



High-Resolution Model Fields of Wet-Troposphere Path Delay in Coastal Regions

Tracy Haack
NRL

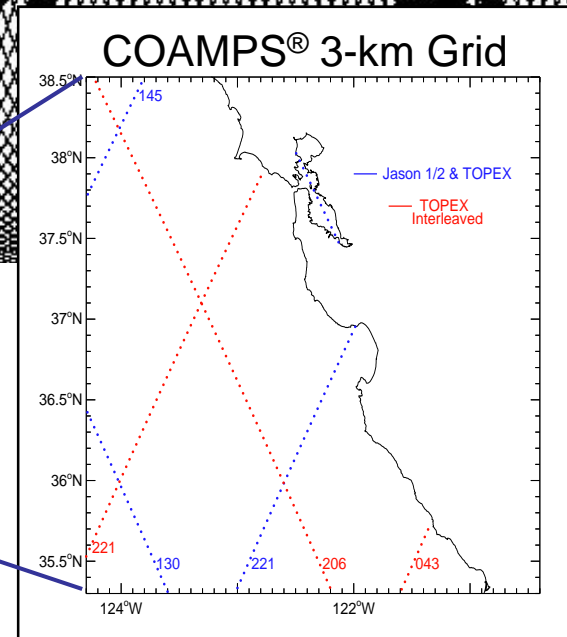
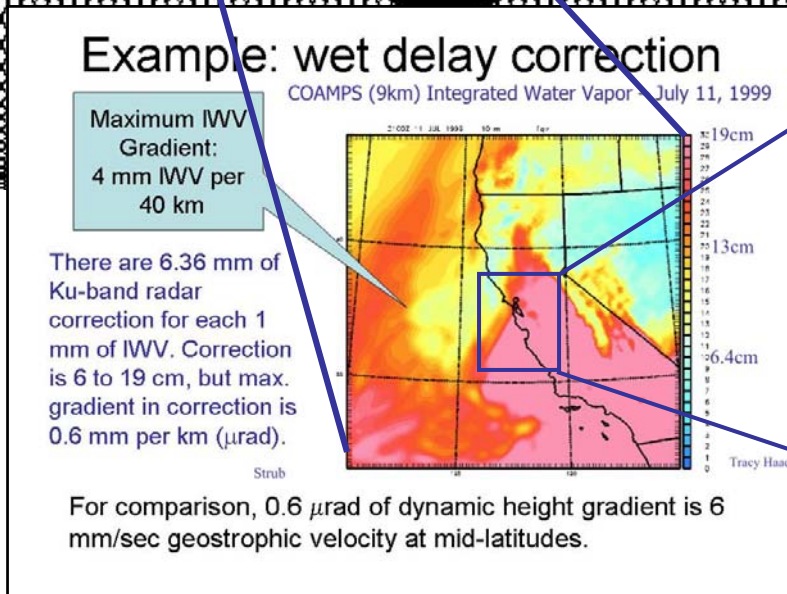
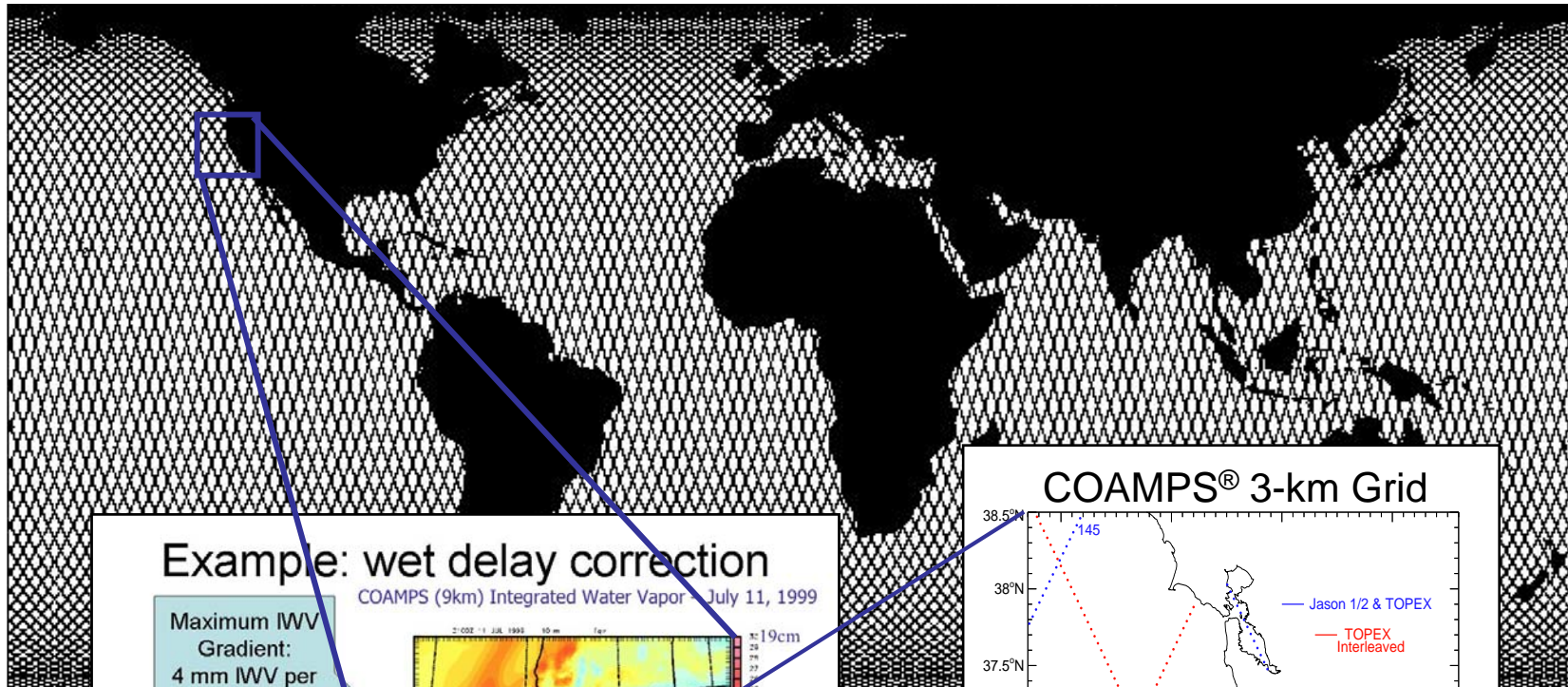
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Ted Strub
COAS/OSU

