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The Raco wind in central Chile: a recurring gap flow interacting with a cold-air pool



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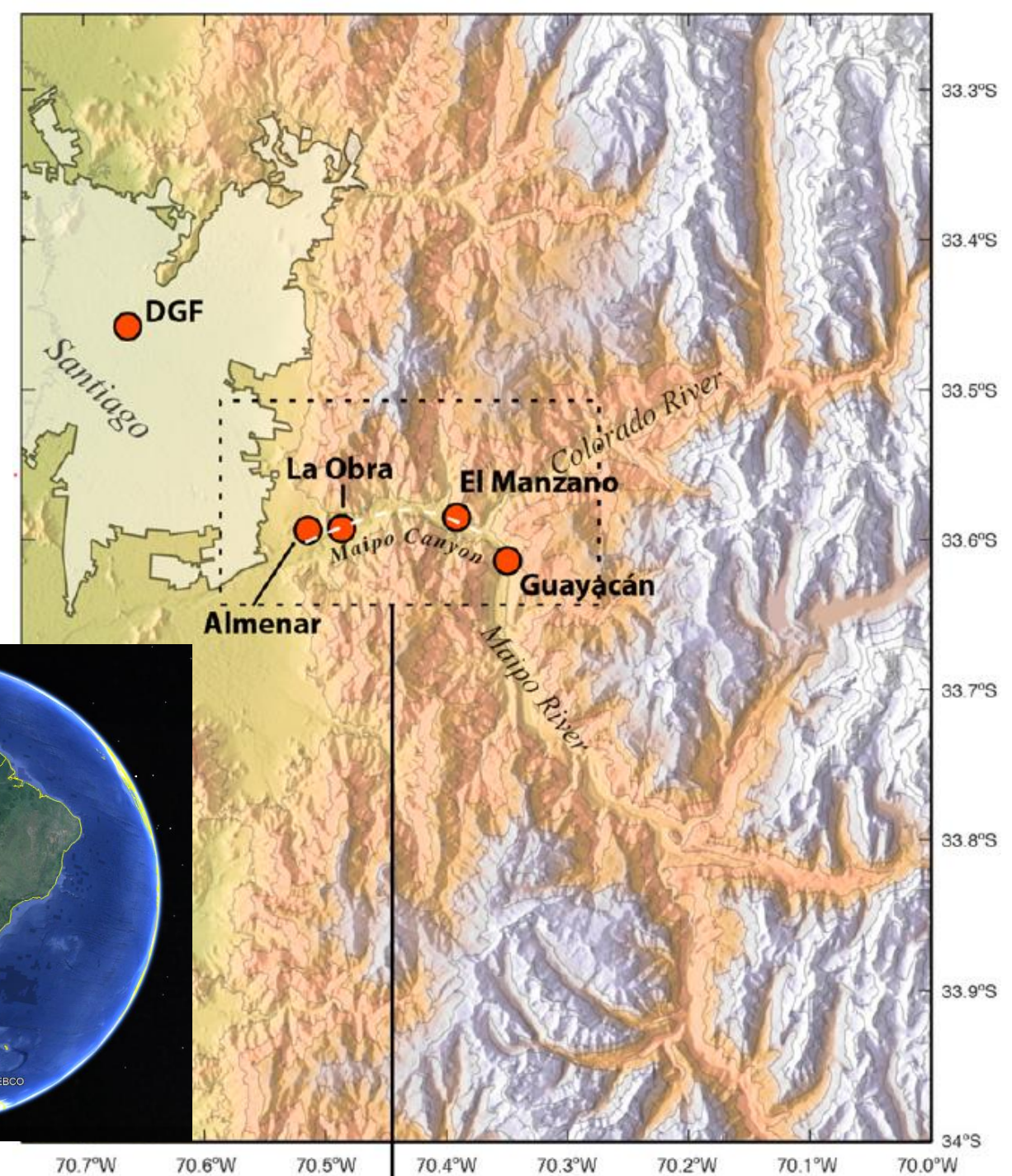
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Raco wind:

- Localized in exit of Maipo Canyon/central Chile
- Easterly-downvalley
- Relatively strong (gusts up to 17 m/s)
- Cold season (May-Nov)
- Night-time
- Warm and dry
- Related to regional coastal low developmet

References:

- Rutllant and Garreaud 2004 (MWR)
- Muñoz et al. 2020 (JAMC)

