

# Current status of meteorological and snow observations and reanalysis available in the French Alps



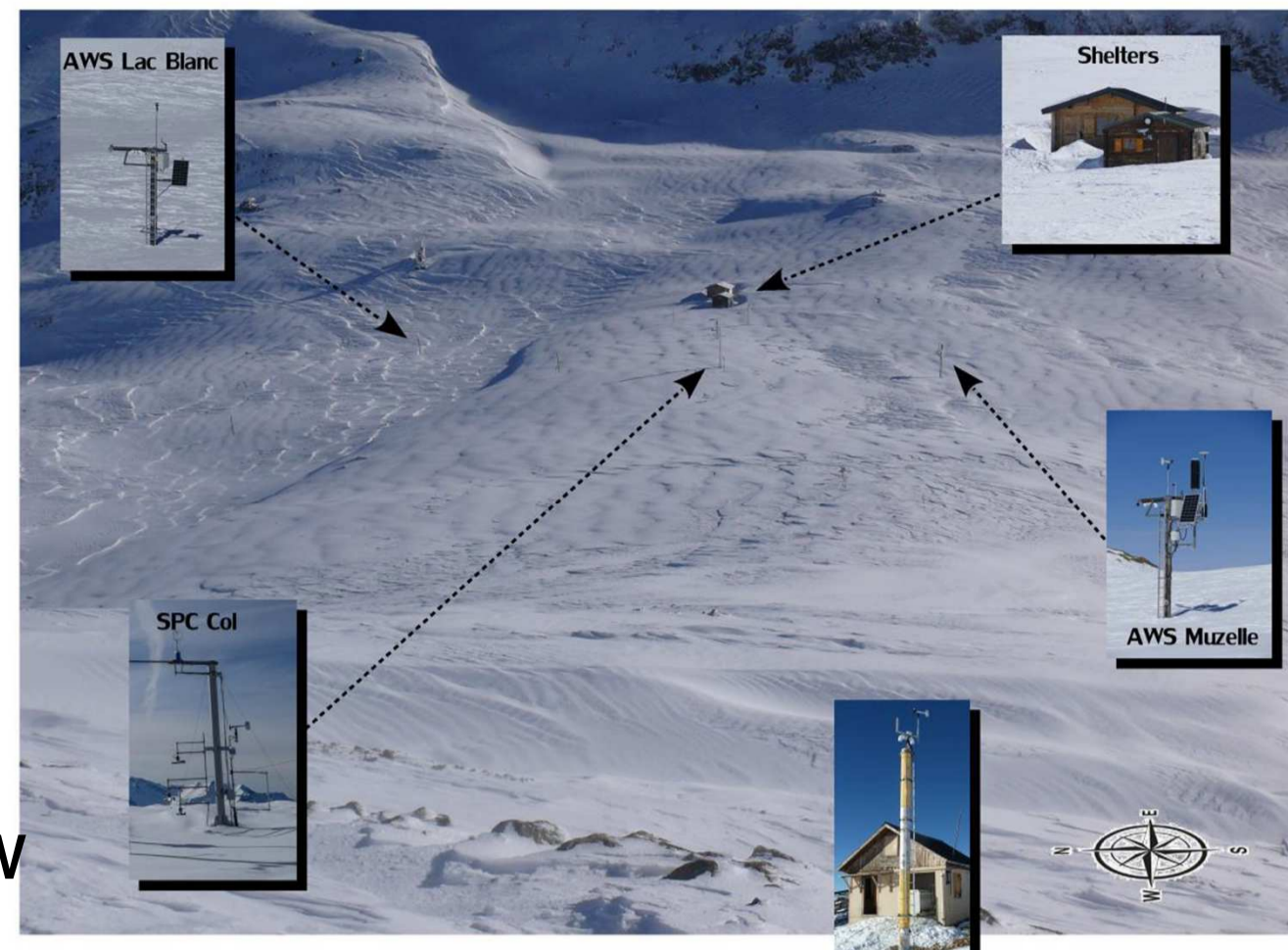
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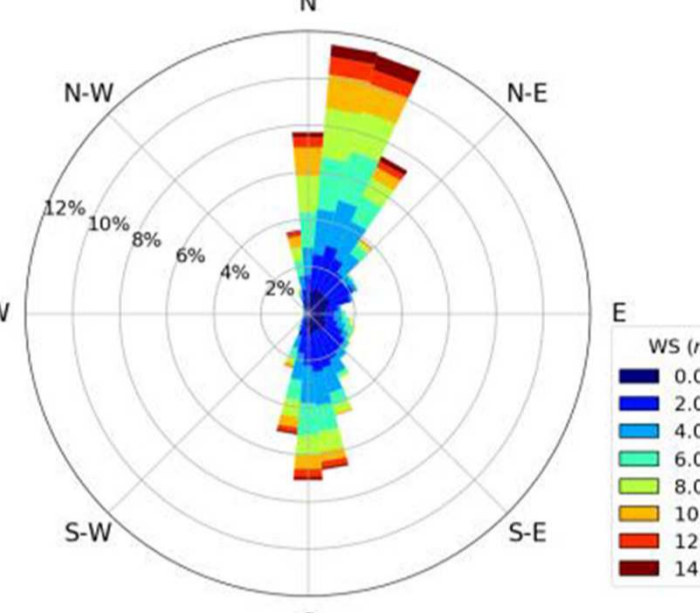


