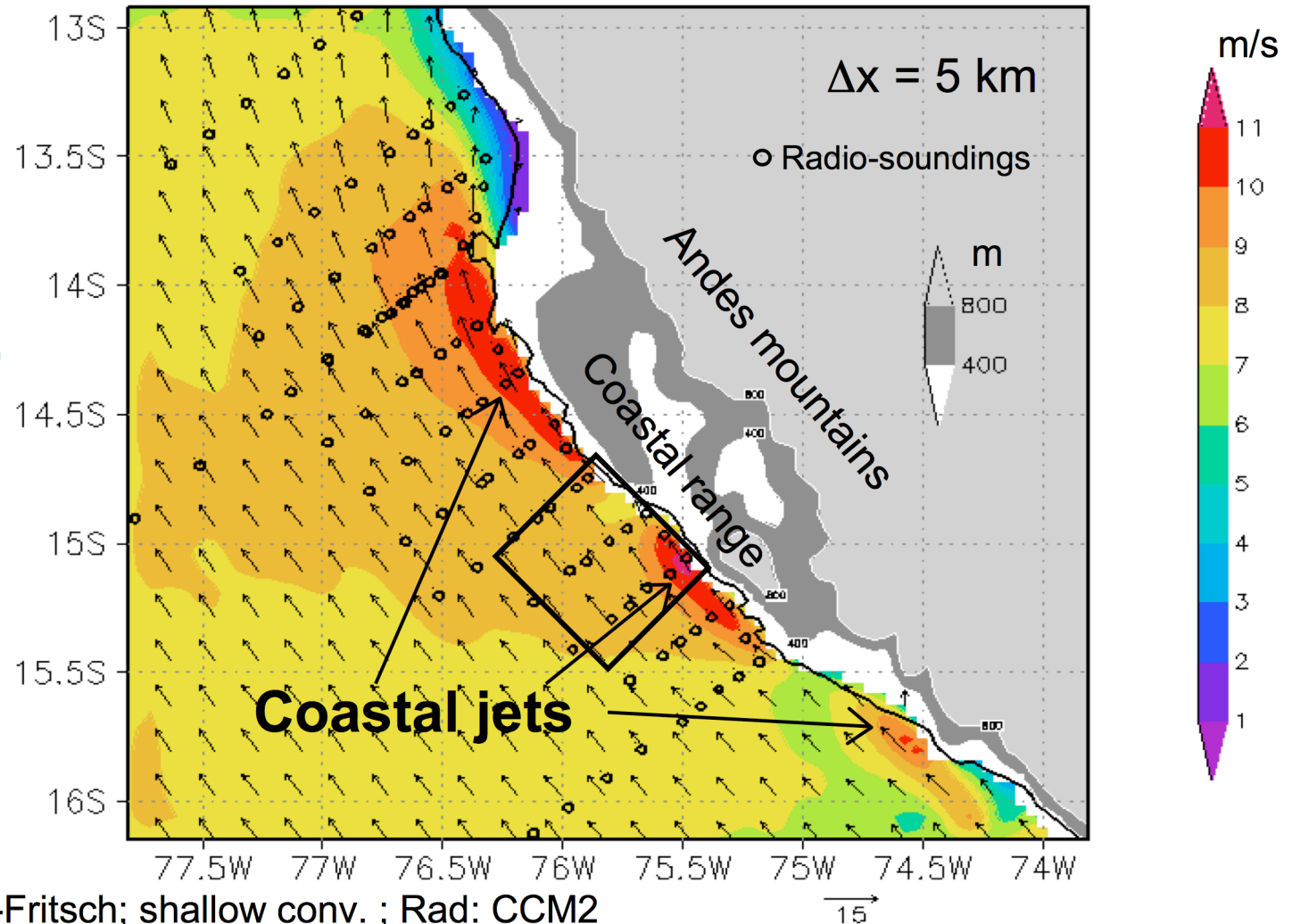
NCAR/PSU MM5 v.
3-7

$\Delta x = 45, 15, 5$ km.

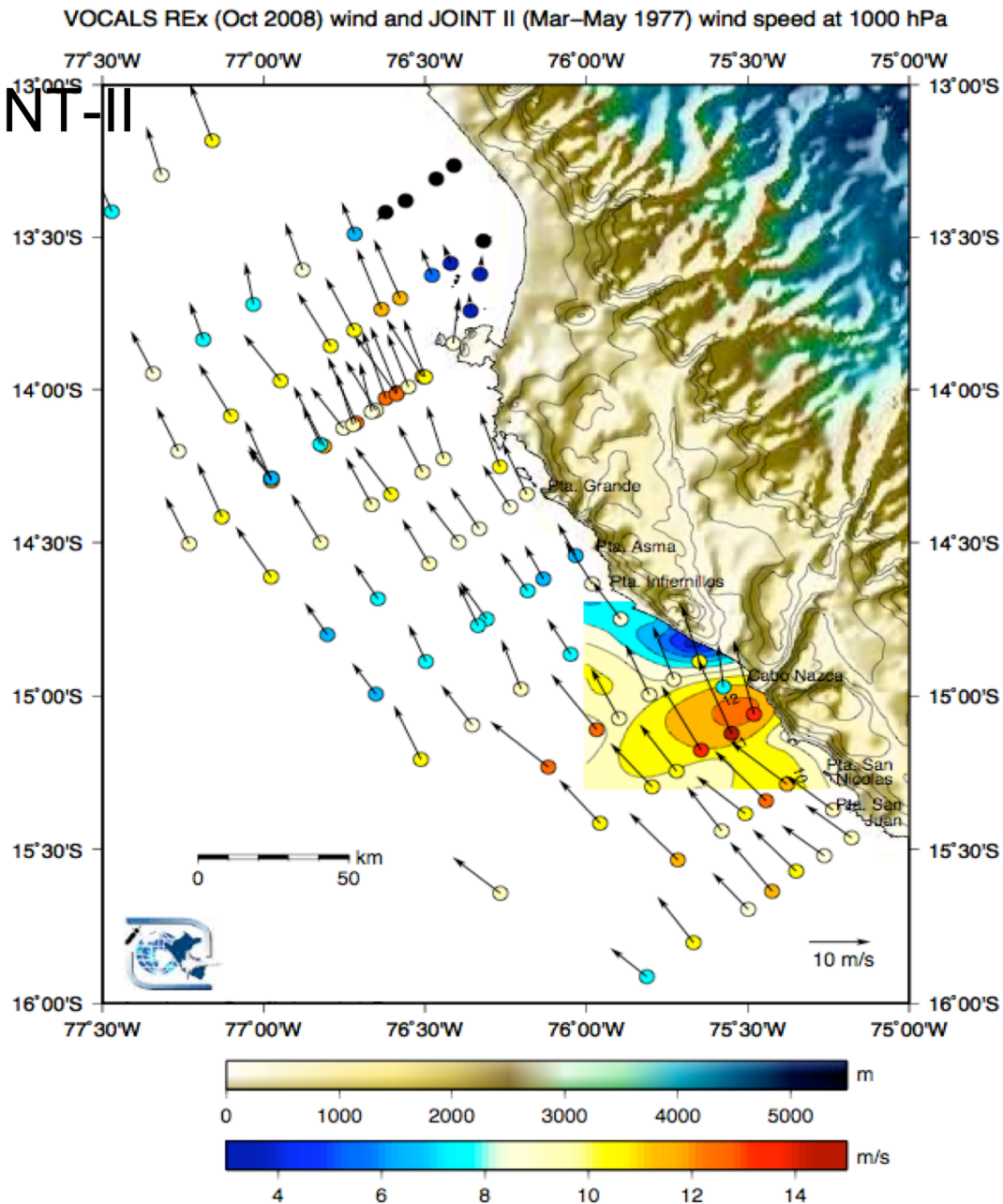
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1000 hPa wind for Oct 5-15, 2008

