

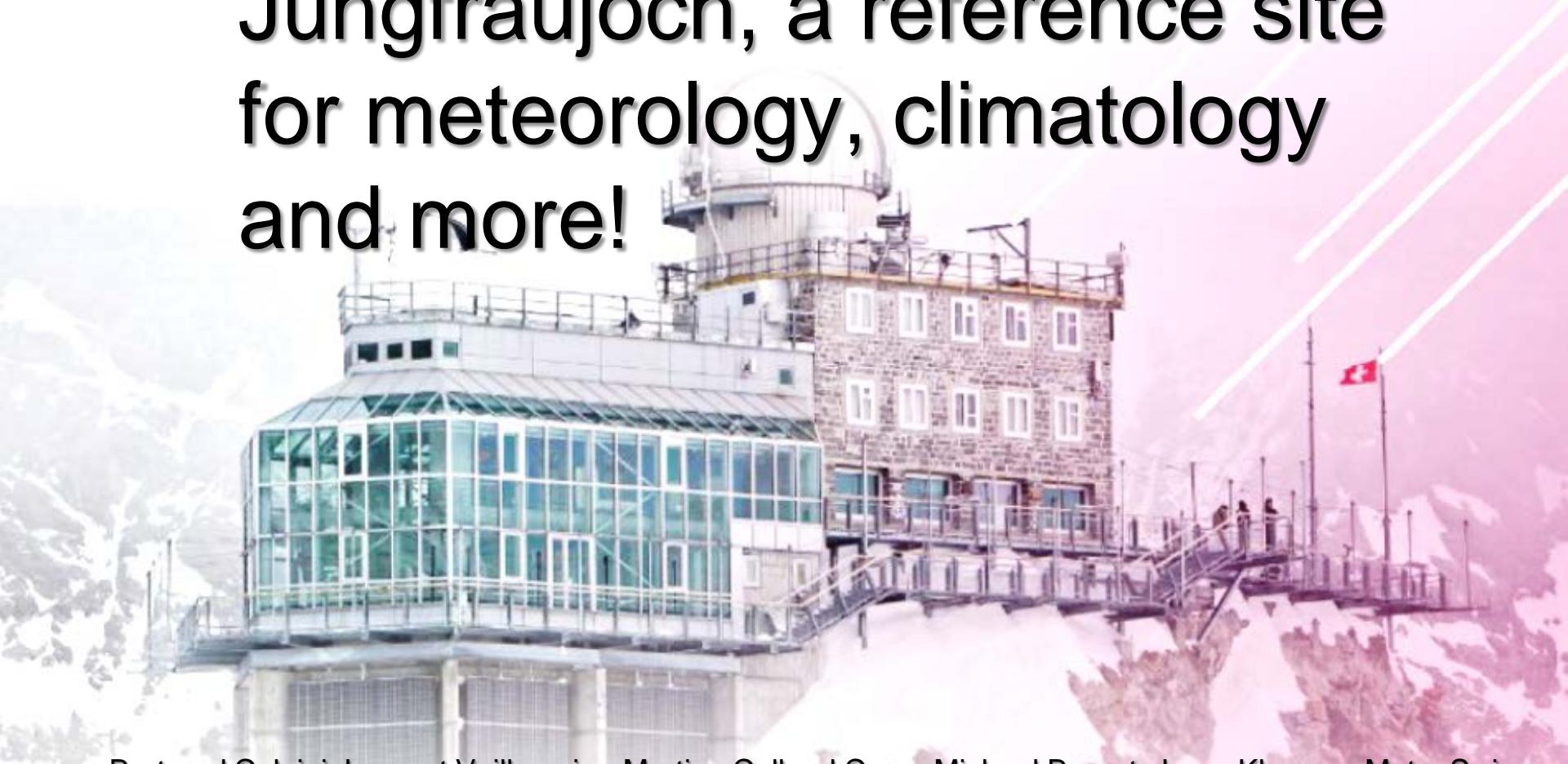


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Federal Office of Meteorology and Climatology MeteoSwiss

