CIGoM
Consorcio de Investigación del Golfo de México

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Centro de Ciencias de la Atmósfera UNAM

CICESE
Departamento de Oceanografía Física

Dispersion Of Atmospheric Pollution From Surface Oil Burns In The Gulf Of Mexico

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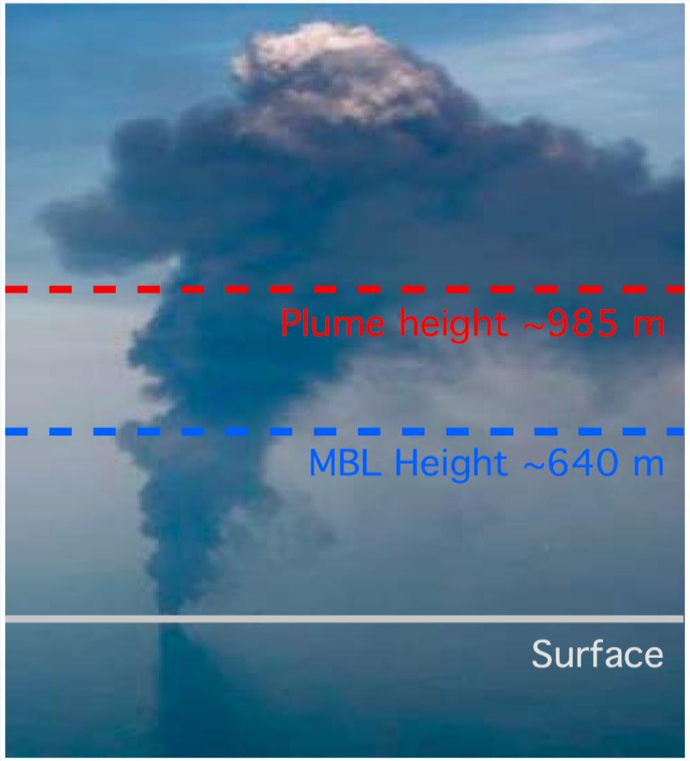
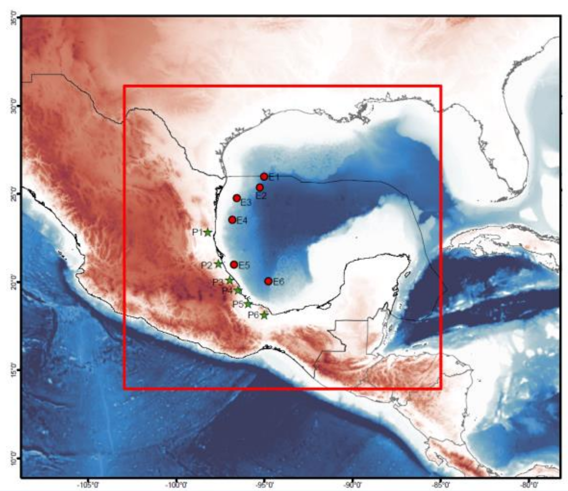