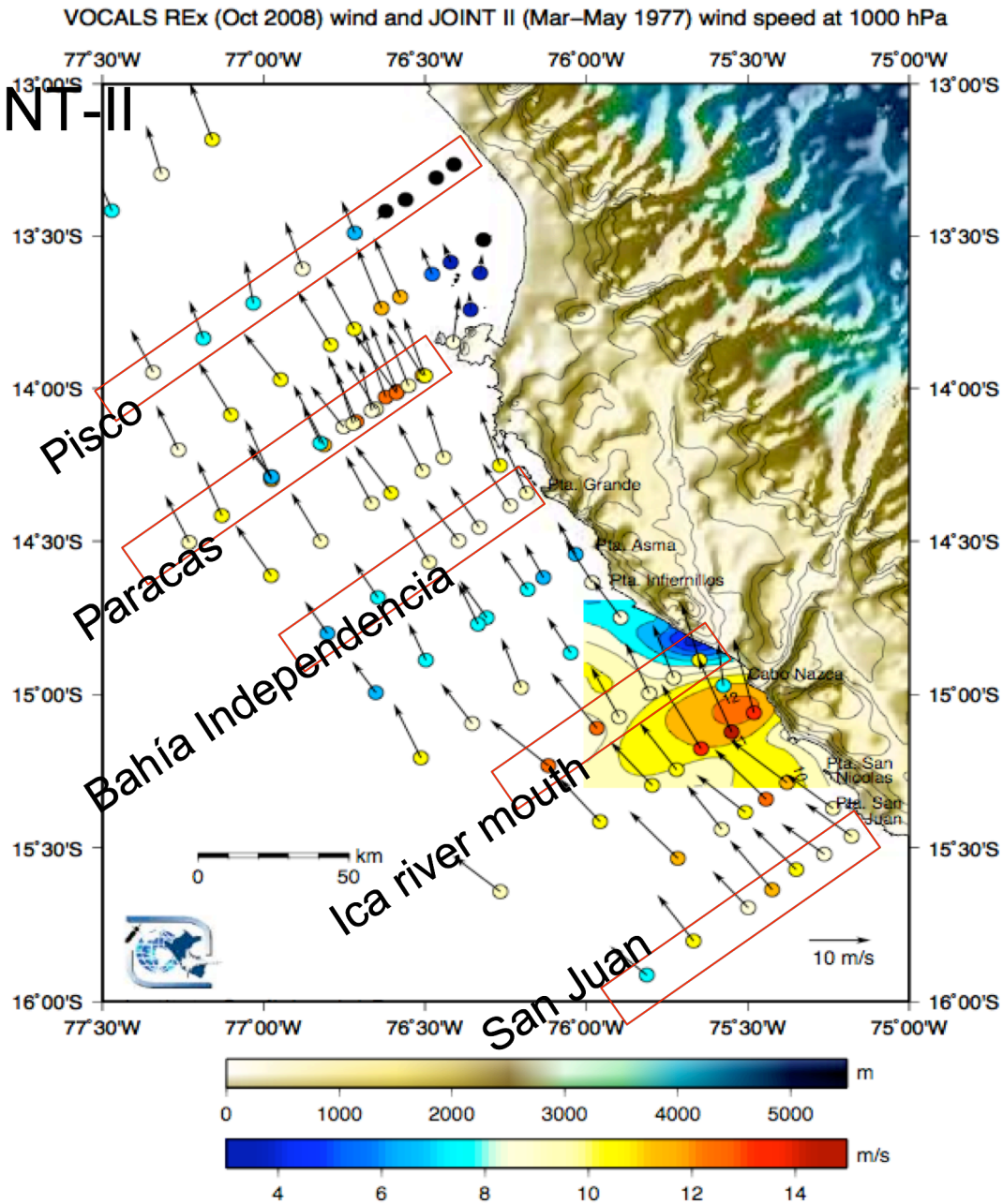
Simulated mean 1000 hPa vector wind and its magnitude (m/s) for Oct 05 00z - Oct 15 00z 2008 and model topography