OST-ST Meeting
Seattle, WA
22-24 June 2009



Jason and Topex Ground Tracks

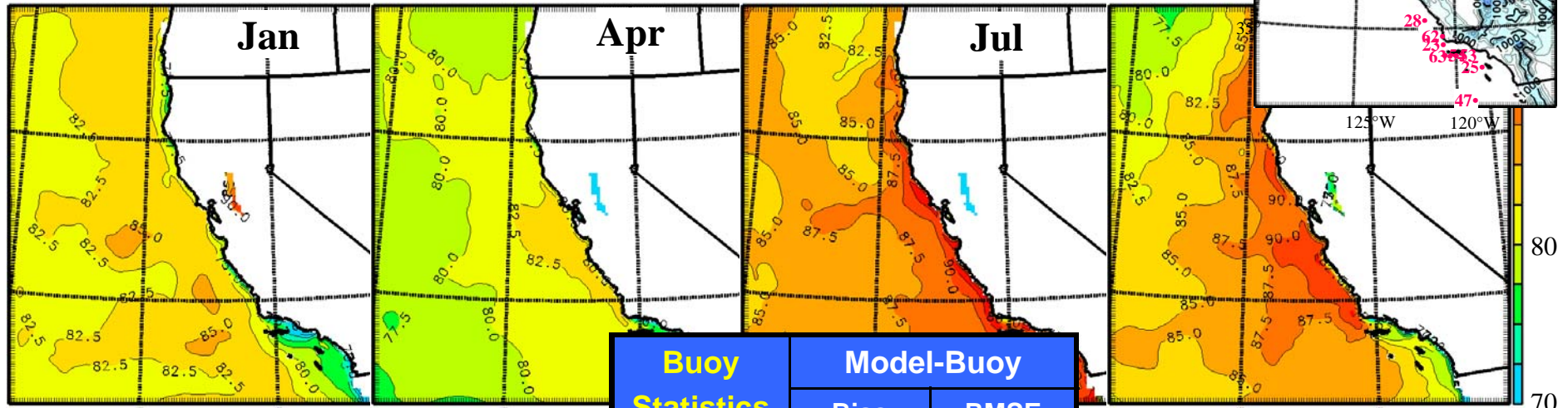


COAMPS is a registered trademark of the NRL

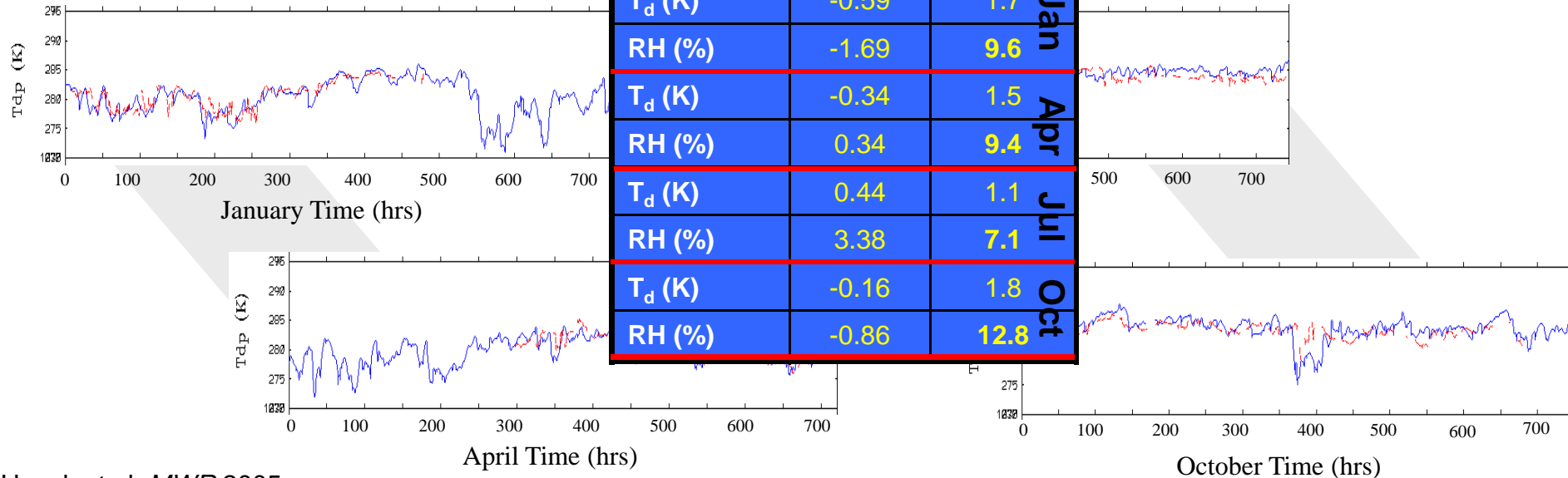


