



Simulation of Atmospheric Marine Layer off S. Oregon and N. California

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NORTH AMERICAN REGIONAL REANALYSIS



South Coast 2001 Wind Event

04 UTC 6 June 2001







June 2001 Sea Level Pressure

North American Regional Reanalysis Weather Research and Forecasting (NARR) (WRF-12) 45N 43N SLP [hPa] 1022,0 43N SLP [hPa] 022.0 1021.5 1021.5 1021,0 1021.01020.5 1020.5 41N 1020.01 1020.0 1019.5 1019.5 18 1019.0 1019.0 1018.5 1018.539N 39N 1018.0 1018.0 1017.5 1017.5 1017.0 1047.01018.5 1016.5 37N 1016.0 1016.0 1015.5 1045.5 1015.0 1015.0 1014.5 1014.5 35N 35N 1014.0 1014.0 1013.5 1013.5 1043.01013.0 1012.5 1012.5 33N 1012.0 1012.0 31N 31N 122W 118W 128W 126W 124W 120W 116W 124W 128W 120W 116W

June 2001 Sea Level Pressure







WRF-12 10-Day Composites

With strong Nly-NWly winds 14-23 June 2001







WRF-12 Trajectories From 10-day Composite



Buoy Upper Max Wind Speed About 20 m/s

West Coast NDBC Buoy Speeds

May – August, 2001

Major Cape Lee	Lat	Buoy	Buoy Speed m/s					
			Stand Dev	50%	99%	99.9%	100% Max	
	46.1	29	2.7	5.4	12.0	15.3	16.9	
	44.6	50	2.9	6.1	12.9	15.9	16.8	
Blanco	41.8	27	4.7	4.6	17.4	18.4	19.3	46050 *
	40.8	22	3.1	5.4	13.7	16.3	16.8	494 ASOT 5
Mendocino	39.2	14	3.8	7.3	15.0	18.6	19.2	46022 Cape Mendodro
Arena	38.2	13	4.8	9.3	17.5	20.9	21.6	46014 Pt Arena 35 ⁴ 46013 Arg
	37.4	12	2.6	5.5	13.2	15.5	15.8	46042 Pr. Sur
	36.8	42	3.2	6.9	13.7	14.7	15.9	344 4601 Pt.Conception 46014 Pt.Conception
Sur	35.7	28	4.2	8.4	16.2	17.6	18.3	400.07 · · · · · · · · · · · · · · · · · · ·
	35.0	11	3.3	5.4	13.1	14.6	15.0	30 ⁹ Par fic Occum
Conception	34.3	54	4.1	8.5	15.5	16.7	16.9	2.8° 124° 120° 1164
	32.4	47	2.9	6.4	12.2	14.2	14.4]

Assumes Frictionless Bernoulli Energy is conserved over 4 hrs or 200 km travel Aircraft Measurements support faster speeds, shallower layer, stronger inversion

 $E = (d\rho/\rho)h + V^2/(2g) + P/(\rho g) \sim E = (d\rho/\rho)h + V^2/(2g) = E = (d\Theta/\Theta)h + V^2/(2g)$

Sea Level Pressure Along A and the ger Modified -45-Speed Along Track -18 (¹2m) beads 10 Layer Depth Along Track 600 100 Height(m) 300 200 100÷ 400 200 Ò. Distance From Cage (km)

Along Track Layer Properties: SLP, Speed, Depth

Stylized Surface Speeds About Northern Cape



The upper limit of the averaged layer wind speed Is largely set by the inbound layer depth and speed

 $E = (d\Theta/\Theta)h + V^2/(2g)$



Summary

Mesoscale simulations using WRF with 12 km resolution are able to reproduce the complex summer flow of the lower atmosphere along Southern Oregon and Northern California.

Composites of the strong NW flow episodes resemble the June 2001 monthly and events.

The large scale synoptic setup of the North Pacific anticyclone offshore and heat low over the southwest U.S. establishes an intensified along shore gradient to south over a limited area of the West Coast.

The lower atmosphere responds as a quasi-Bernoulli flow with a wave like feature in the lee of each major cape.

Sometimes double wave structure responding to the Cape Blanco and Cape Mendocino topographic complex.

Buoy 10-m speeds < 20 m/s, set by the inbound layer depth, stability.