Perring *et al*, 2011

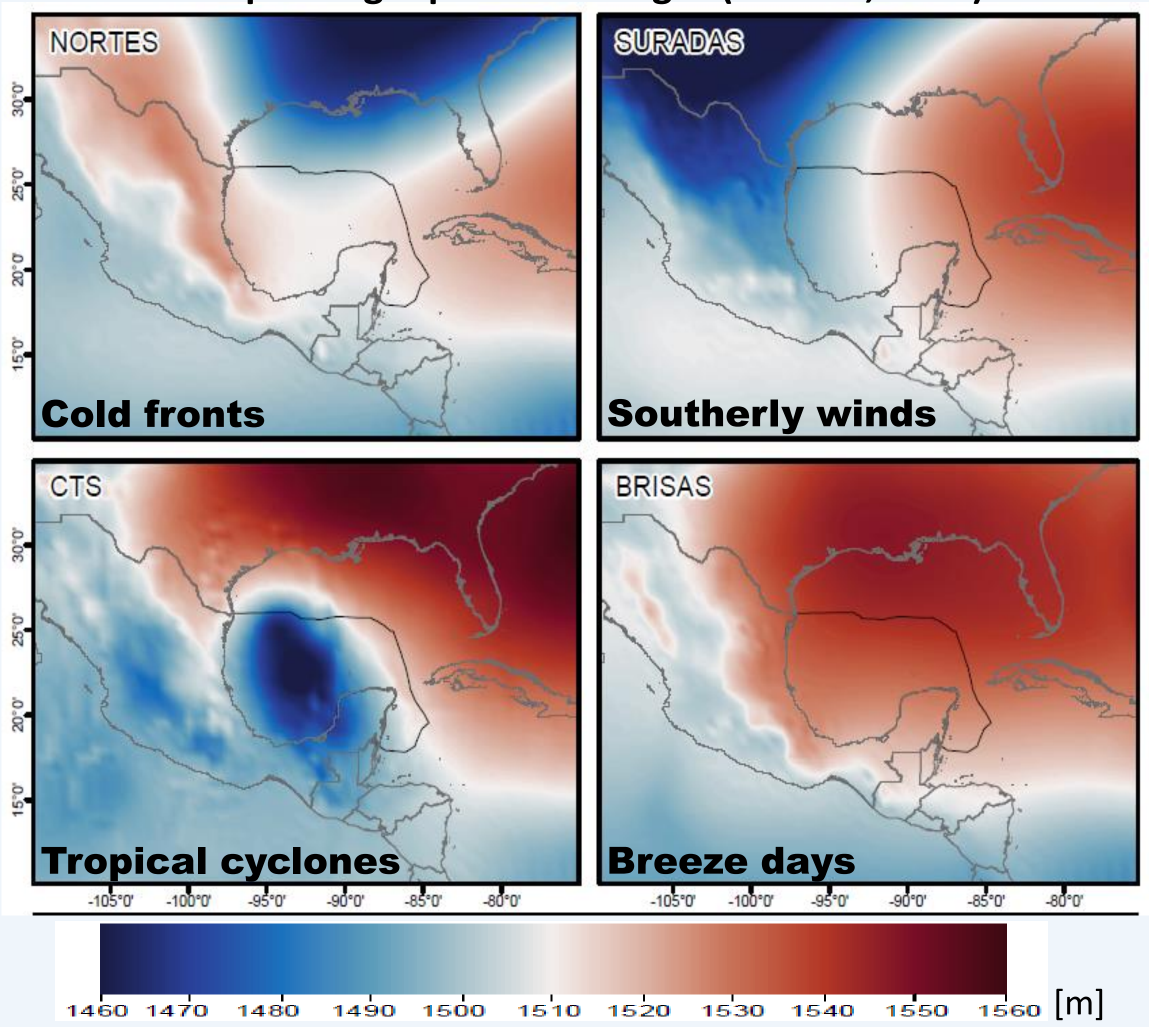
What are the most probable dispersion patterns for emissions from surface oil burns at potential deepwater oil drilling sites in the Gulf of Mexico?



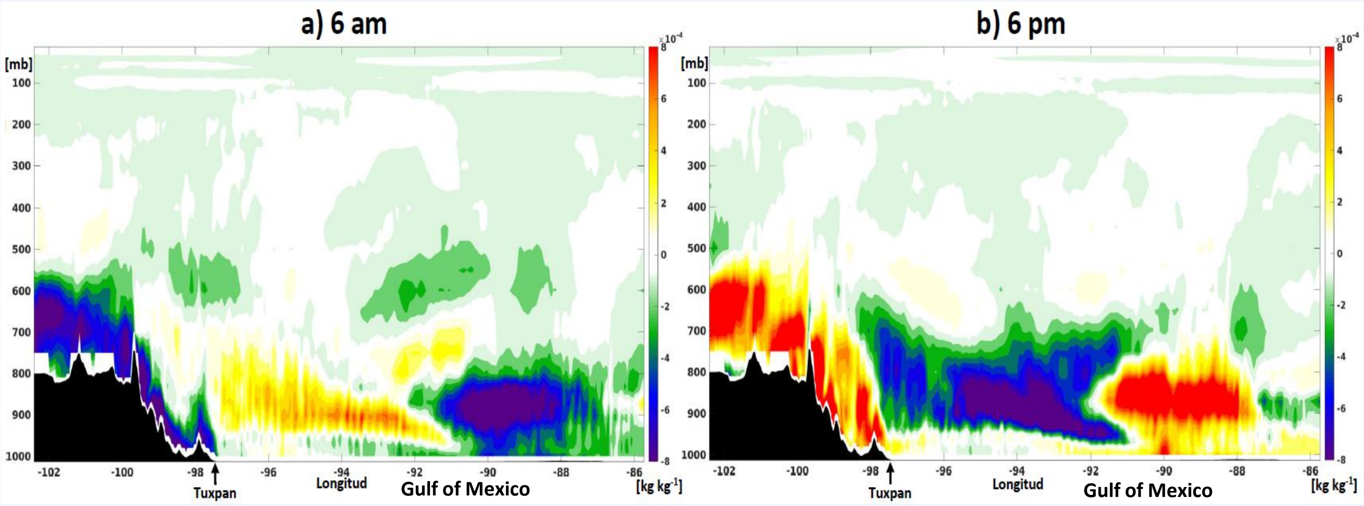
- Dynamical dowscaling of CFSR fields using WRF (4 km resolution)
- 1983, 1992, 2011 were selected on the basis of a climatological criterion for the yearly mean near suface wind speed over the Gulf of Mexico
- Analyze dispersion scenarios for the most comon meteorological conditions (cold fronts, southerly winds, tropical ciclones and winter, spring, summer, fall breeze days)