Mean 2-m RH & Buoy Obs

COAMPS 9-km Grid

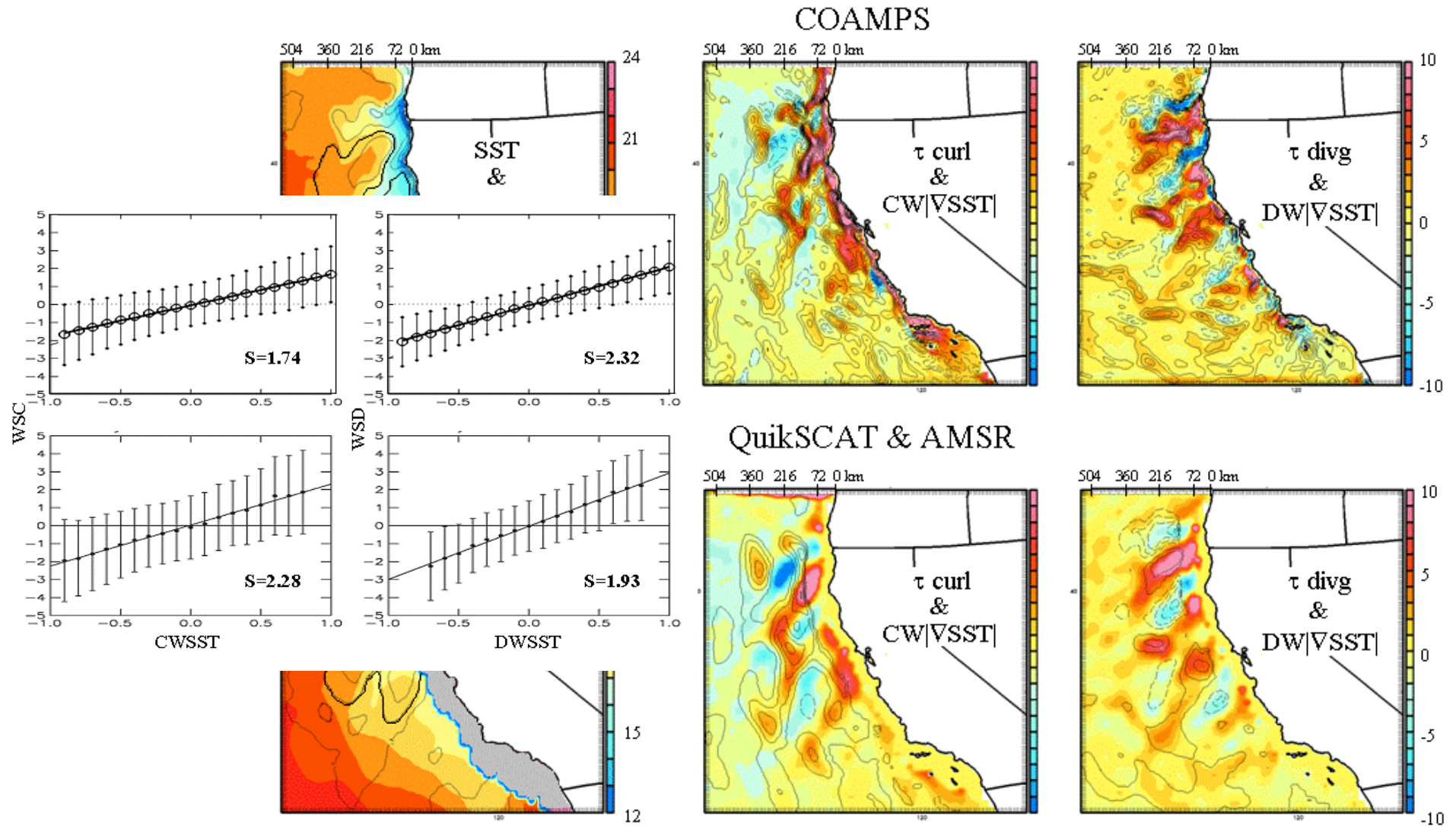


Buoy 26 Time Series





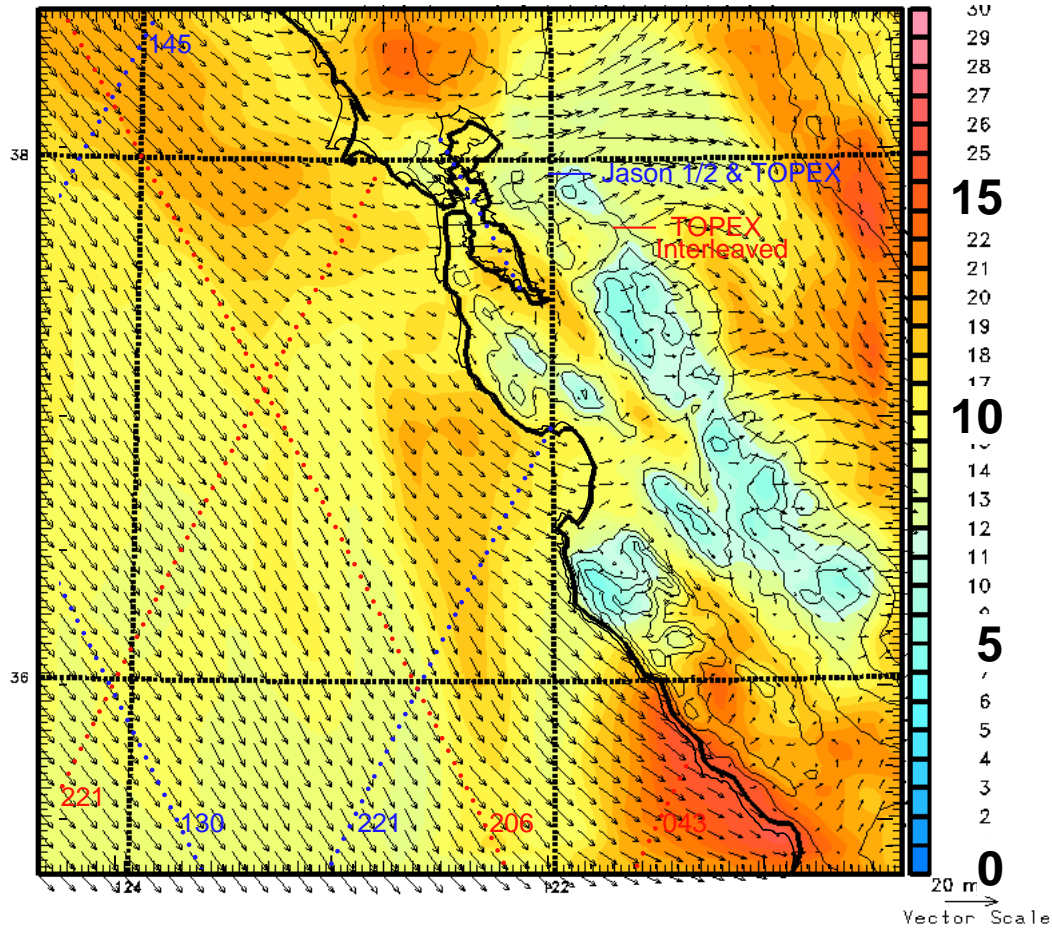
Air-sea Interaction COAMPS 4-year Summertime