## Col du Lac Blanc

- High altitude experimental site (2720m)
- 16 winter snow seasons (2000-2016)
- Study of snow-wind transport
- Bare/rocky soil
- 4 meteorological stations
- Variables: wind speed and direction, snow depth, air temperature
- Vertical profile of Snow Particle Counter

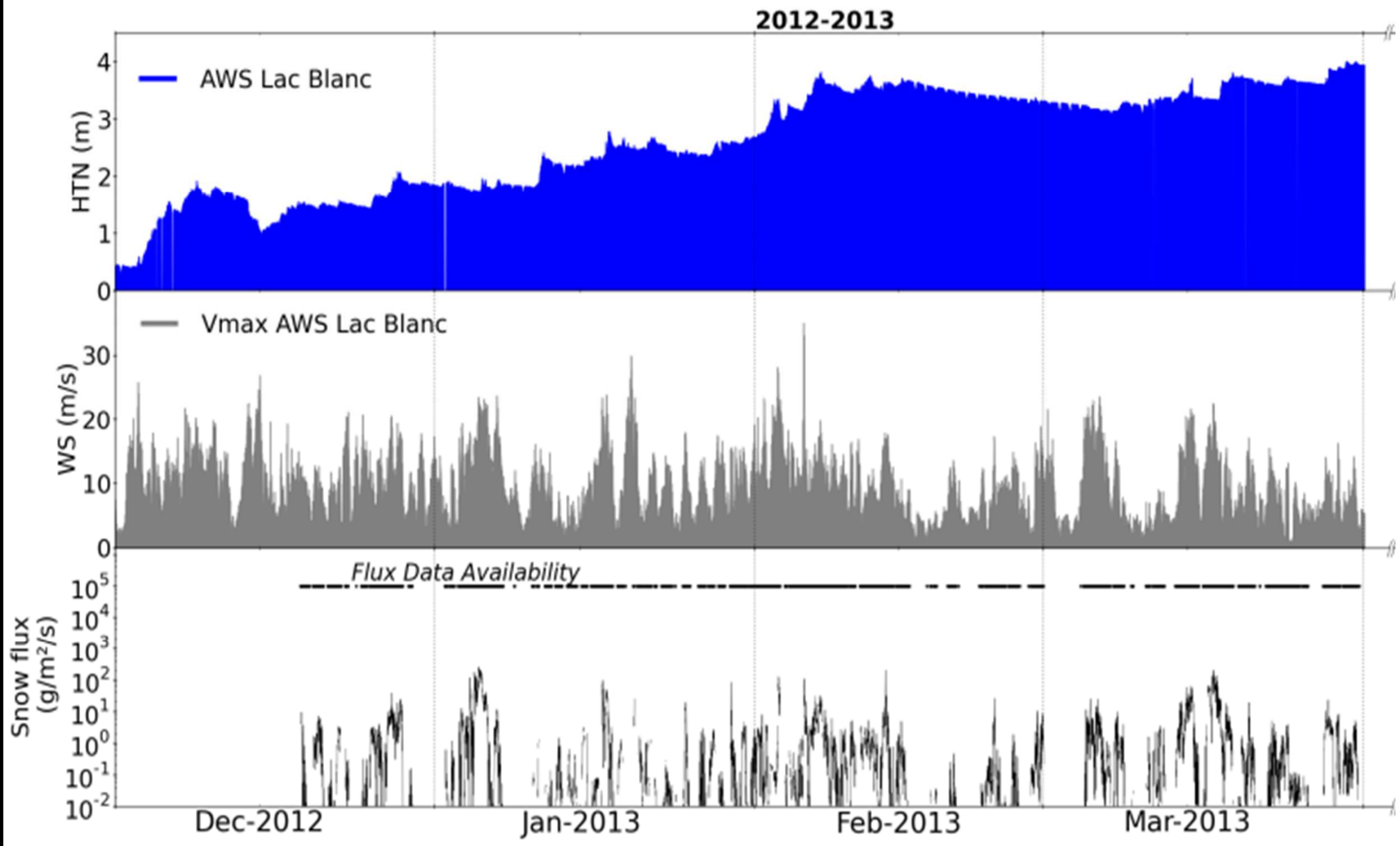
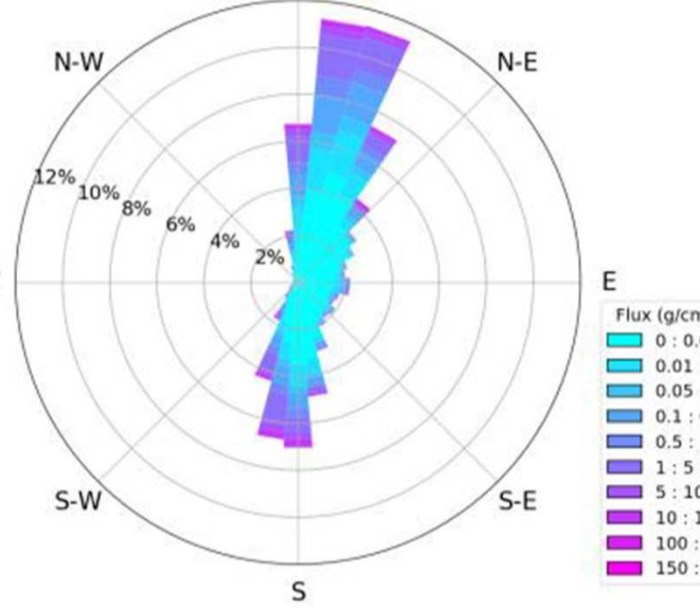