Common synoptic meteorological conditions over the Gulf of Mexico

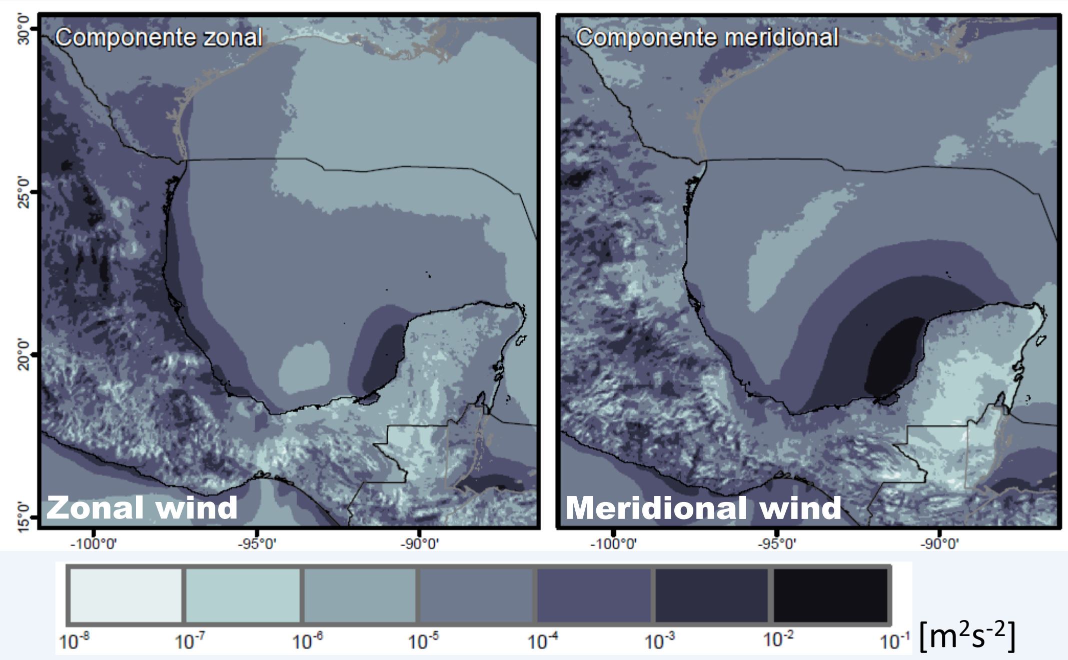
Composite geopotential height (850 mb, CFSR)



Specific humidity diurnal cycle (july 2011, WRF)



Energy in dirunal band for 10 m winds (2011, WRF)