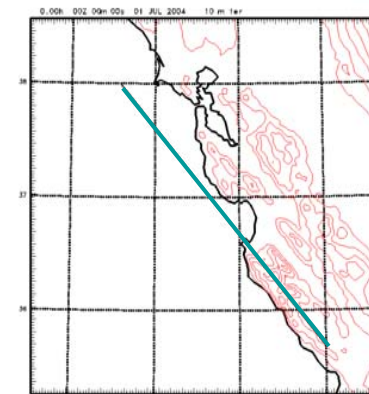
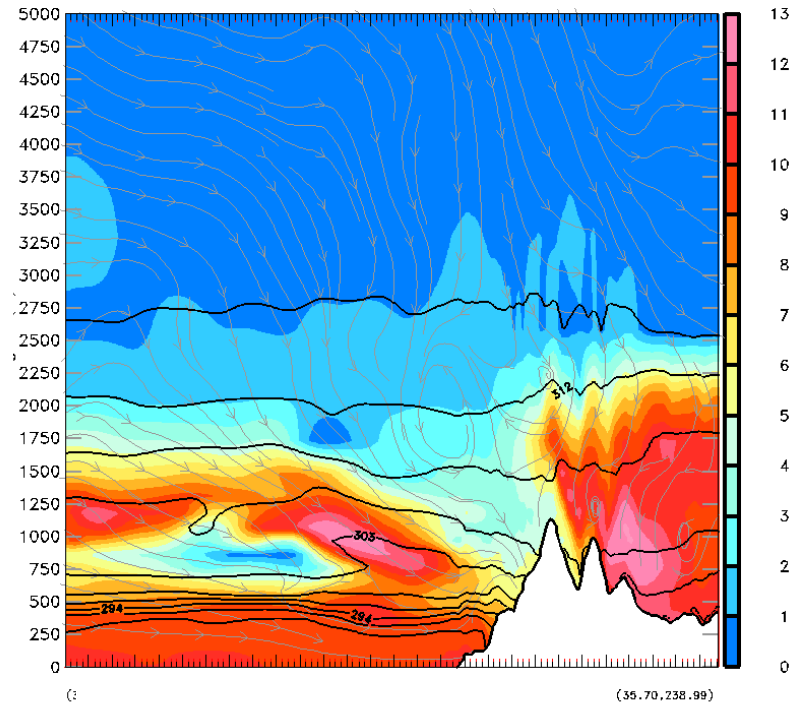


COAMPS 3-km Grid Water Vapor

IWVP (kg m^{-2}) \rightarrow Path Delay (cm)



Water Vapor (g kg^{-1})

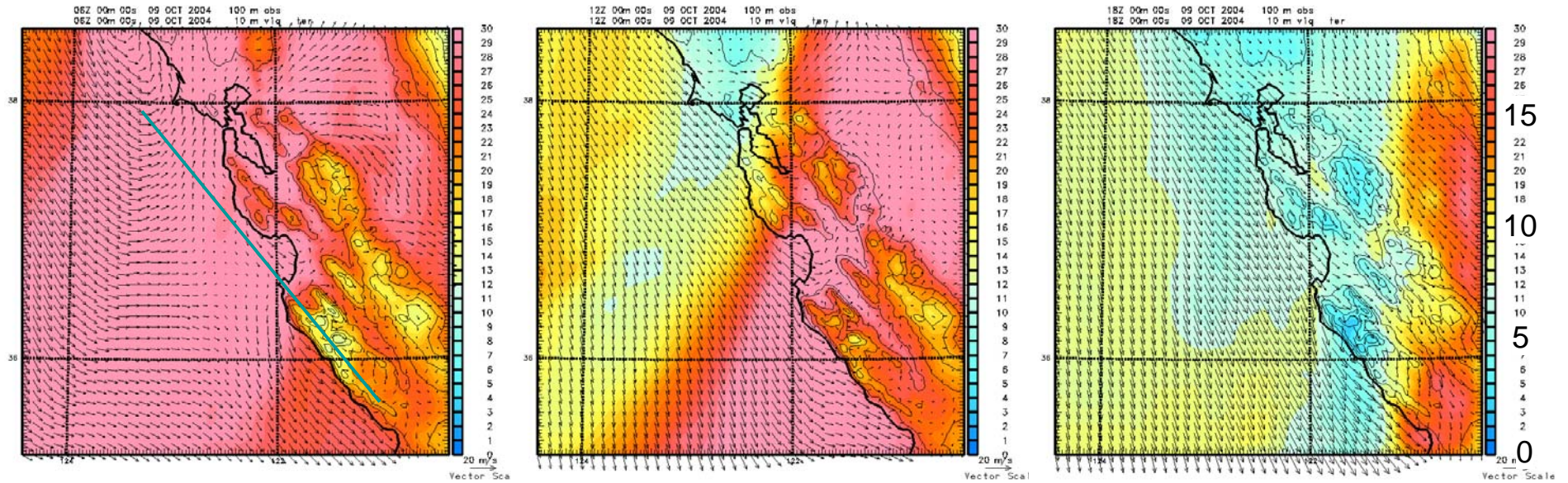




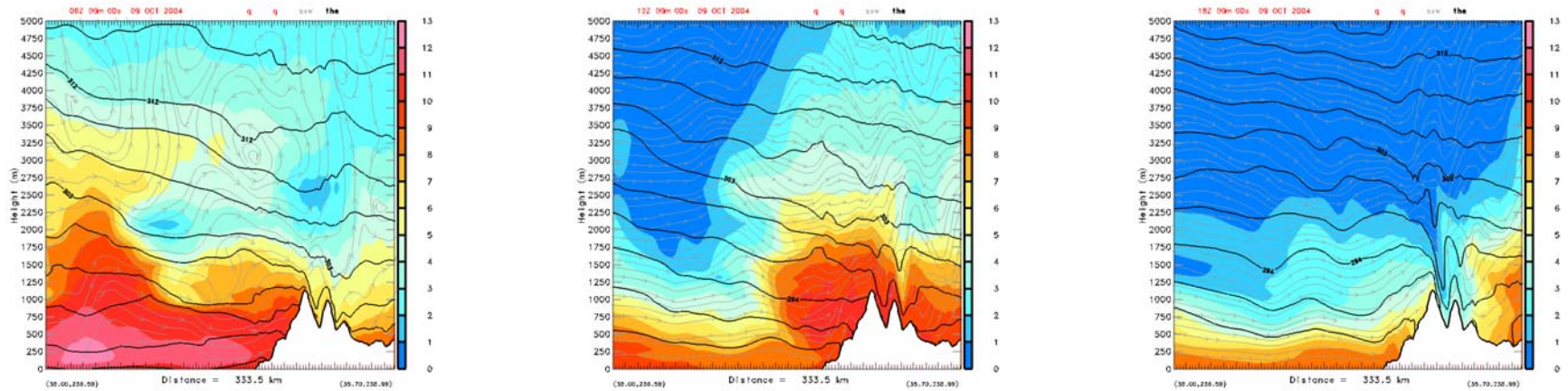
COAMPS Water Vapor Forecasts

9 Oct 2009 6-18 UTC

IWVP (kg m^{-2}) \rightarrow Path Delay (cm)