Wind Rose 2010-16



From SPC and wind, (assuming spherical particles with 917 kg/m<sup>3</sup>)

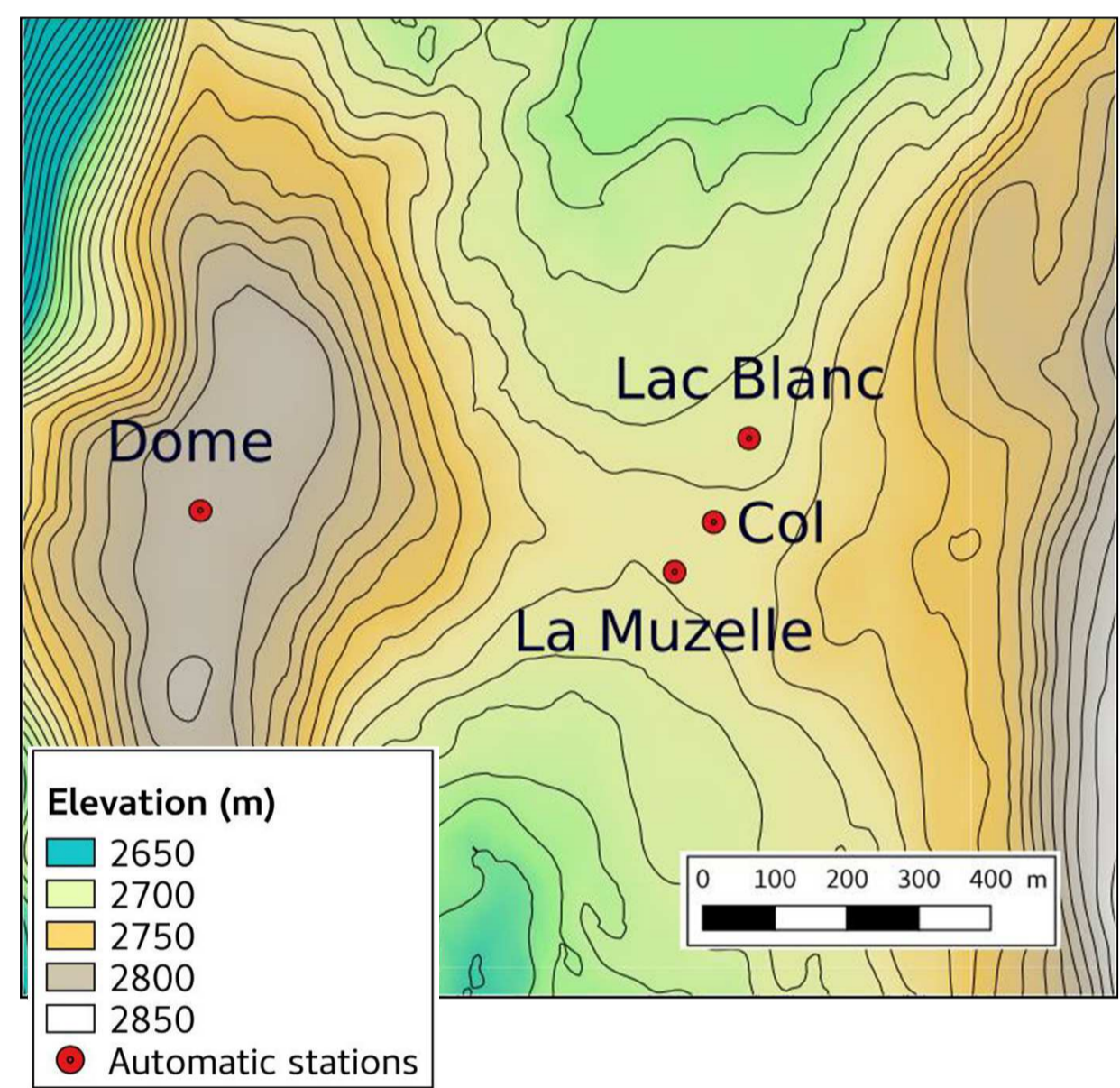
Average Snow flux 2010-16



### Database available:

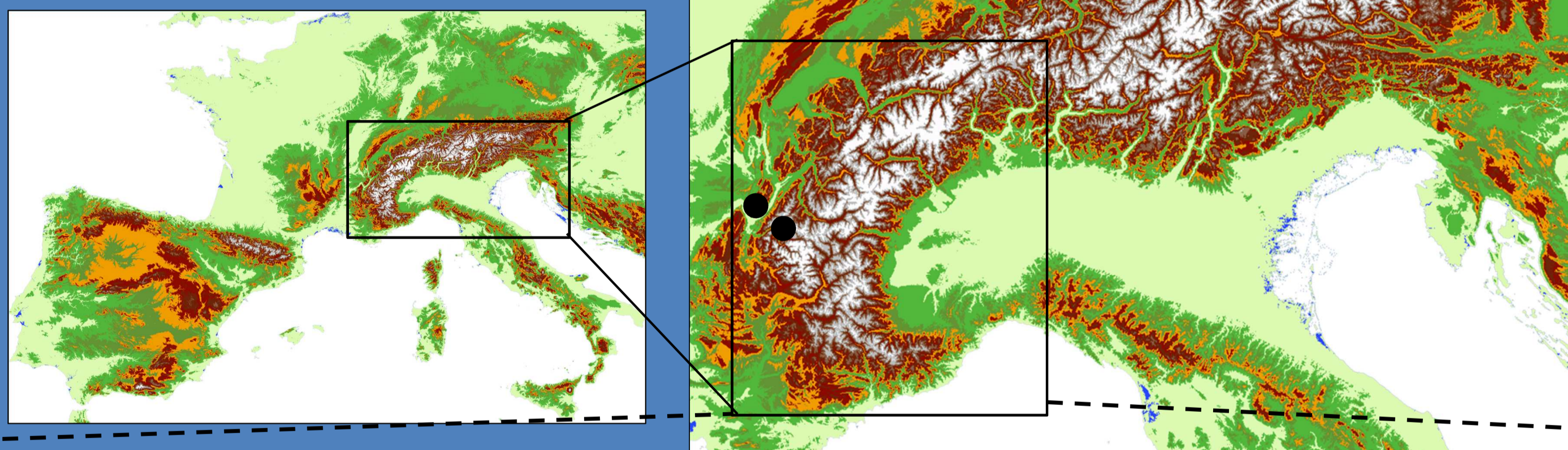
- AWS data for the four stations
  - Blowing Snow Occurrence Database + Snow fluxes
  - SAFRAN reanalysis + 25cm spatial resolution DEM
- doi:10.17178/CRYOBSCLIM.CLB.all [http://doi.osug.fr/public/CRYOBSCLIM\\_CLB/index.html](http://doi.osug.fr/public/CRYOBSCLIM_CLB/index.html)

