

# A network of UHF-radar wind profilers for the HyMeX experimental phase

HyMeX

Hydrological cycle in Mediterranean Experiment

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## THE PURPOSE

- The LSEET-LEPI takes part to the HyMeX project for scientific aspects concerning atmosphere (dynamics and aerosols) and ocean physics.
- In the frame of the preparation of the experimental phase (2009-2010 to 2012) we propose the deployment of a network of five UHF-radar wind-profilers along the french Mediterranean coastline
- This proposition will be discussed during the "Discussions about Experimental and modelling strategies"- round table.

## THE DEGREANE UHF WIND PROFILER

Frequency	1300 MHz
Minimum height (dependent on cellular environment)	75 m
Maximum height (dependent on atmospheric conditions and operation mode)	4.5 km
Resolution dependent on pulse width	50 to 375 m
Radial wind speed accuracy	< 1 m/s
Intrinsic wind direction accuracy	< 10°
Antenna gain	25 dBi
Periodicity of profile computation	Adjustable from 2 minutes
Operational temperature	20 °C to 30 °C
Operational relative humidity	95% (a 95% without condensation)
Resistance to wind	30 m/s (average) 40 m/s (gust)
Power supply	230 V - 50% - 25 % - single phase

Technical specifications of Degréane UHF wind profilers.

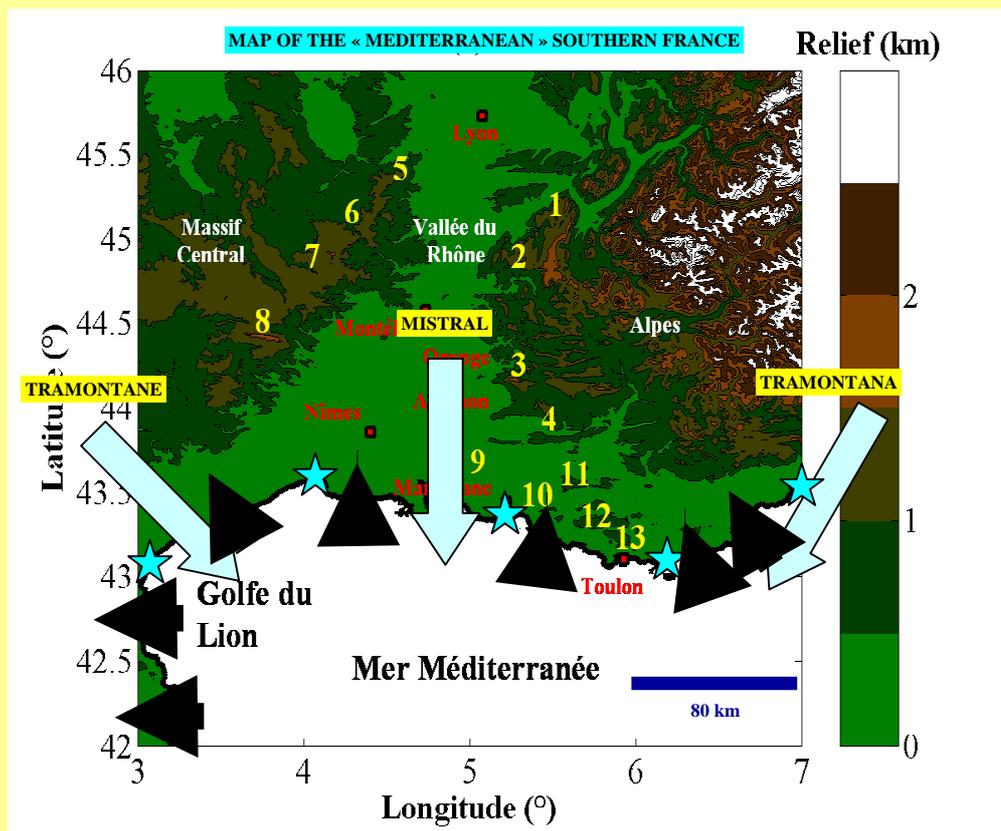


The PCL-1300 Degréane UHF wind profiler.

UHF-radar profiler measurements consist of quasi-continuous monitoring of :

- the wind profiles (u,v,w) from 75 m up to 2/4 km with a 75 m-vertical resolution.
- the profiles of the turbulent dissipation rate  $\epsilon$  thanks to the broadening of the Doppler peak sensitive to the temperature and velocity fluctuations (turbulence) (Jacoby-Koaly et al., 2002)
- the ABL top thanks to the detection of the lower-level reflectivity enhancement (Angevine et al, 1994).

## THE PROPOSED NETWORK



Five UHF radars operated by different institutions (to be solicited for acceptance of collaboration) are susceptible to be part of the network (see the blue stars on the map from east to west) :

- one in Nice (Météo-France/Nice Airport) = *Tramontana* radar
- one in the Toulon area (Degréane-Horizon/LSEET-LEPI) = *Lee of the Alps* radar
- one in Marignane (Météo-France/Marseille-Provence Airport) = *Mistral* radar
- and two others to be suitably installed (from LA and CNRM/Météo-France, respectively). For these two radars a site in the Nîmes-Montpellier area (= *Lee of the Massif Central* or *Cevenol Rains* radar) and another one in the Narbonne-Perpignan area (= *Tramontane* radar) would be appropriate to complete the whole coverage of the french Mediterranean coast.

A network covering 500 km with a 100-km step would be therefore available.

## POSSIBLE CONTRIBUTIONS TO THE HyMeX SCIENTIFIC OBJECTIVES

- The general contribution of such a network to the HyMeX campaign concerns (i) the spatial (75-m vertical and 100-km along-the-coast horizontal resolutions) and quasi-continuous temporal experimental documentation of coastal ABL dynamics and (ii) the constitution of a data set susceptible to be used directly in mesoscale atmospheric numerical models (boundary conditions, reanalysis, assimilation, test and validation ...), and indirectly in oceanic and coupled atmospheric-oceanic numerical models (essentially the forcing terms ...)
- More specific contributions concern two already identified scientific objectives (from the white book): (i) Coastal Dynamics (strong offshore wind regimes such as Tramontana, Mistral and Tramontane at local, regional and northwestern Mediterranean scales, their modulation by land/sea-breezes, their general impact on the coastal-zone water and more specifically the impact of their variability on the coastal oceanic circulation ...) and (ii) Dense Water Formation (association between those wind regimes and the cyclogenesis resulting in air-sea heat exchanges and sea surface cooling, ...)

### References:

- ⊠ Angevine, W. M., A. B. White, and S. K. Avery, 1994: Boundary-layer depth and entrainment zone characterization with boundary-layer profiler. *Boundary-Layer Meteorol.*, **68**, 375-385.
- ⊠ Jacoby-Koaly, S., B. Campistron, S. Bernard, B. Bénéch, F. Arduin-Girard, J. Dessens, E. Dupont, and B. Carissimo, 2002: Turbulent dissipation rate in the boundary layer via