Water Vapor (g kg^{-1}) & Theta (K)



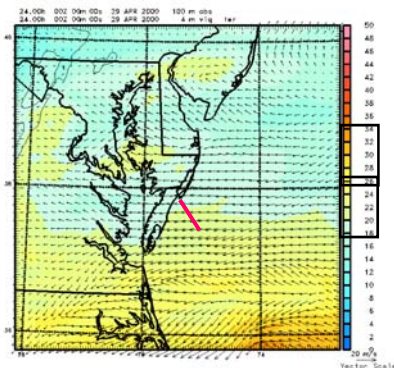
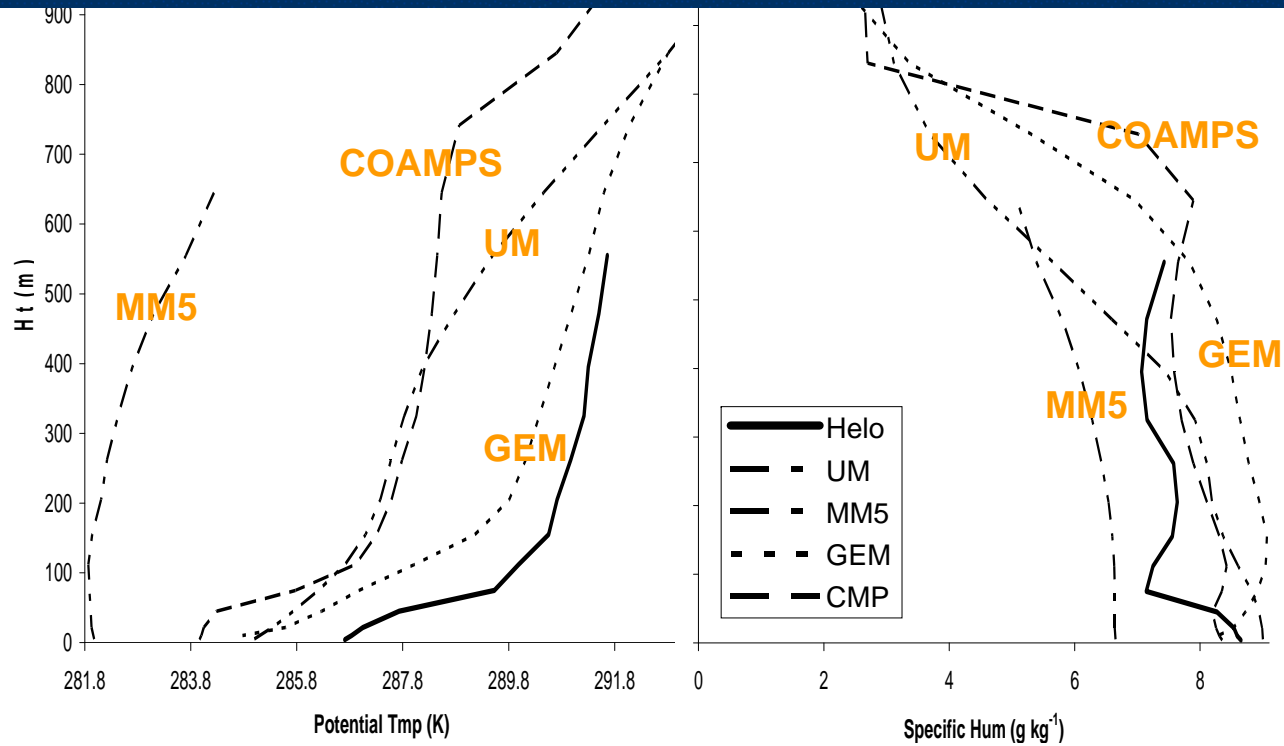


Helo Comparisons Profiles

Mean/Bias/RMSE

Specific Humidity (g/kg)

Ht (m)	Helo	COAMPS	Unified Model	MM5	GEM
112	5.9	6.4 / -0.5 / 1.2	7.2 / -1.4 / 1.8	7.3 / -1.4 / 2.1	6.8 / -0.9 / 1.4
45	6.7	7.0 / -0.3 / 0.8	7.6 / -1.3 / 1.5	7.4 / -0.8 / 1.8	7.0 / -0.4 / 0.9
5	7.3	7.4 / -0.1 / 0.5	7.9 / -0.7 / 1.1	7.5 / -0.3 / 1.5	7.1 / 0.1 / 0.6



Models Too Moist (0.5 – 1.5 g kg⁻¹) and Cold (0.2 – 4.0° K)

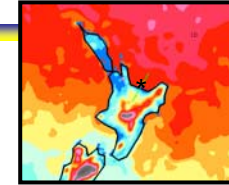


NZ PROFILES

Potential Temperature and Specific Humidity

COAMPS ———
RAOB ———

RMSE: $\sim 1 \text{ g kg}^{-1}$ \rightarrow IWVP (mm) \rightarrow PD $< 1 \text{ cm}$