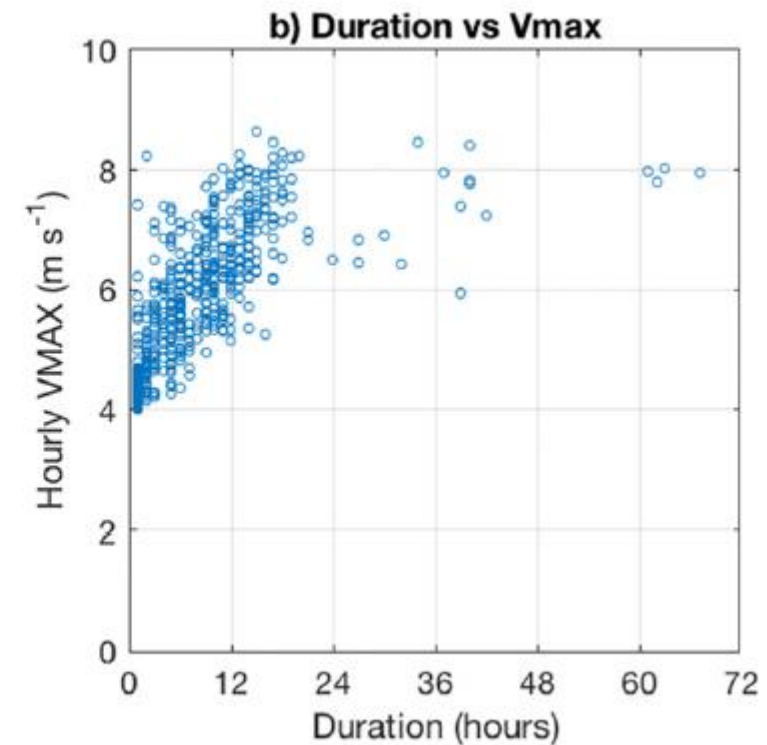
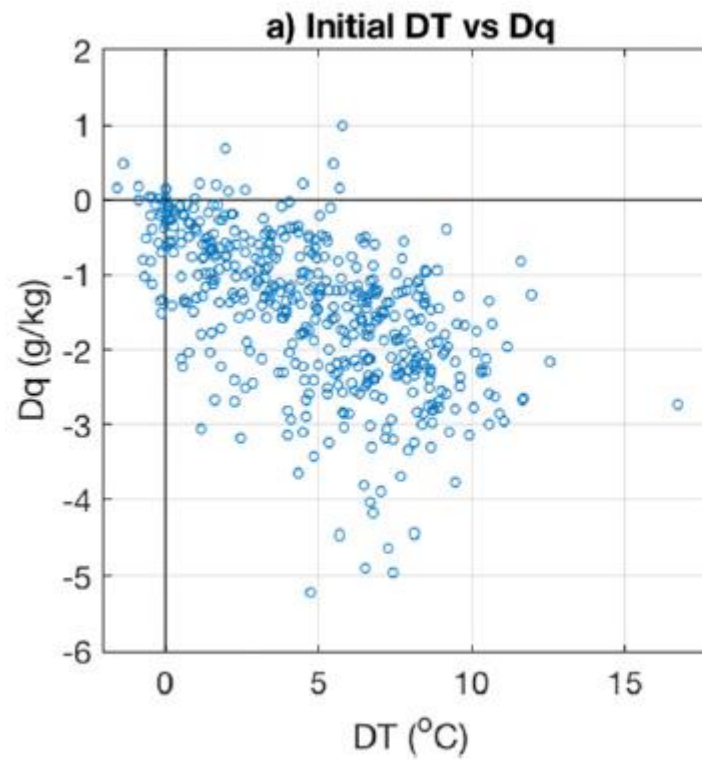


Additional features of Raco winds:

- Very abrupt surface appearance
- Concomitant temperature increases and humidity drops
- Associated to easterly jet at ~ 800 m AGL
- Quite frequent from May to August

References:

- Muñoz et al. 2020 (JAMC)