Col du Lac Blanc experimental site



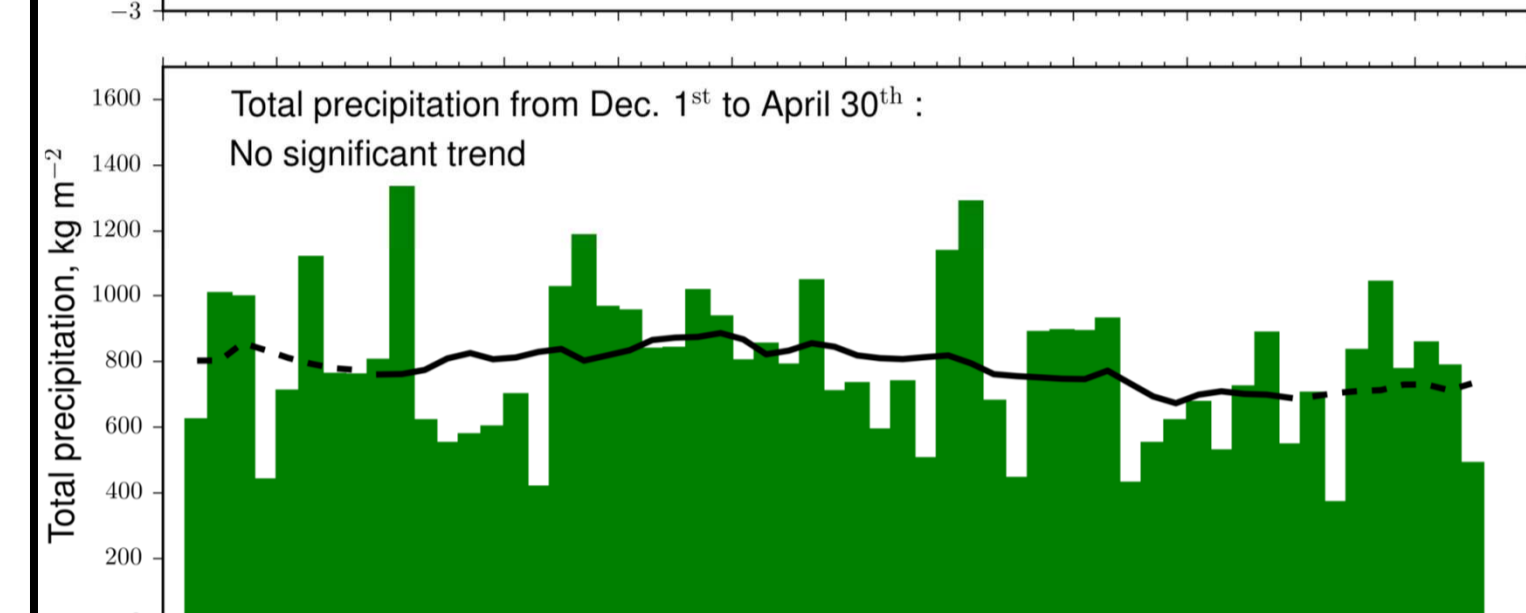
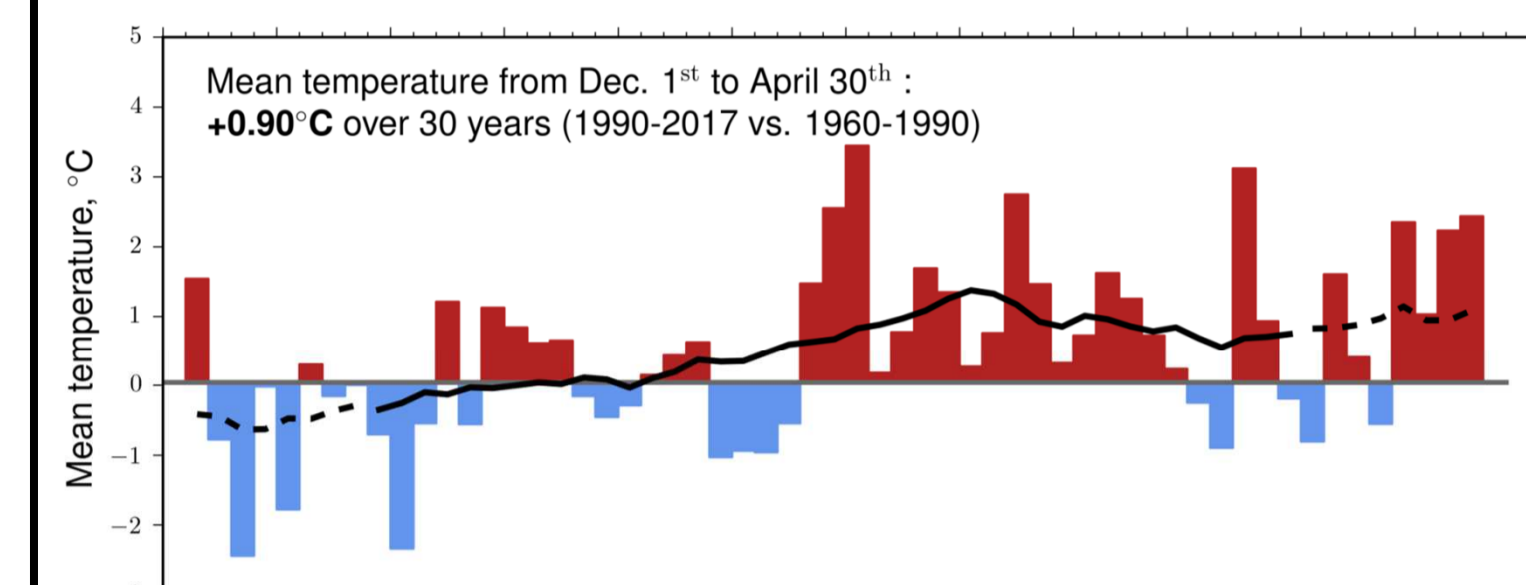
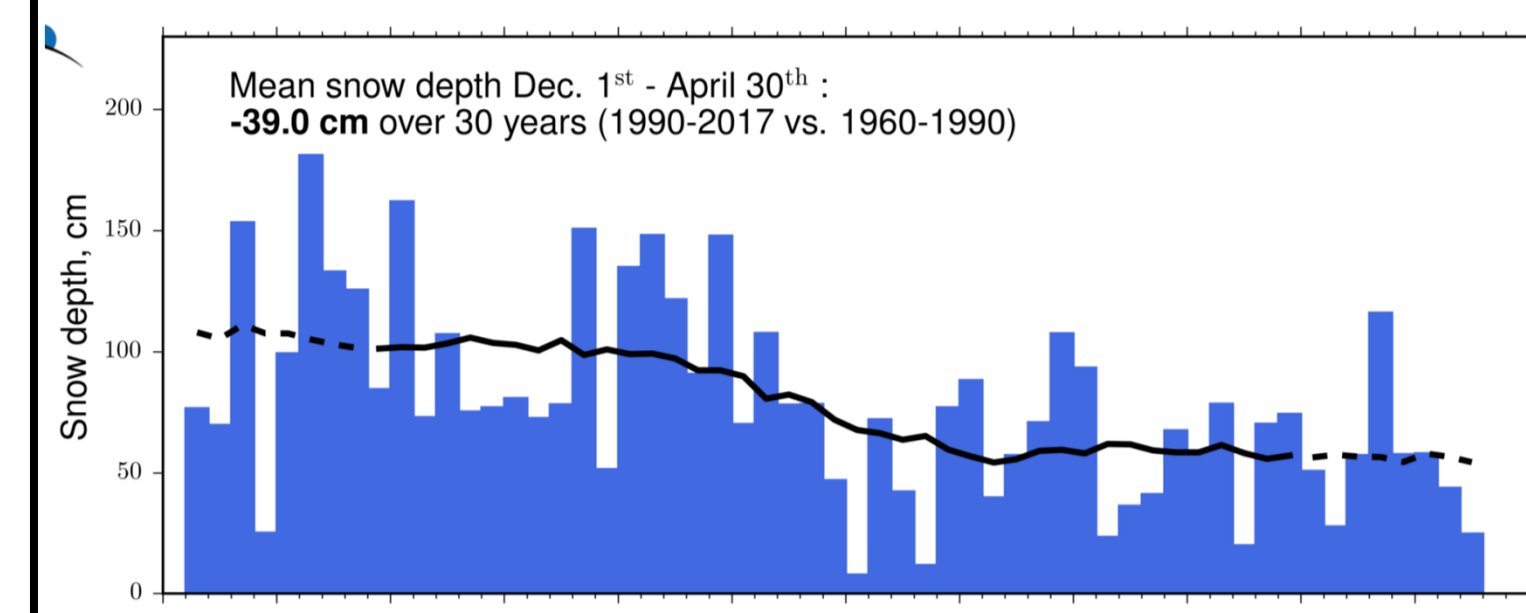
Guyomarc'h, G., Bellot, H., Vionnet, V., Naaim Bouvet, F., Déliot, Y., Fontaine, F., Pugliese, P., Naaim, M., and Nishimura, K.: A meteorological and blowing snow dataset (2000–2016) from a high-altitude alpine site (Col du Lac Blanc, France, 2720 m a.s.l.), *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2018-74>, in review, 2018.