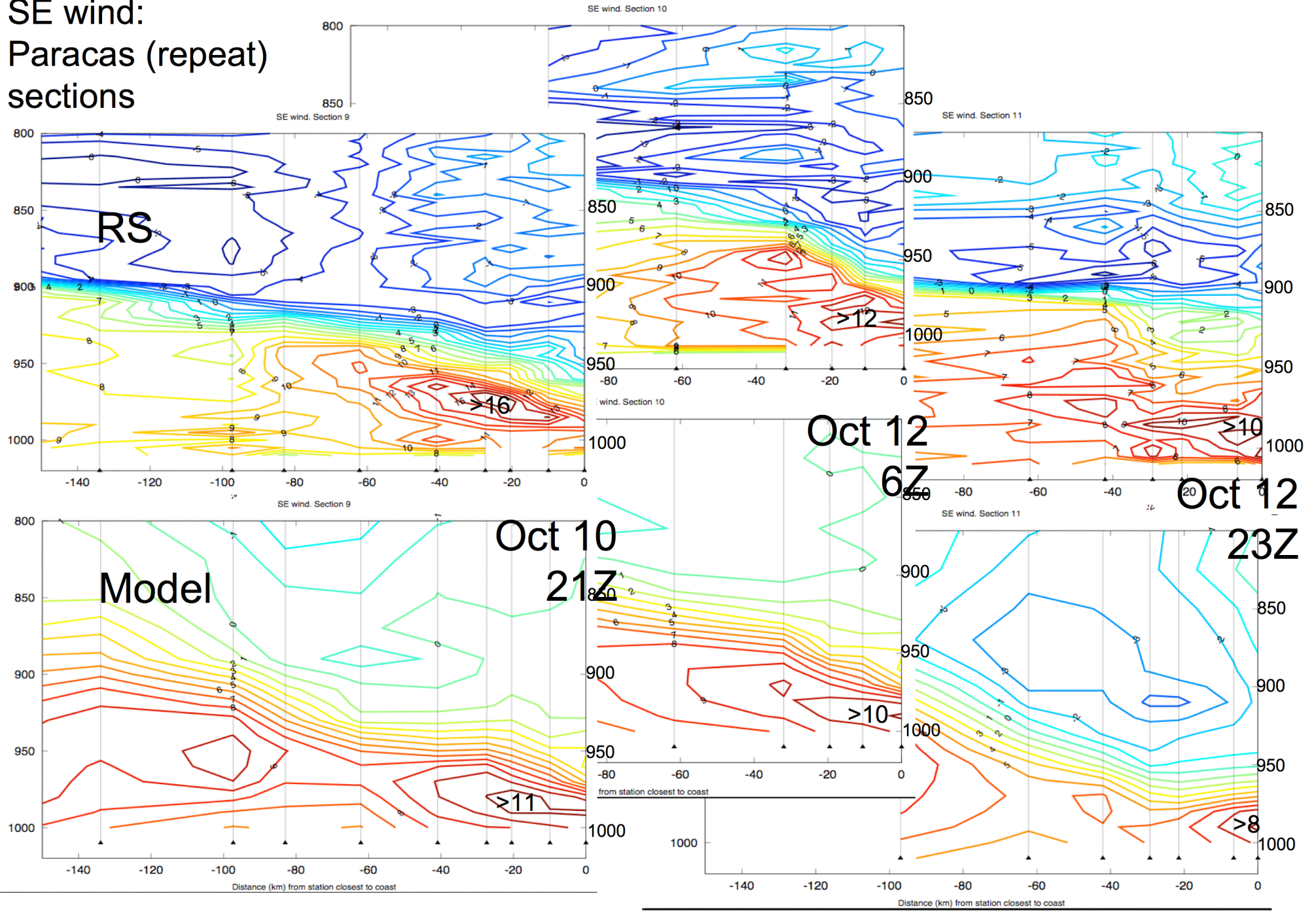
VOCALS & JOINT-II



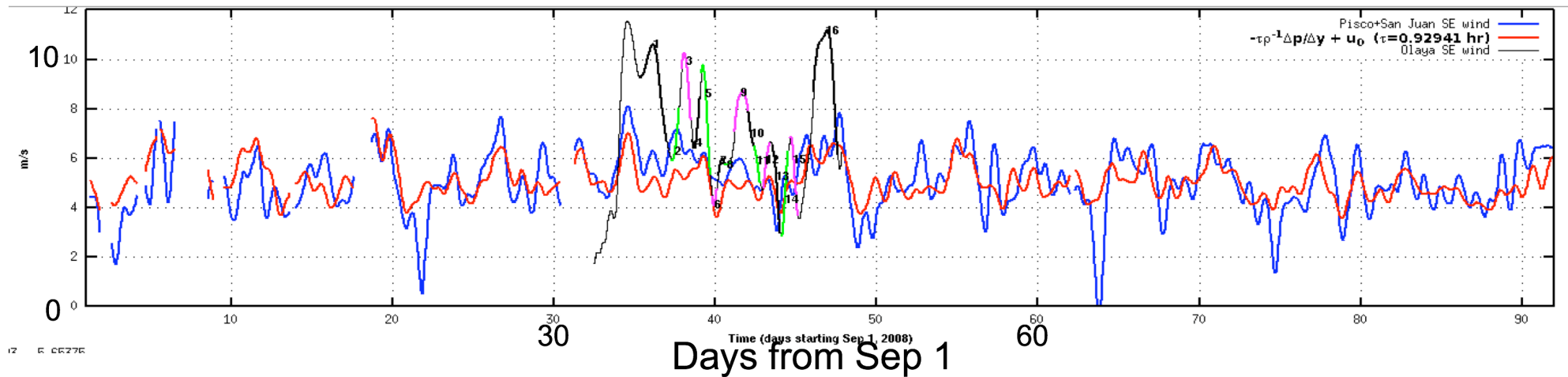
VOCALS & JOINT-II



SE wind:
Paracas (repeat)
sections



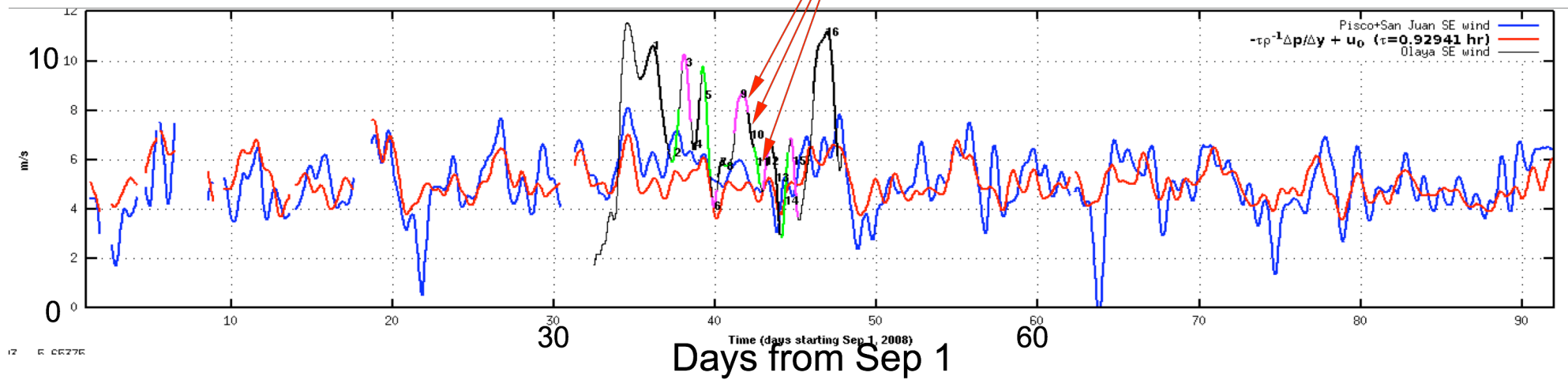
Synoptic time-scale variability (> 1 day) in SE wind