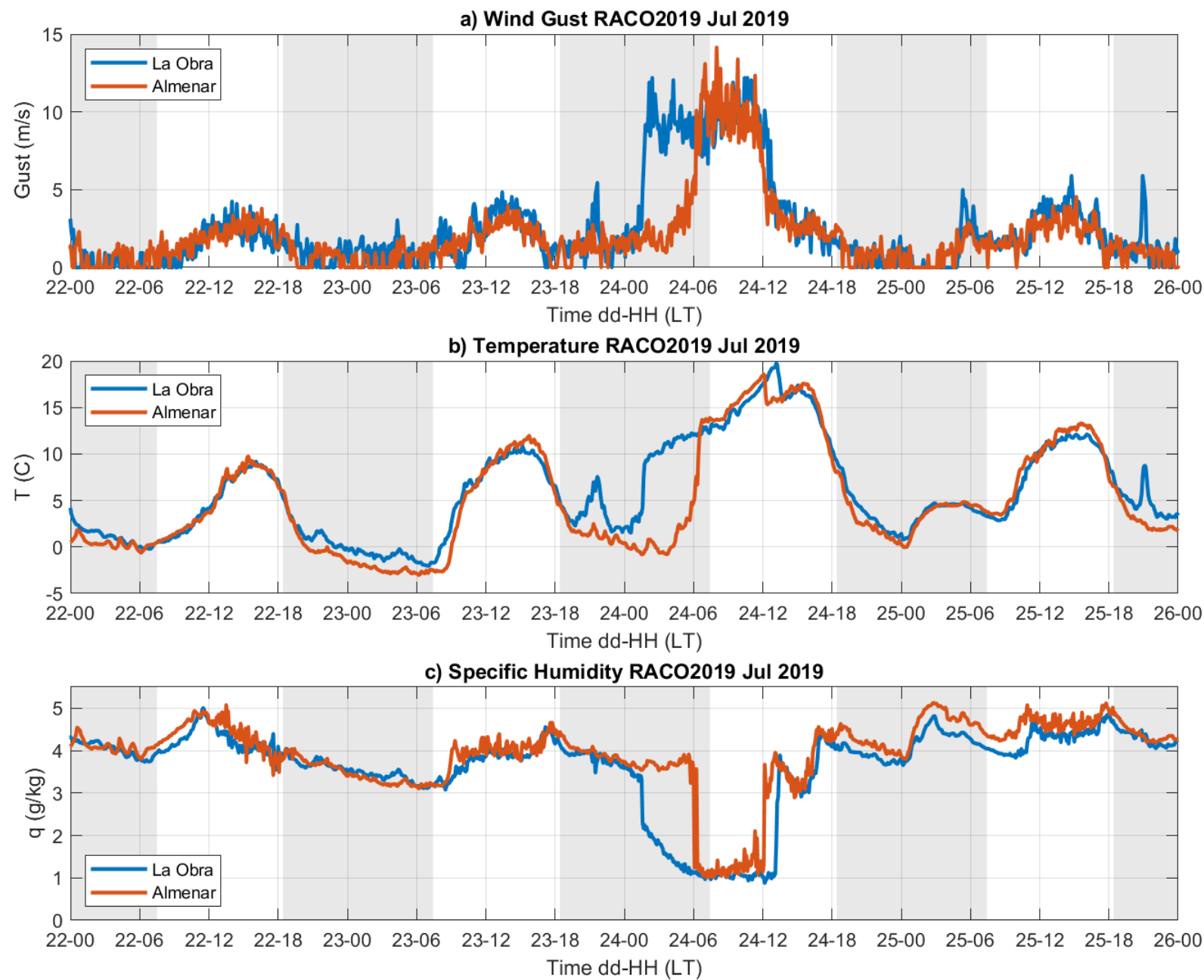


Recent field campaigns:



Campaign	Dates	Main Sites	Main observations
RACO-2017	15-18 Sep. 2017	ALM	6-hourly radiosondes
RACO-2018	22-26 July 2018	ALM, MAN	6-hourly radiosondes, SODAR, mobile ceilometer
RACO-2019	22-25 July 2019	ALM, CAN, MAN	6-hourly radiosondes, mobile ceilometer