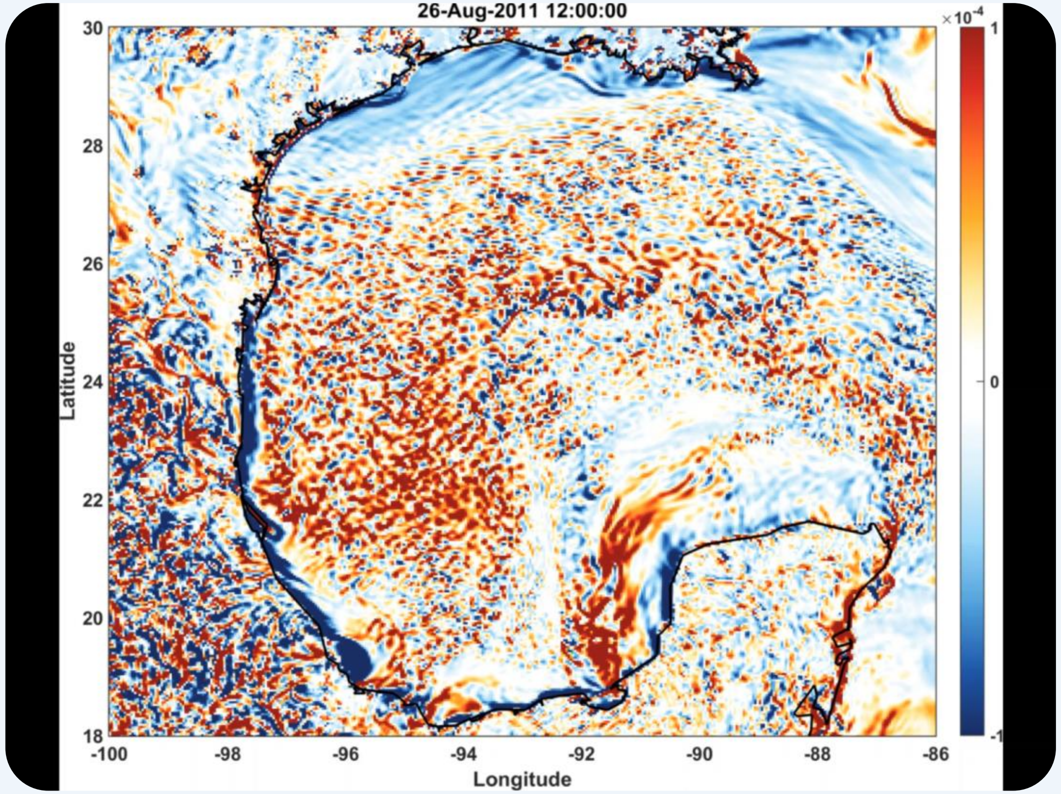
Lagrangian modeling

Flexpart-WRF

- The initial positions of particles are randomly distributed vertically in a 900 m column at 7 different point sources
- 36 hour simulations with 12 hours of emissions
- 20,000 particles released at each point source

	1983	1992	2011	Number of simulations
Winter breeze	4	5	1	39
Spring breeze	5	11	2	72
Summer breeze	11	6	14	124
Fall breeze	9	4	4	68
Cold fronts	49	28	36	385
Southerly wind	19	15	16	198

Near-surface relative vorticity (WRF)



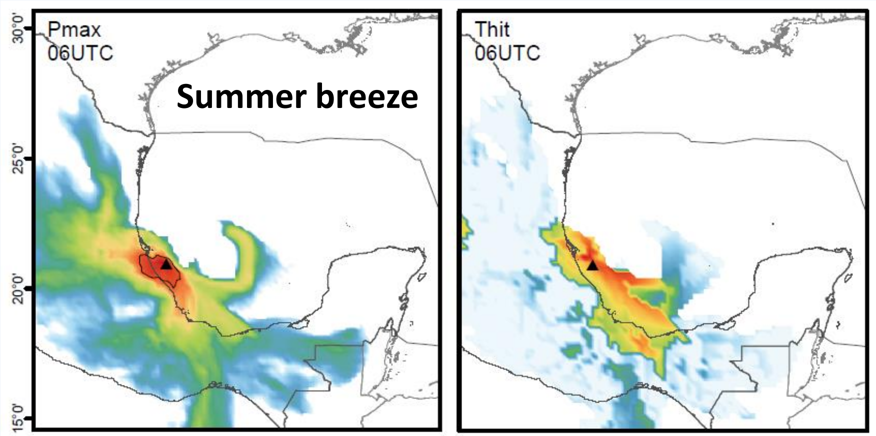
Metrics

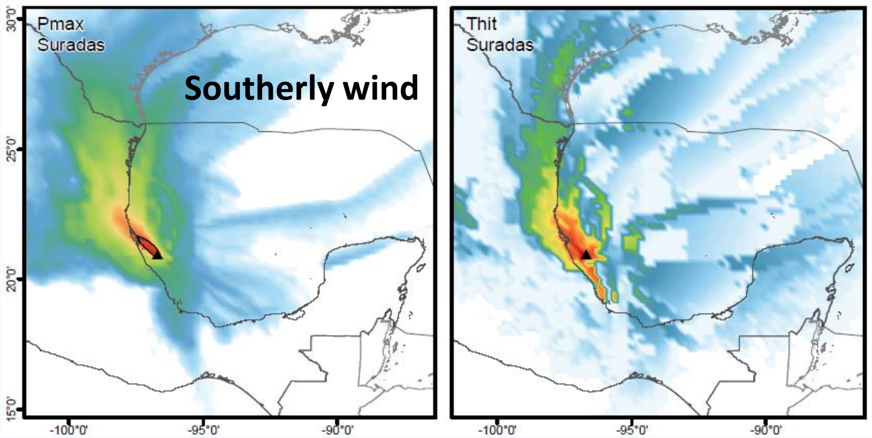
1. P_{max}: the average over all simulations for a given meteorological condition of the maximum mass fraction recorded in each quadrant of a 0.25 degree mesh.