- Black: RV Olaya surface data (sections colored)
- Blue: Coastal station data (Pisco & San Juan average)
- Red: Estimate from along-shore pressure gradient

Synoptic time-scale variability (> 1 day) in SE wind

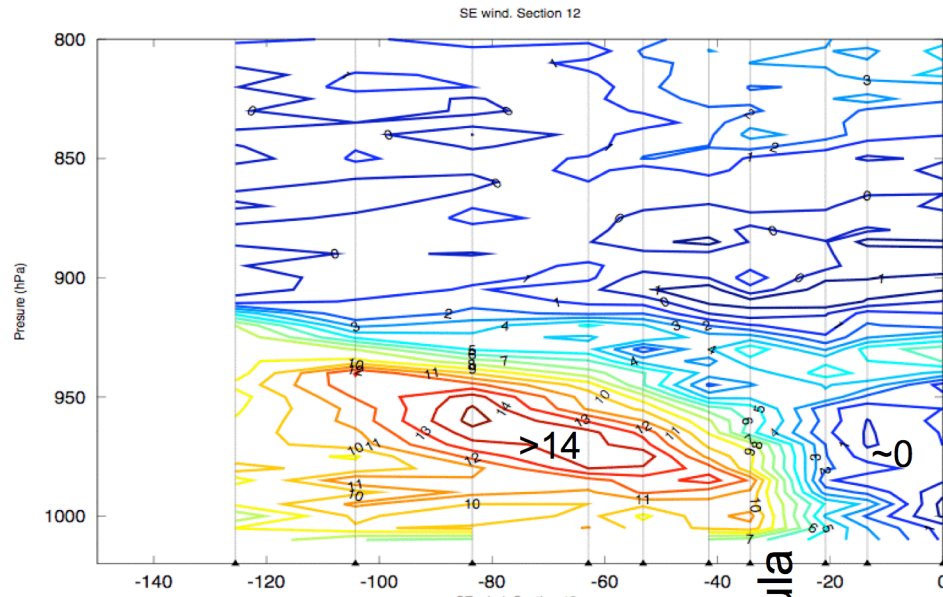
Paracas sections



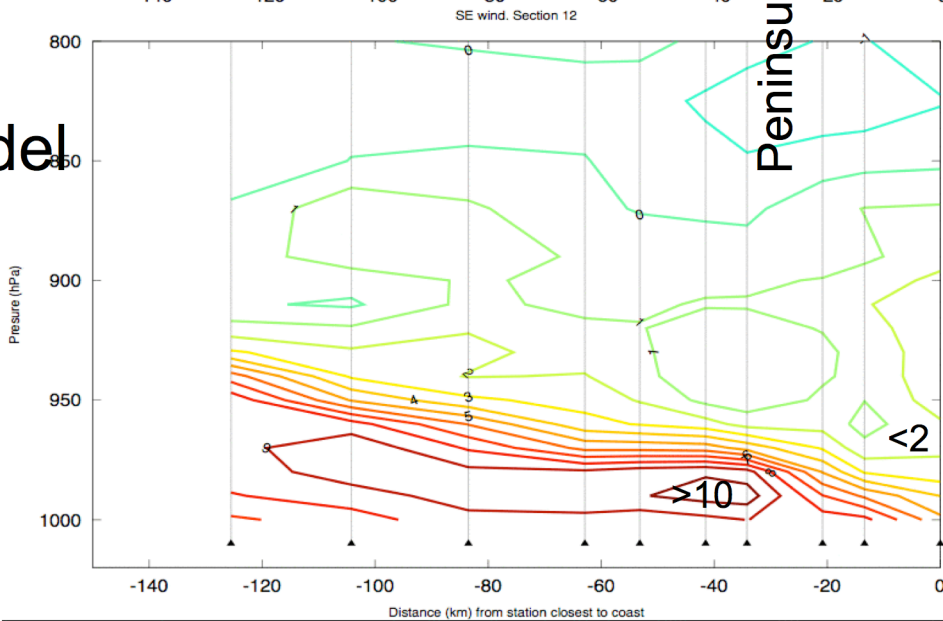
- Black: RV Olaya surface data (sections colored)
- Blue: Coastal station data (Pischo & San Juan average)
- Red: Estimate from along-shore pressure gradient