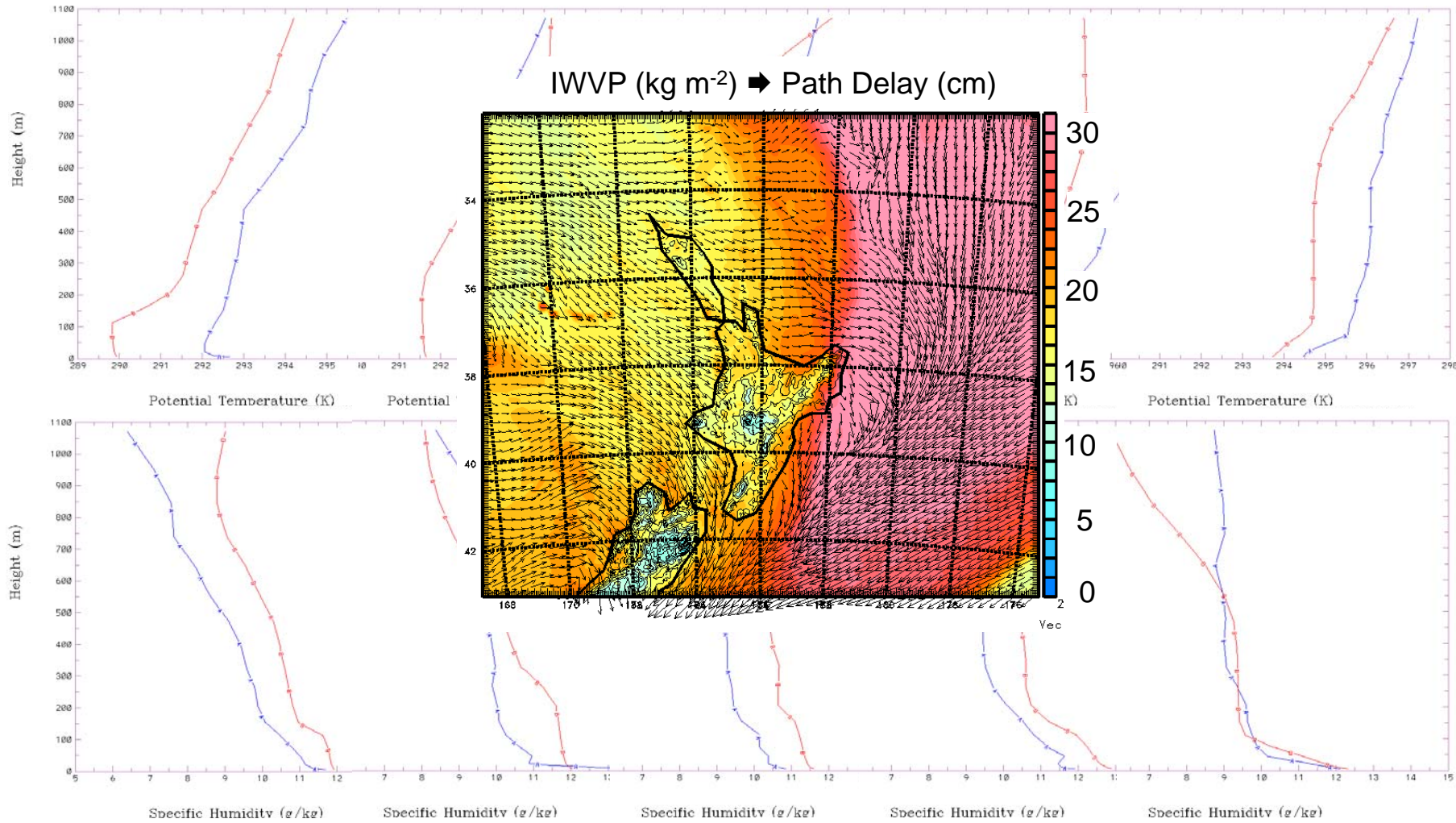
21 UTC

23 UTC

0 UTC

3 UTC

8 UTC



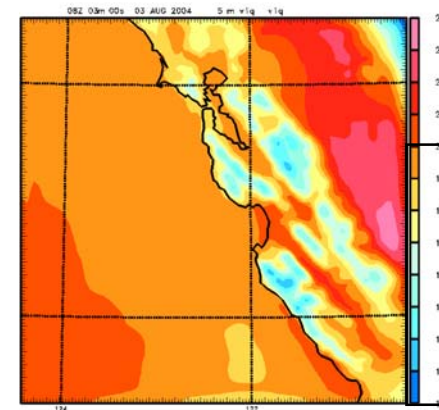
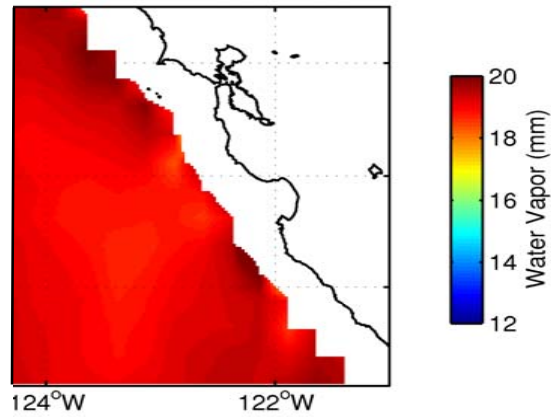


July Mean IWVP 2004

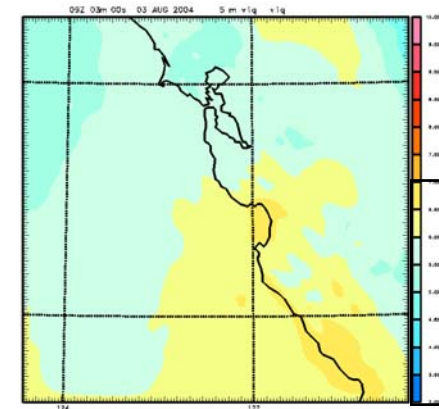
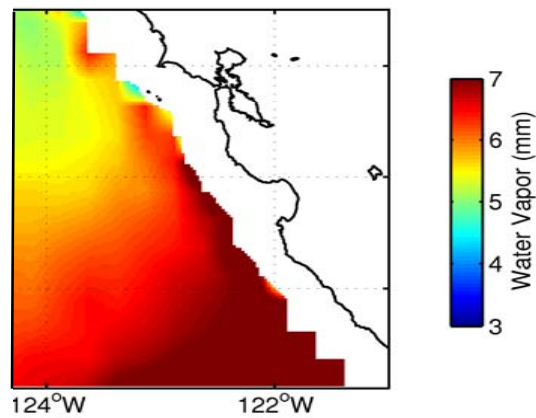
TMI, SSMI, AMSR
Satellite Observations