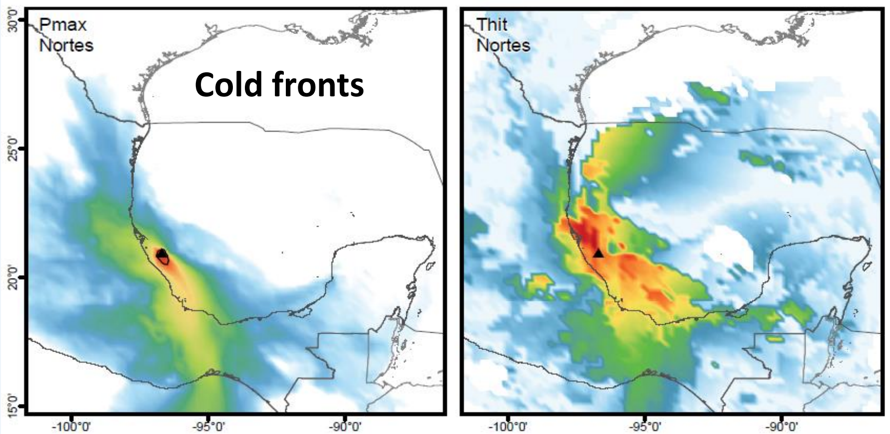
2. T_{hit}: the average time elapsed from the start of emissions until the mass fraction in each quadrant of the mesh reached the value of P_{max}.

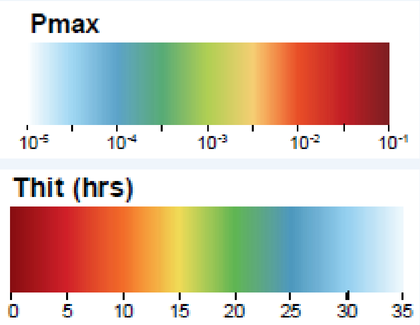
3. Z_{mean}: the average height, over all simulations of a given meteorological condition, of the particles located inside the planetary boundary layer at the end of the emission period (12 hours after the start of the simulation) in each quadrant of the mesh.