## Study area location



## Col du Port

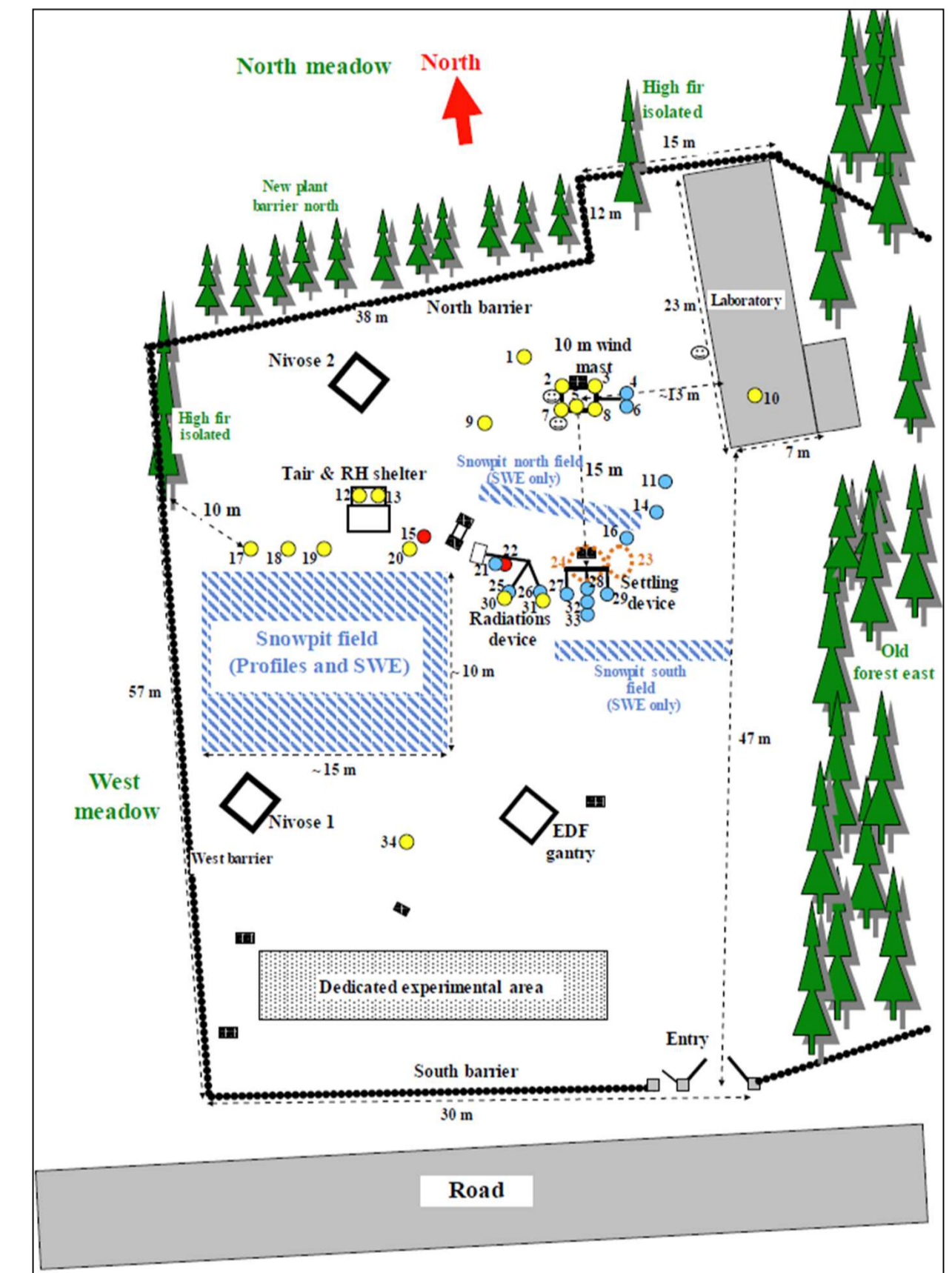
- Medium altitude site (1325 m)
- 57 years of snow/meteorological observations (1960-2017)
- Grassy meadow surrounded by mainly coniferous
- Snow and meteorological data
  - ✓ Hourly: 1993-2017
  - ✓ Daily: 1960-2017
- Weekly snow profiles (1993-2015)
- Radiation mask available
- Soil properties
- Validation/calibration of instruments
- Long-time trend analysis of precipitation, temperature and snow depth