COAMPS 3-hrly
W Vapor Forecasts

Mean



STD



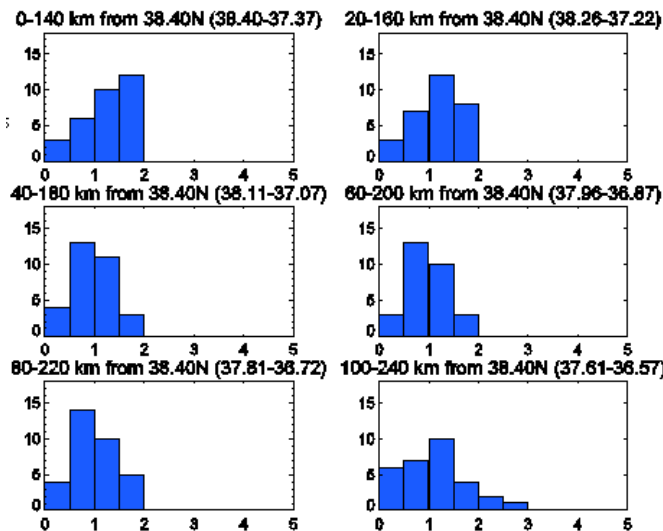
RMSE: IWVP < 1.5 mm → PD < 1 cm



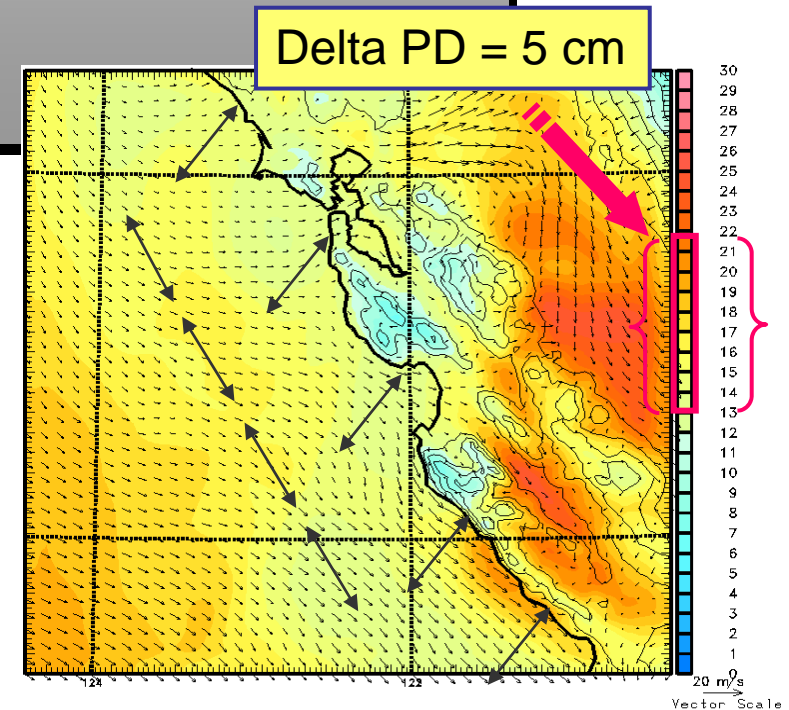
Estimating PD Error from Mesoscale Models in Coastal Regions

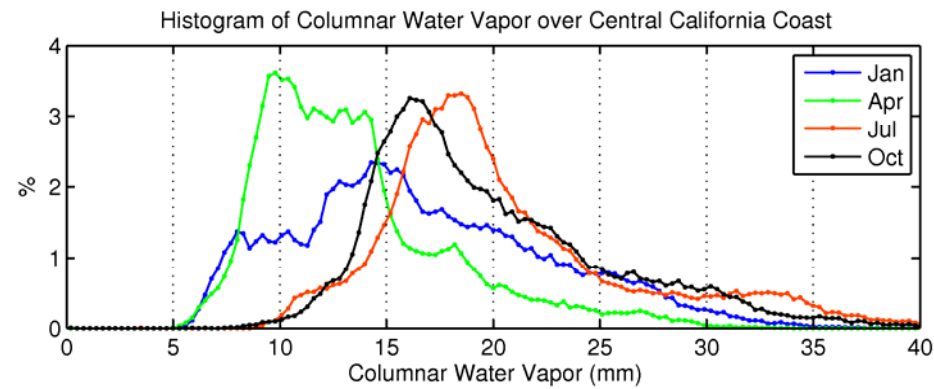
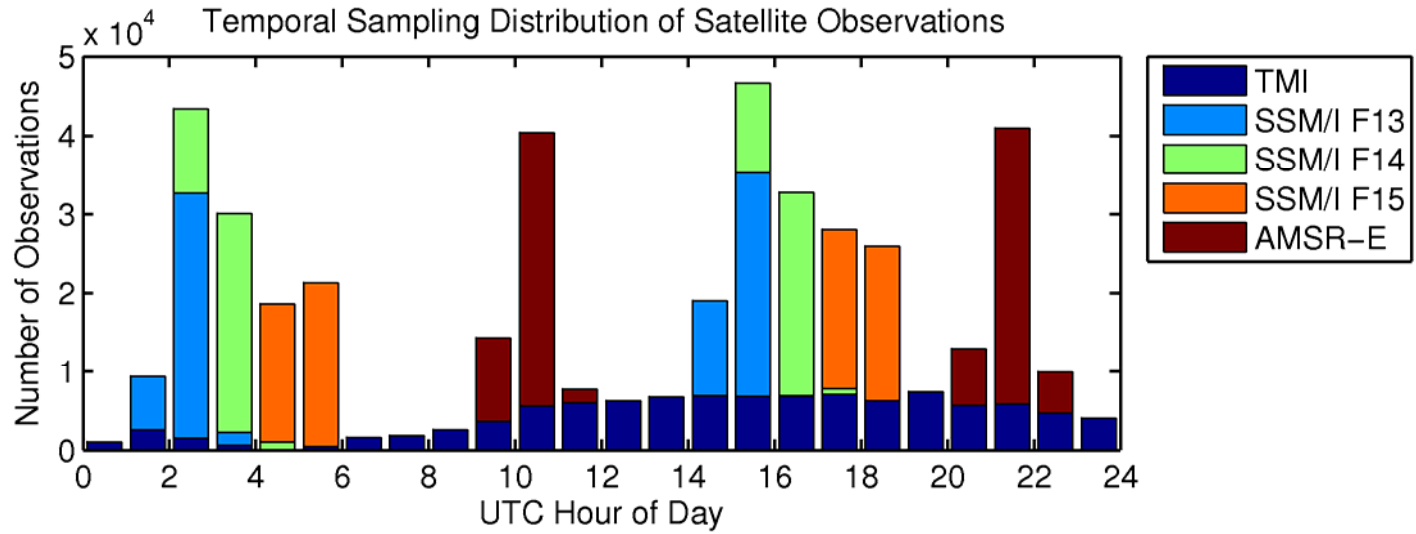
- 1) Compute error in PD for estimate of mean error in model predicted IWVP
- 2) Compute difference in PD between near shore value and 50 km offshore along satellite track 221
- 3) Compute difference in PD between 50 km lengths of coast parallel track
- 4) Construct histograms of errors and differences