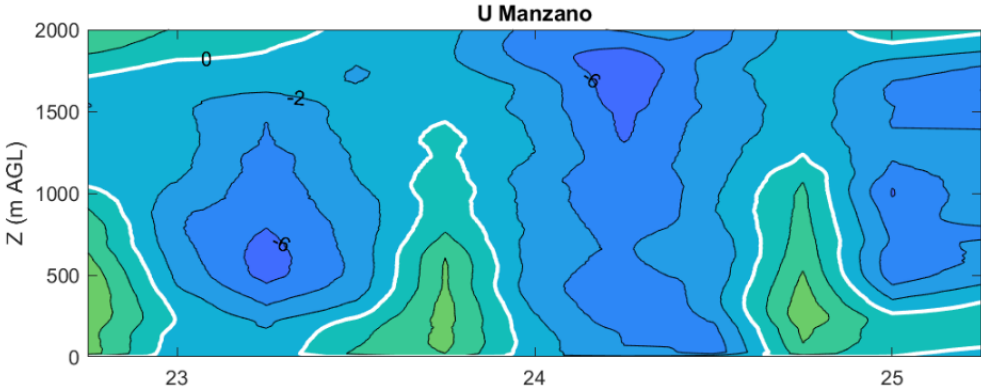
RACO-2019 time series:



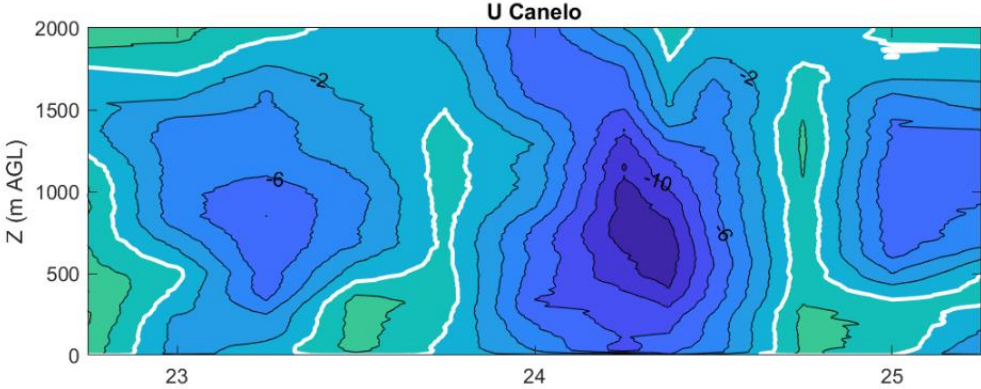
RACO-2019 zonal wind vertical profiles:



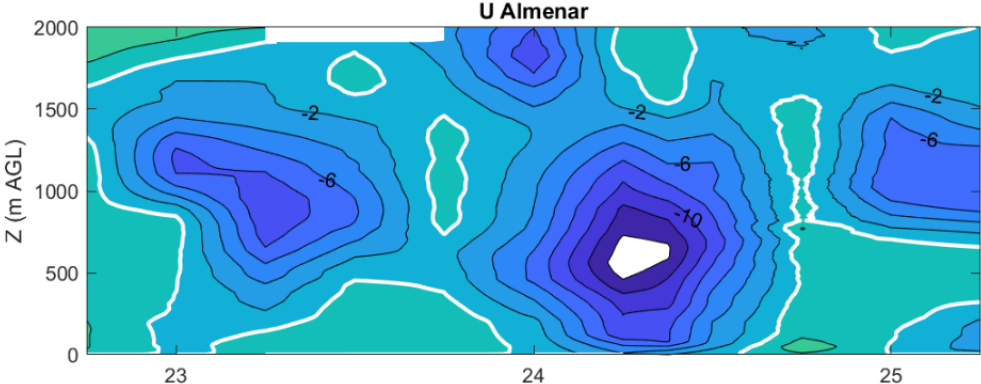
Manzano



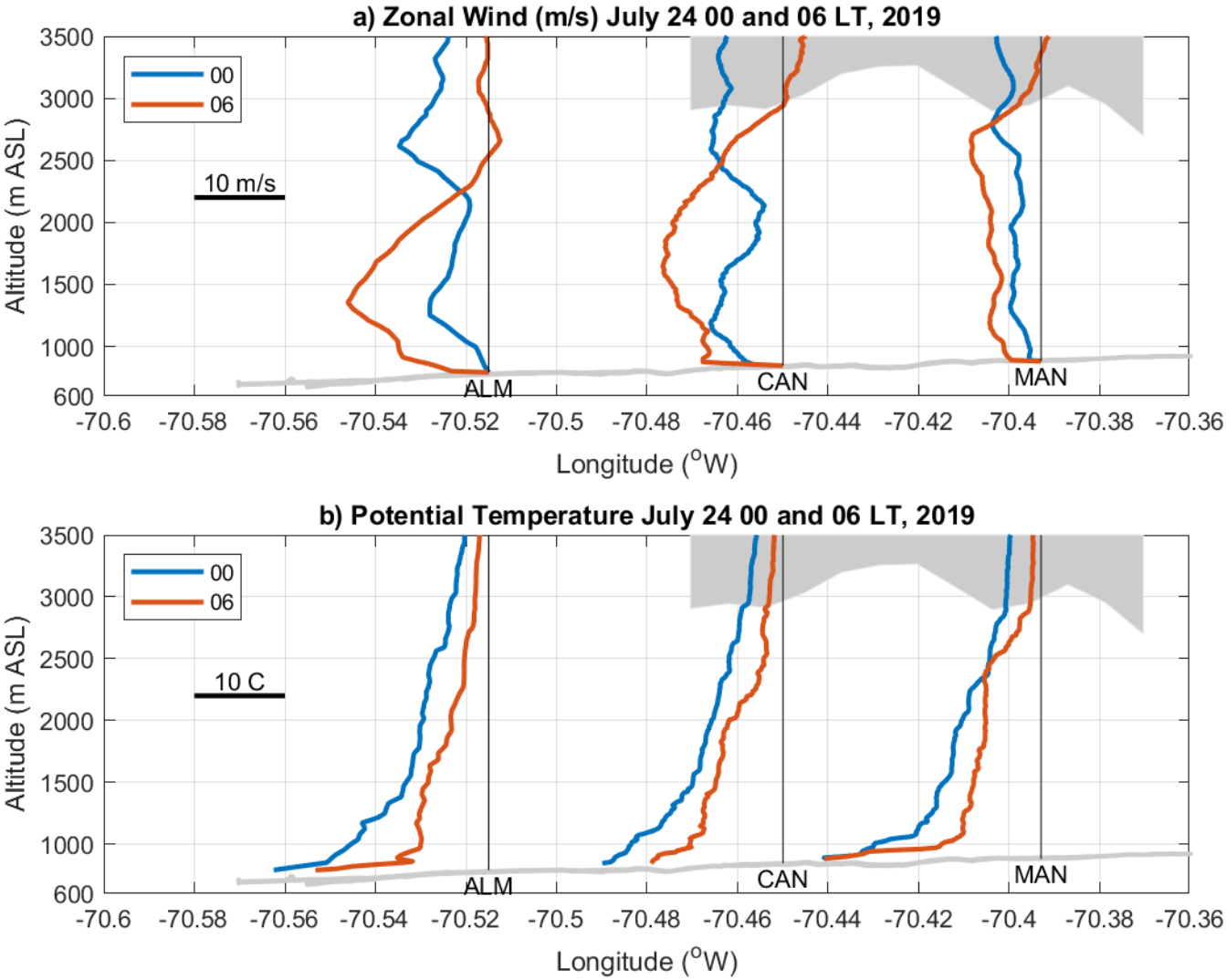
Canelo



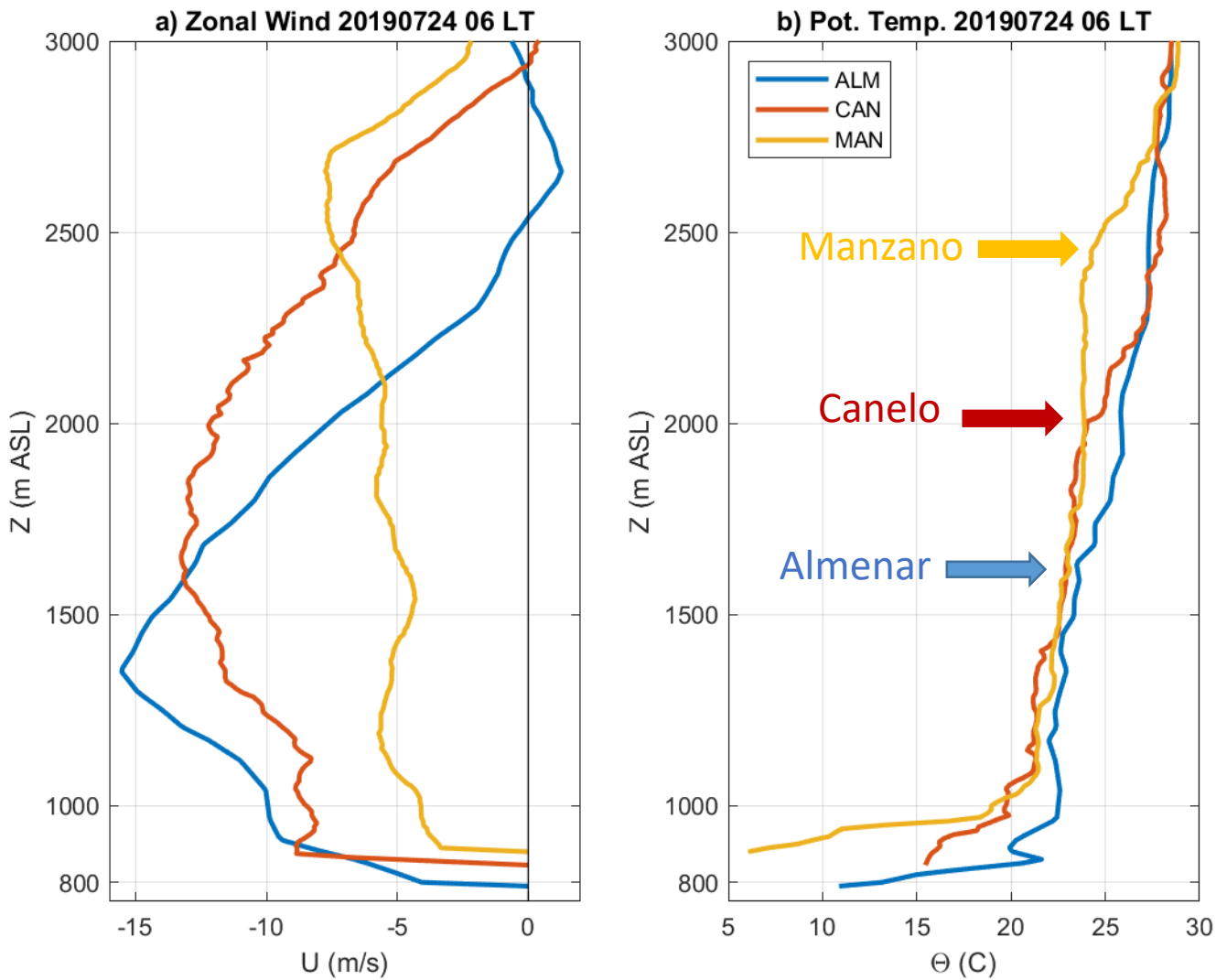
Almenar



RACO-2019 vertical profiles before/during Raco conditions:



Internal Froude number estimations:

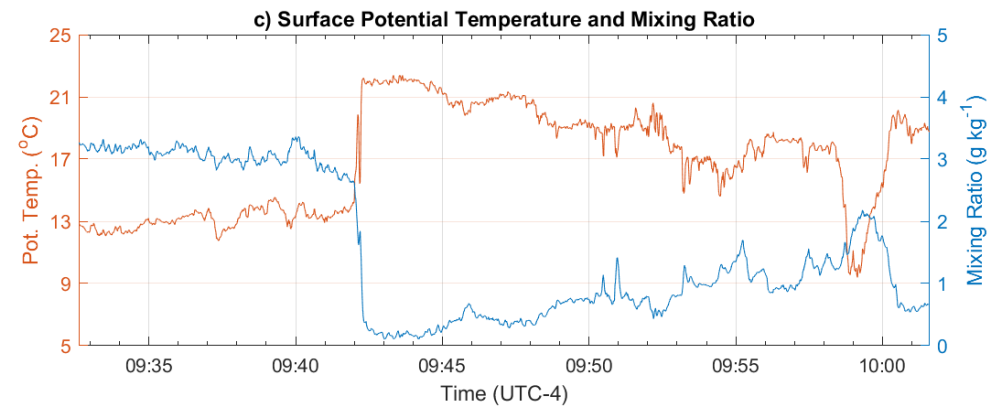
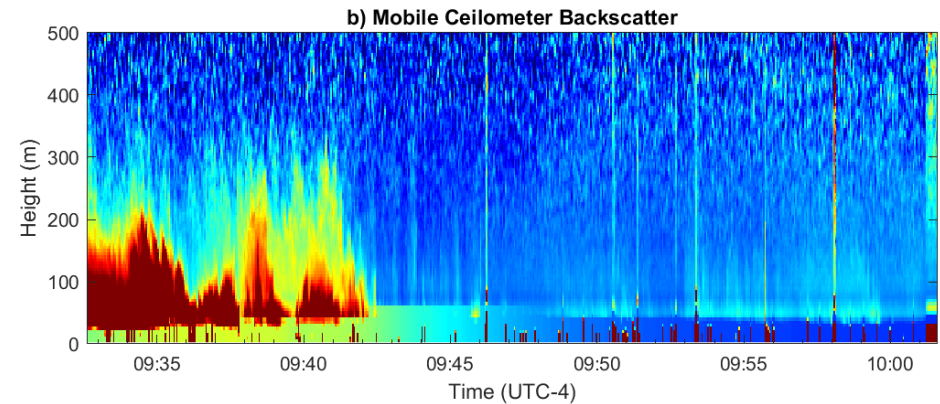
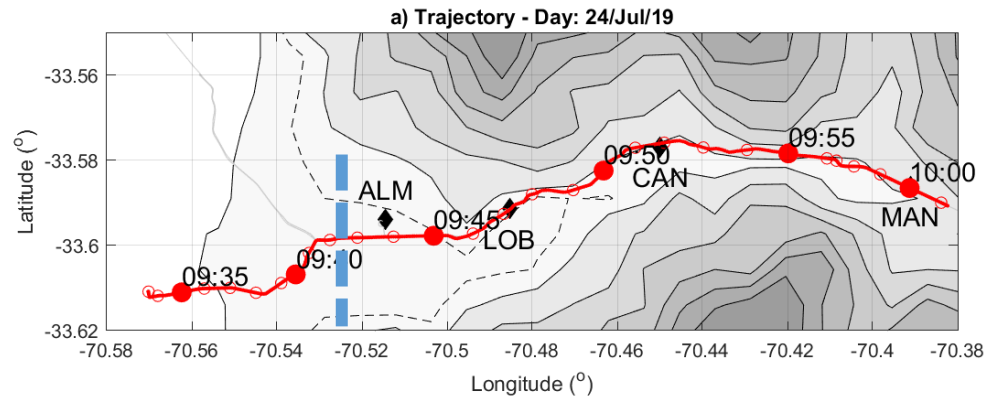


$$F_i^2 = \frac{U^2}{g \frac{\Delta\theta}{\theta} h}$$

	ALMENAR	CANELO	MANZANO
U (m/s)	~ 13	~ 12	~ 6
h (m)	~ 700	~ 1100	~ 1500
$\Delta\theta$ (C)	~ 3	~ 4	~ 4
F_i^2	~ 2.5	~ 1	~ 0.2

Mobile ceilometer transects: tracking the Raco front

Mobile ceilometer
route/times:

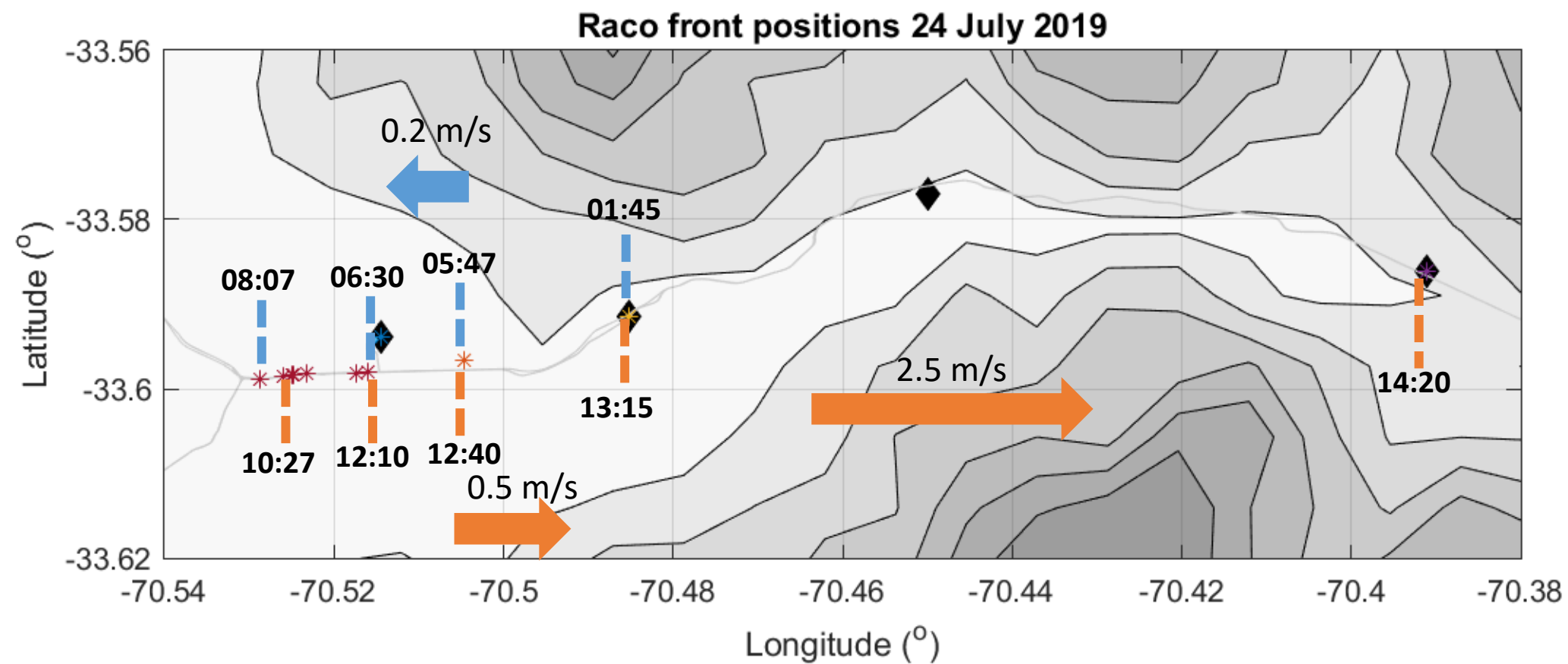


CL31 Ceilometer
backscatter transect:

Surface temperature
and specific humidity:

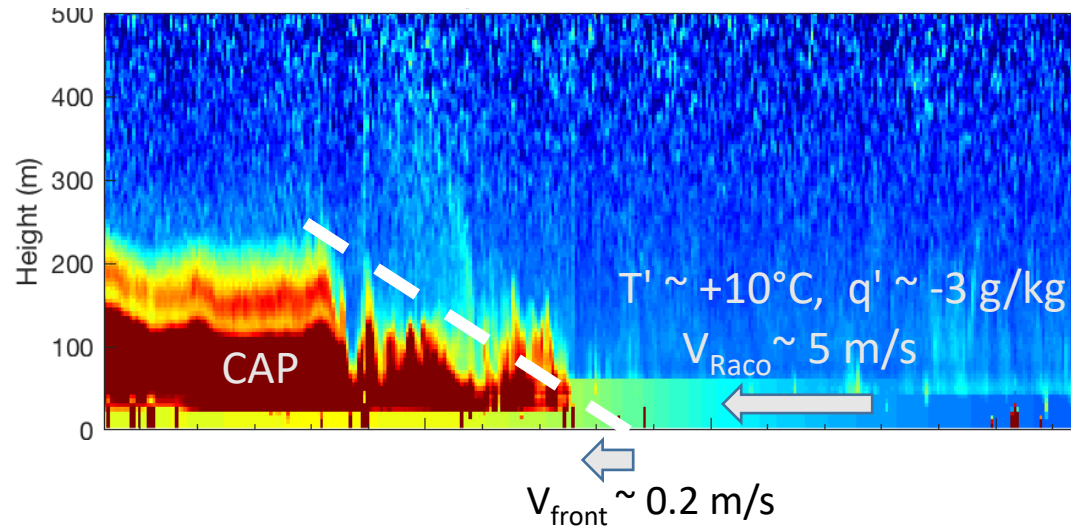


Front positions at different times:



Conclusions and future work

- The Raco wind phenomenon appears to result from the interaction between terrain-forced dynamics and a cold-air pool (CAP).
- In the RACO-2019 field campaign a subcritical-supercritical transition was documented across a narrows in the exit corridor of the Maipo Canyon.
- The Raco front can be clearly tracked along the exit corridor pushing slowly the CAP during the night and rapidly retreating east in the morning.



- The 3 field campaigns provide a rich observational database to be used in the validation of high-resolution numerical modeling currently underway.