SE wind: Pisco section

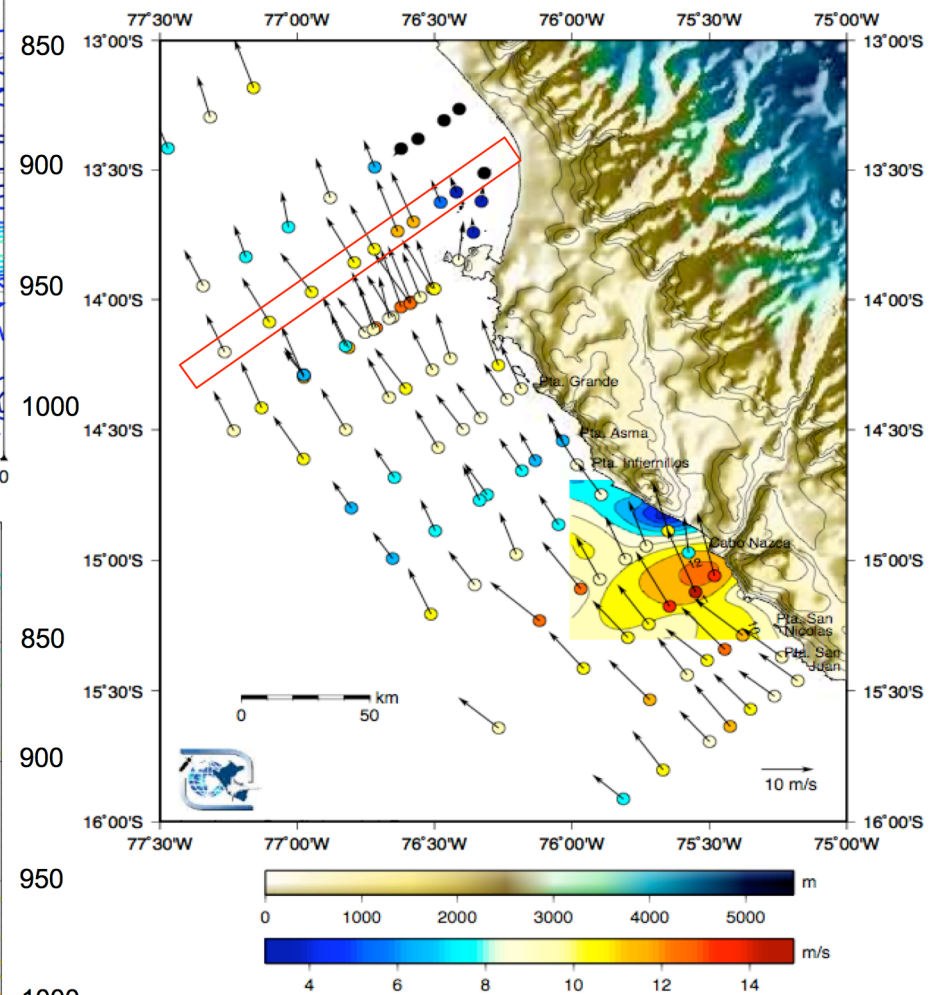
RS



Model

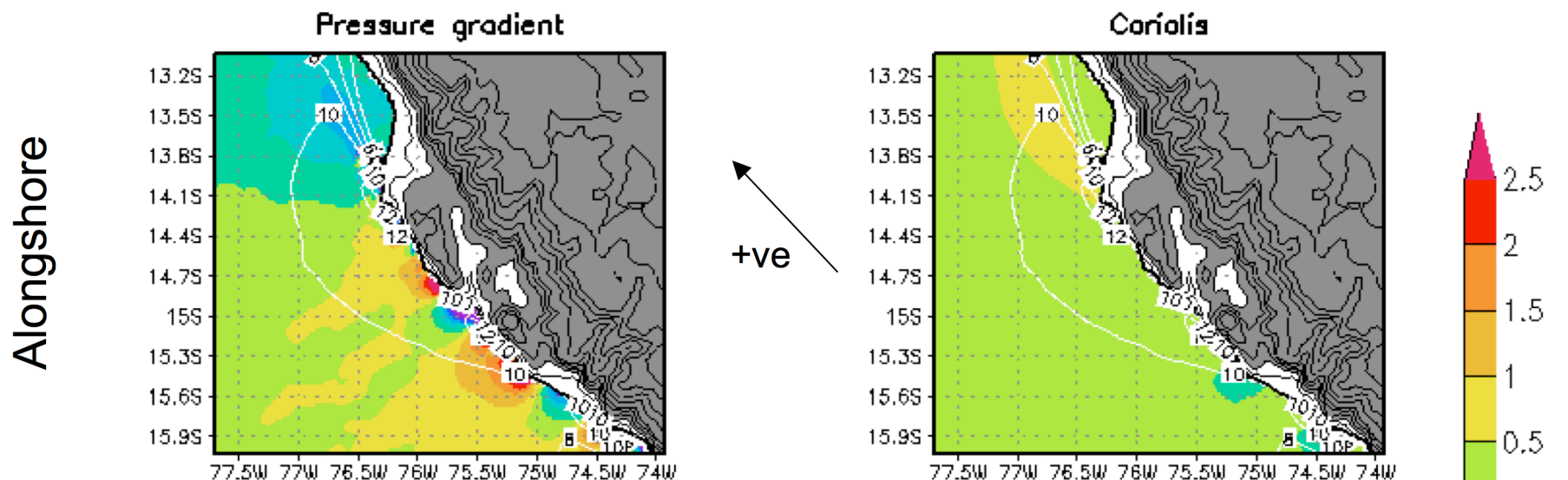


VOCALS REx (Oct 2008) wind and JOINT II (Mar–May 1977) wind speed at 1000 hPa

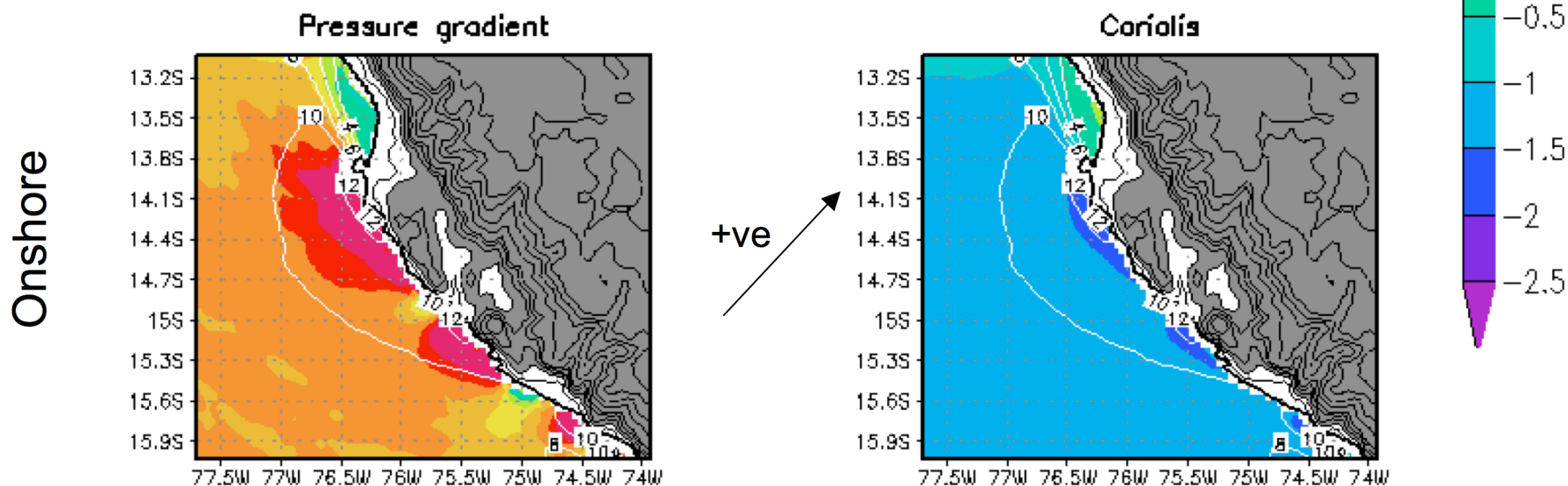


Modeled momentum budget (5-18 Oct, 2008)