### Database available:

- SWE, temperature long and short-wave radiation, humidity, solid/liquid precipitation, snow depth, soil temperature (several depths), wind speed and direction
- Database available: doi:10.17178/CRYOBSCLIM.CDP.2018 <http://dx.doi.org/10.17178/CRYOBSCLIM.CDP.2018>

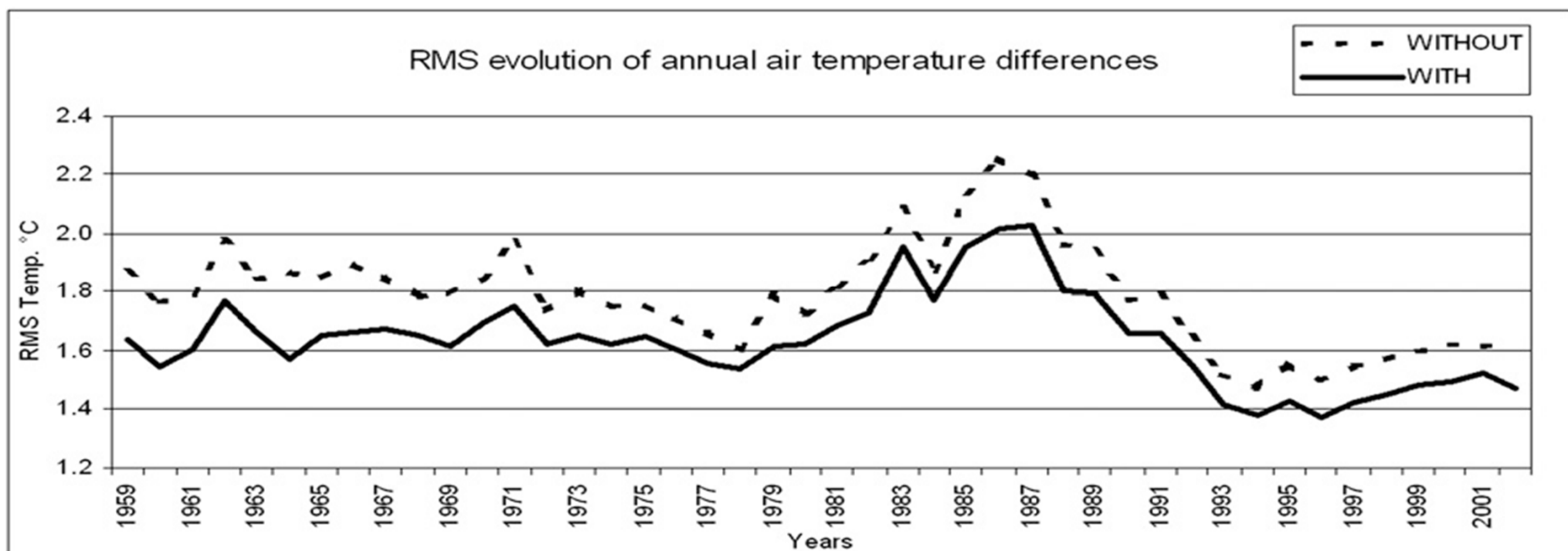
Col du Port schematic view



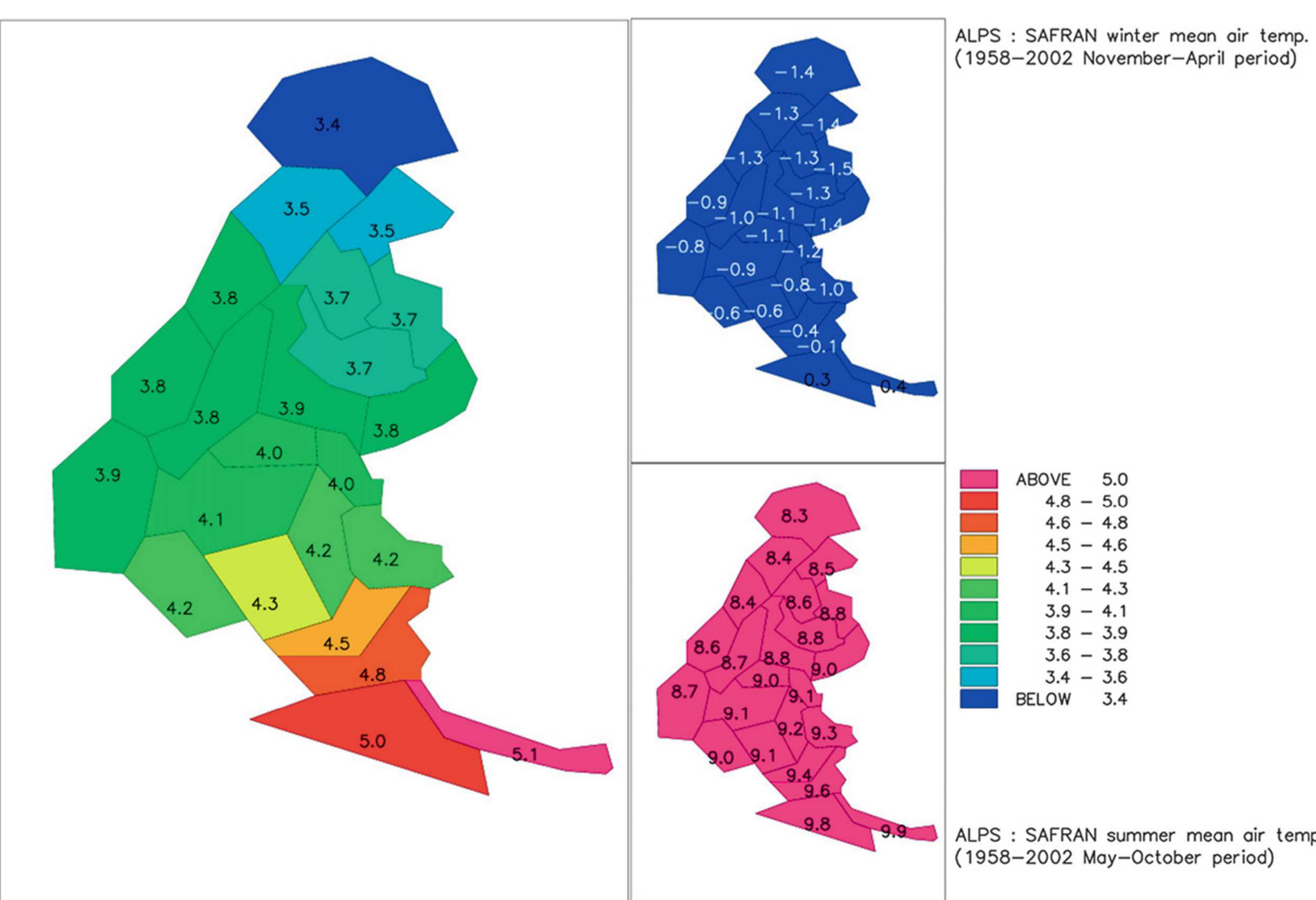
Lejeune, Y., Dumont, M., Panel, J.-M., Lafaysse, M., Lapalus, P., Le Gac, E., Lesaffre, B., and Morin, S.: 57 years (1960–2017) of snow and meteorological observations from a mid-altitude mountain site (Col de Porte, France, 1325 m alt.), *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2018-84>, in review, 2018.

## SAFRAN reanalysis

- 60-years of reanalysis : ERA-40 reanalysis (1958 to 1999), ARPEGE (2000 to 2018) and the best set of available in-situ meteorological obs.
- Semi-distributed model for 23 French Alps massifs in 300-m-altitude steps
- Hourly data for the main atmospheric parameters affecting snow surface (i.e., air temperature, wind speed, air humidity, cloudiness, snow and rain precipitation, long-wave radiation, and direct and scattered solar radiation)



ALPS : SAFRAN annual mean air temperature within the 1958–2002 period at 1800 m.a.s.l.



- It will be provided in near future SAFRAN – Crocus – MEPRA (S2M) reanalysis, now covering 60 years including the latest model versions

Durand, Y., Laternser, M., Giraud, G., Etchevers, P., Lesaffre, B., & Mérindol, L. (2009). Reanalysis of 44 yr of climate in the French Alps (1958–2002): methodology, model validation, climatology, and trends for air temperature and precipitation. *Journal of Applied Meteorology and Climatology*, 48(3), 429–449.

## Kalideos-Alpes

### Concept

- Prototyping, proof of concept based on remote sensing (optical, radar).
- Satellite data base gathered & pre-processed by CNES, made available for the program sites.
- Support from Kalideos sites PIs and CNES to the community gathered around Kalideos sites

### Data

- Several acquisitions since 2016 (Pleiades, Spot6/7; ALOS2; TanDEM-X)
- Available archive data:
  - ✓ In-situ measurements
  - ✓ Products from scientists
  - ✓ Users

[alpes.kalideos.fr](http://alpes.kalideos.fr)

55 members from different communities:

- ✓ Cryosphere,
- ✓ Gravity risks,
- ✓ vegetation