➔ Model PD error less than 1 cm
Model PD error less than difference



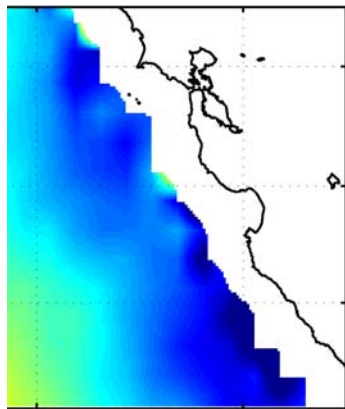
Strub and James





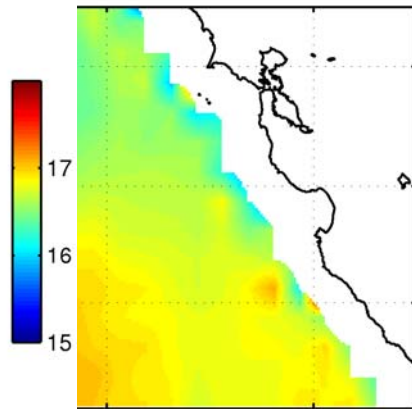


Vertically-Integrated Water Vapor



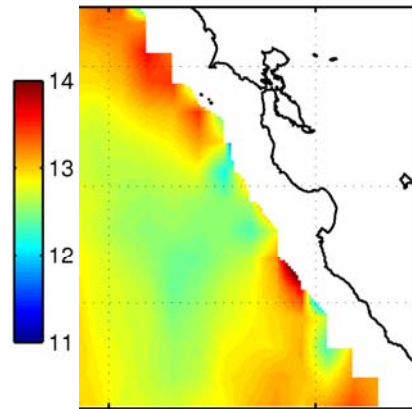
124°W 122°W

Vertically-Integrated Water Vapor



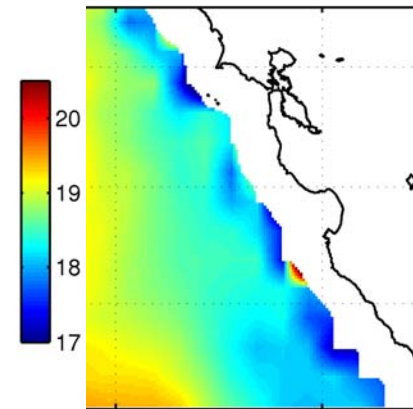
124°W 122°W

Vertically-Integrated Water Vapor



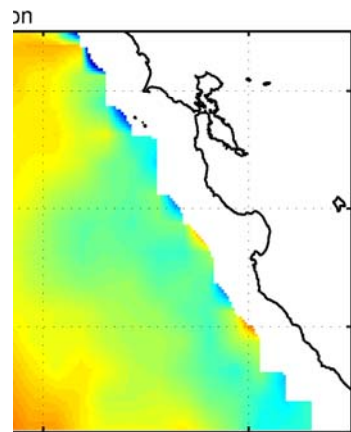
124°W 122°W

Vertically-Integrated Water Vapor

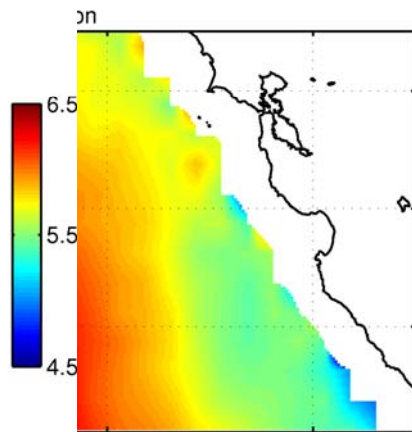


124°W 122°W

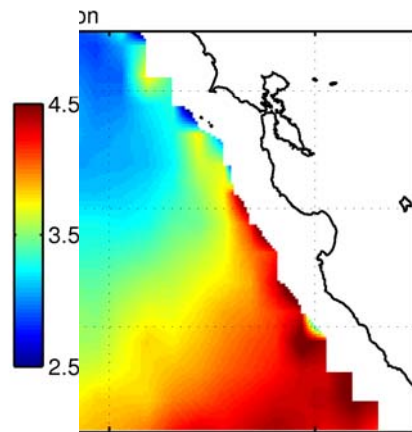
Water Vapor (mm)
20
19
18
17



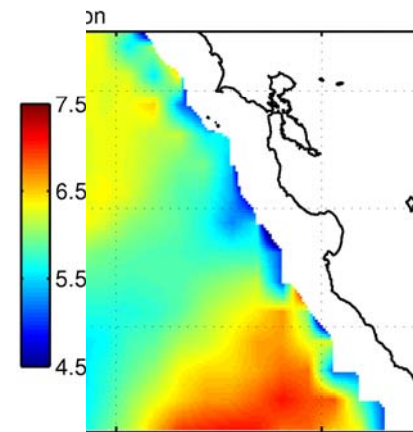
124°W 122°W



124°W 122°W



124°W 122°W



124°W 122°W

Water Vapor (mm)
6
5
4