Results

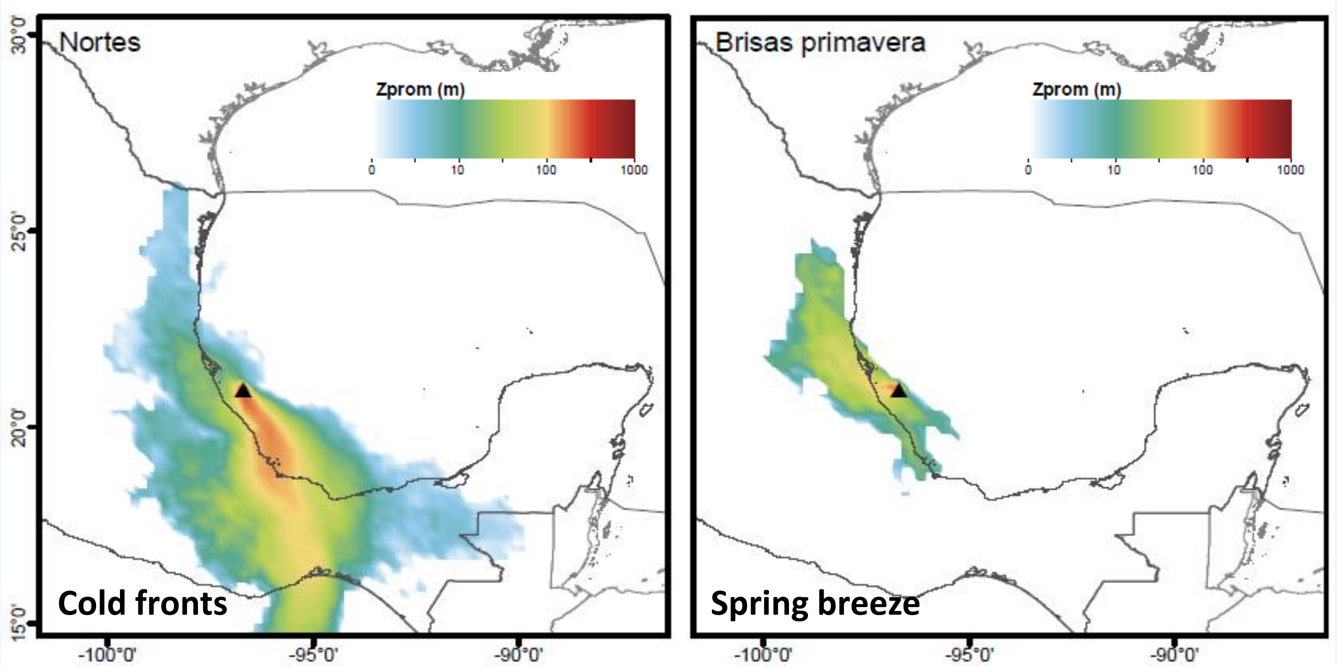




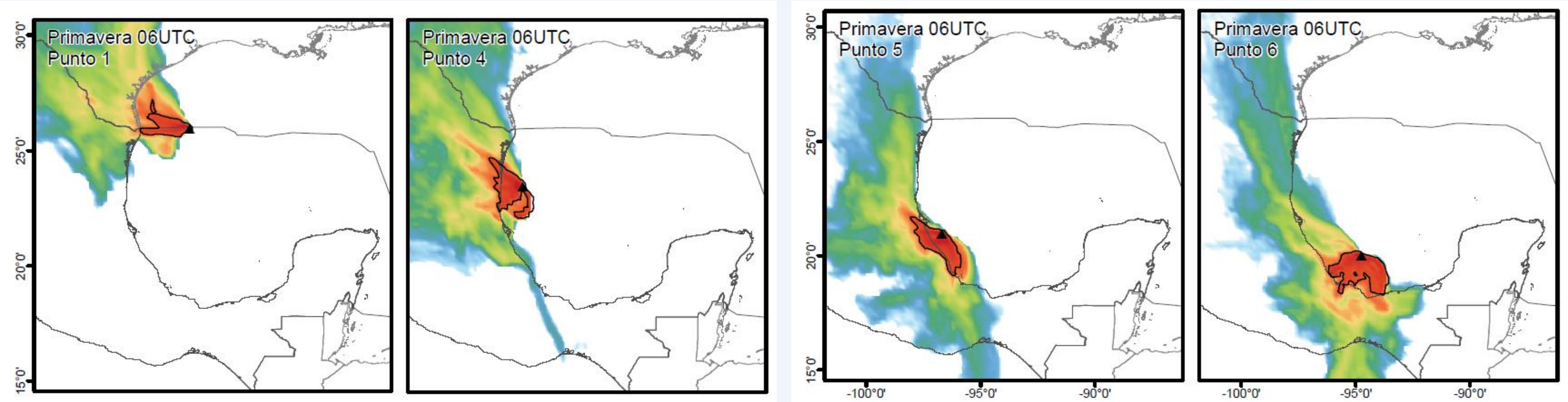


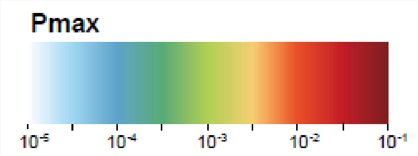


Z_{mean}



- **Higher atmospheric stability during breeze days would result in greater risk to human health in coastal regions**





➢ **Spring breeze days produced the largest impact regions**

Conclusions

- The proposed metrics can be used to assess the risk to human populations in coastal regions, under different meteorological conditons, from the atmospheric pollutants that would result from surface oil burns.

- Breeze days present the greatest risk for the air quality of Mexican coastal communities in the event of a large-scale oil spill in the GoM. During those days, larger accumulations of atmospheric pollutants within the planetary boundary layer are expected compared to other synoptic conditions.

- Point sources located near the cities of Tuxpan and Poza Rica, Veracruz produced, during breeze days, the distribution of particles that has the highest probability of affecting air quality in Mexican coastal communities of the GoM, with arrival times of less than 12 hours.