Alongshore (SE–NW) accelerations (m/s per hour) at $\sigma=0.97$

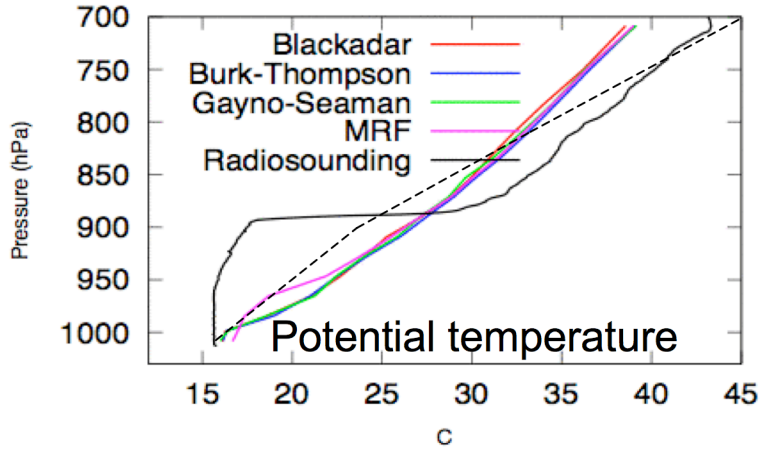


Onshore (SW–NE) accelerations (m/s per hour) at $\sigma=0.97$

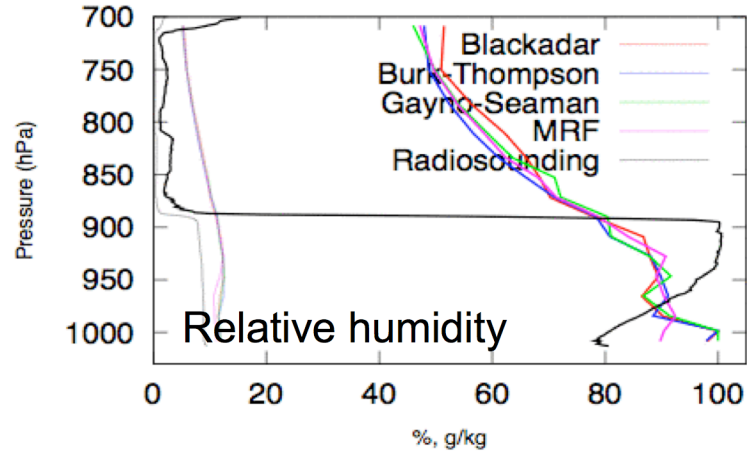


Model/radiosounding comparison: Offshore

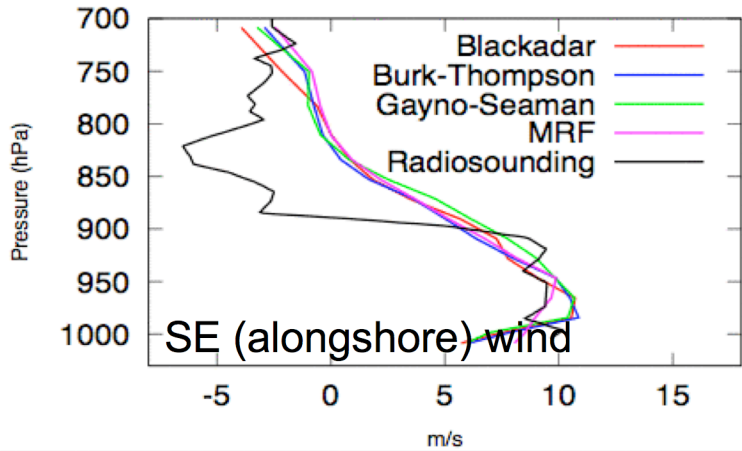
Station 066: Potential temperature



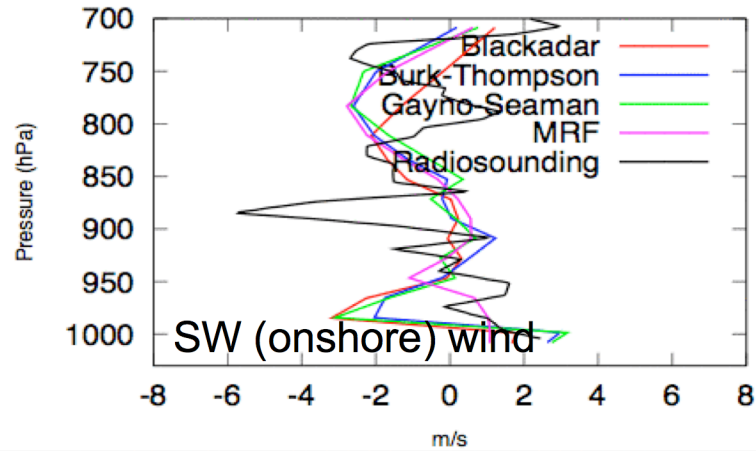
Station 066: Relative humidity, (q in thin)



Station 066: SE wind

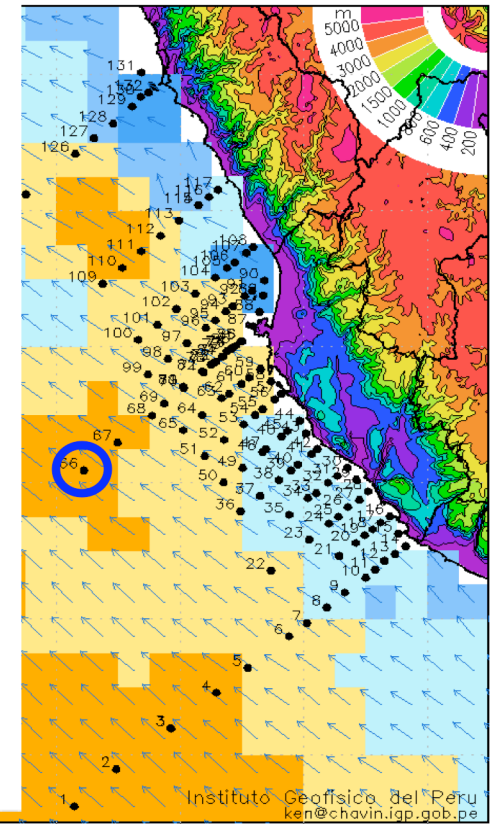


Station 066: SW wind



Model: MM5 ($\Delta x=5$ km)

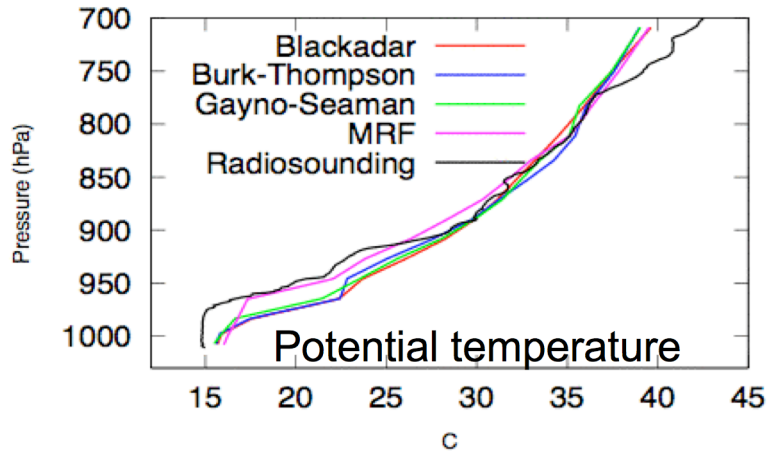
-Rex Peru (Oct 5-17, 2008)
contours with topography (m) and mean
m/s) for the week of Oct 5-18, 2008



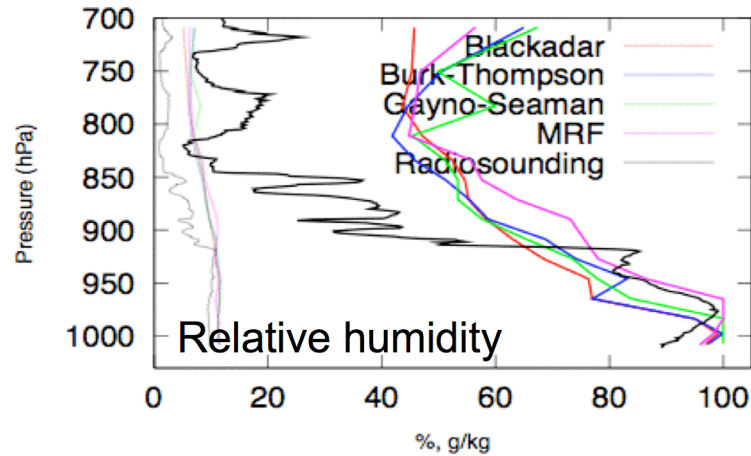
80W 79W 78W 77W 76W 75W

Model/radiosounding comparison: Nearshore

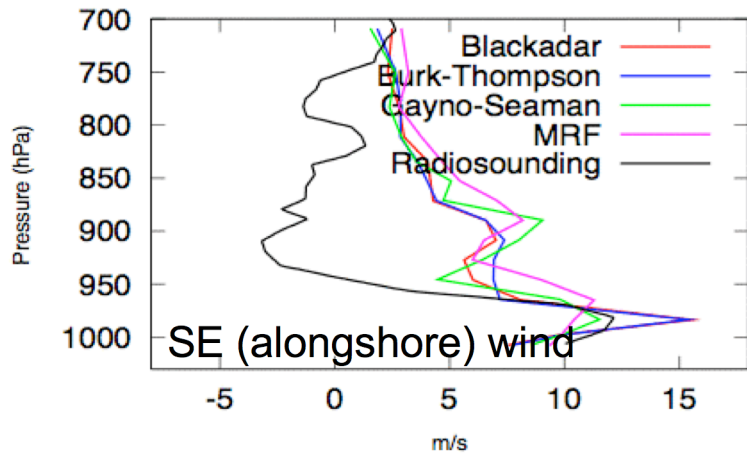
Station 076: Potential temperature



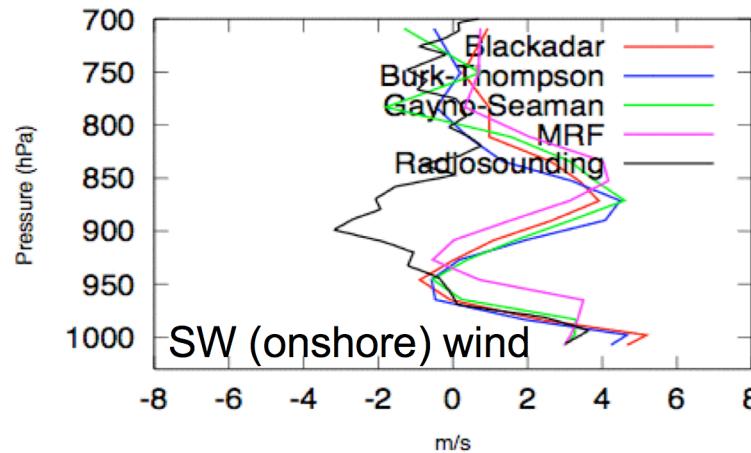
Station 076: Relative humidity, (q in thin)



Station 076: SE wind

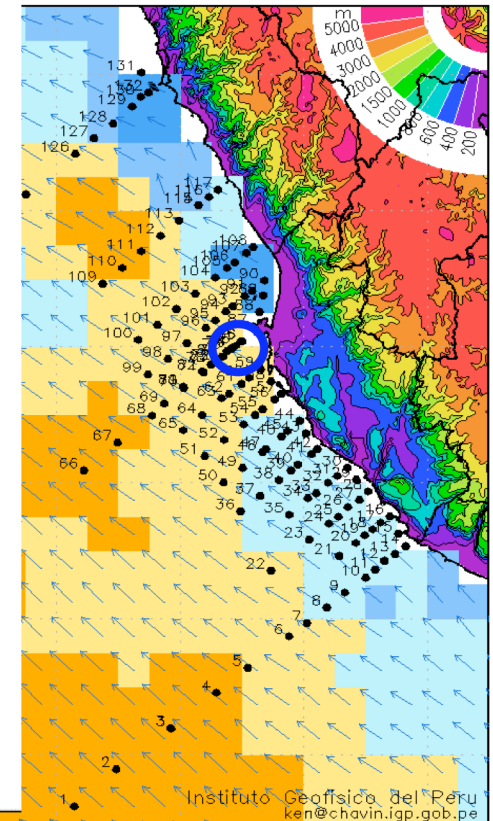


Station 076: SW wind



Model: MM5 ($\Delta x=5$ km)

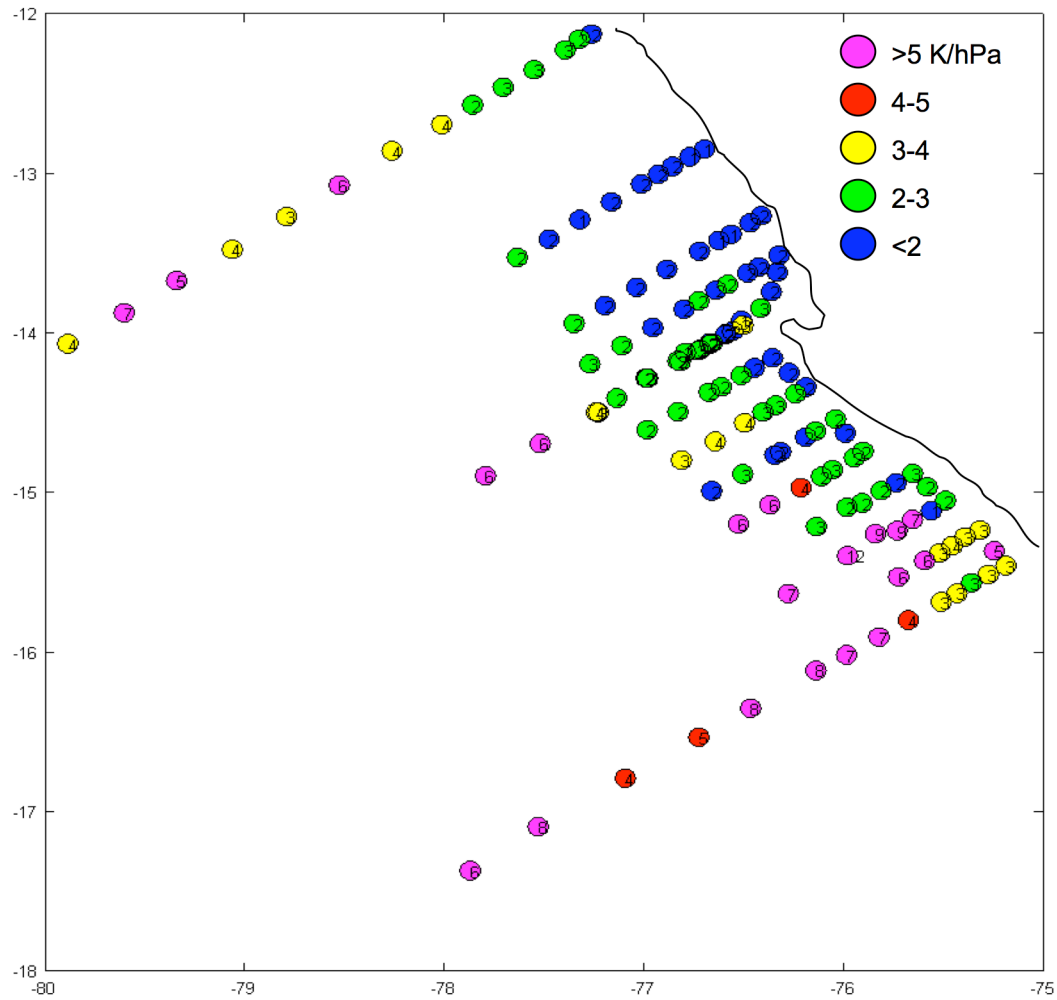
-Rex Peru (Oct 5-17, 2008)
 stations with topography (m) and mean
 m/s) for the week of Oct 5-18, 2008



Instituto Geofísico del Perú
 ken@chavin.igp.gob.pe

80W 79W 78W 77W 76W 75W

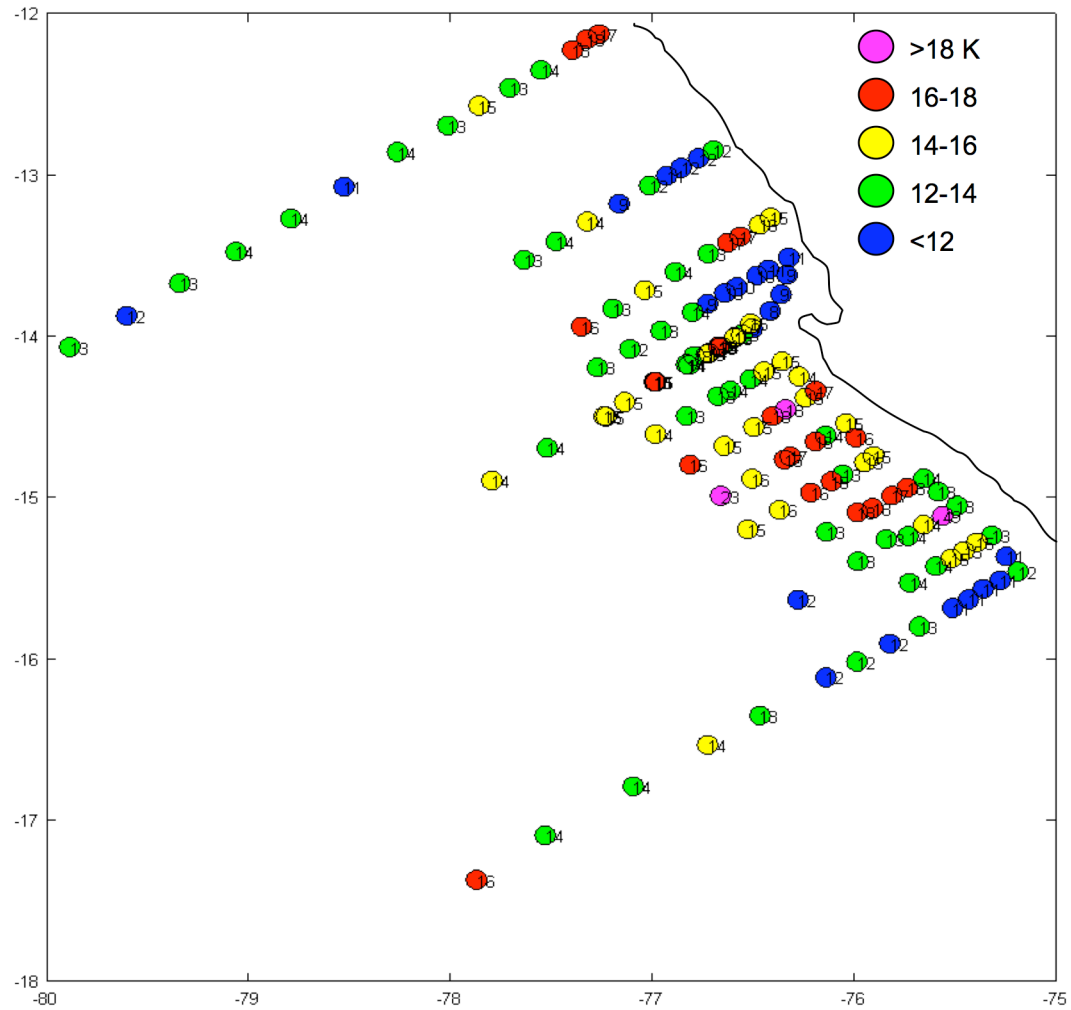
Inversion strength ($-\partial\theta/\partial p$)



Summary

- A coastal (within 50 km) intensification of the jet has been observed and is consistent with model results. This could lead to ~20% larger coastal upwelling.
- There is substantial synoptic scale temporal variability in the jet strength
- The equatorward extension of the jet appears to be associated with inertia of the high speed flow.
- The model (MM5) underestimates the jet speed.
- Low altitude (~600 m) and weak gradients in the thermal inversion are associated with the jet
- The model is unable to reproduce the sharp inversions away from the coast, but is comparable to observations in the jet area

Potential temperature change across inversion



SE wind sections

SE wind. Section 4