# Jungfraujoch, a reference site for meteorology, climatology and more!



Bertrand Calpini, Laurent Vuilleumier, Martine Collaud Coen, Michael Begert, Joerg Klausen, MeteoSwiss  
EPS Historic Site 2019, High Altitude Research Station Jungfraujoch  
University of Berne, 7 February 2019



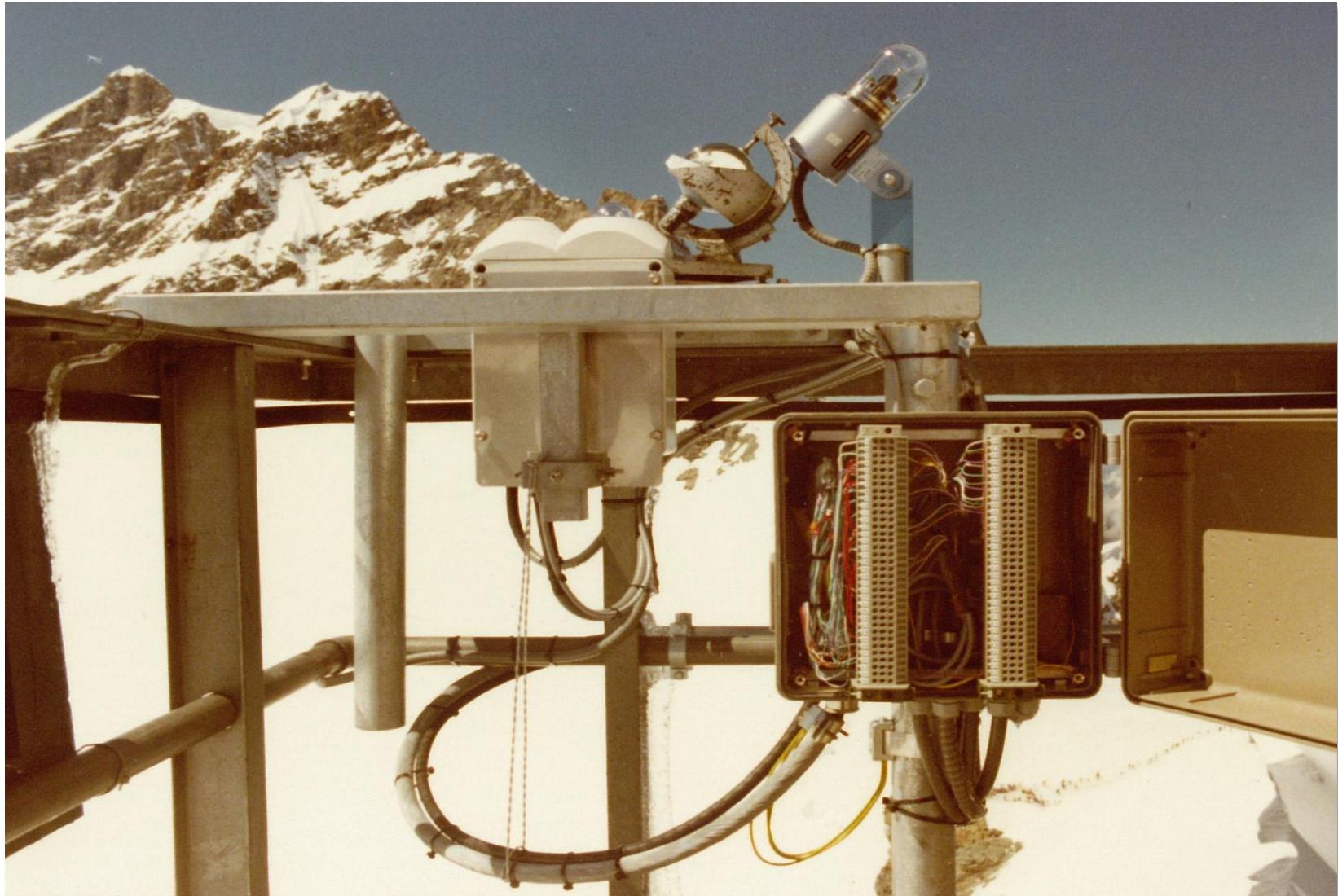
# Meteorological observations since 1930's



Photo: Fahrm



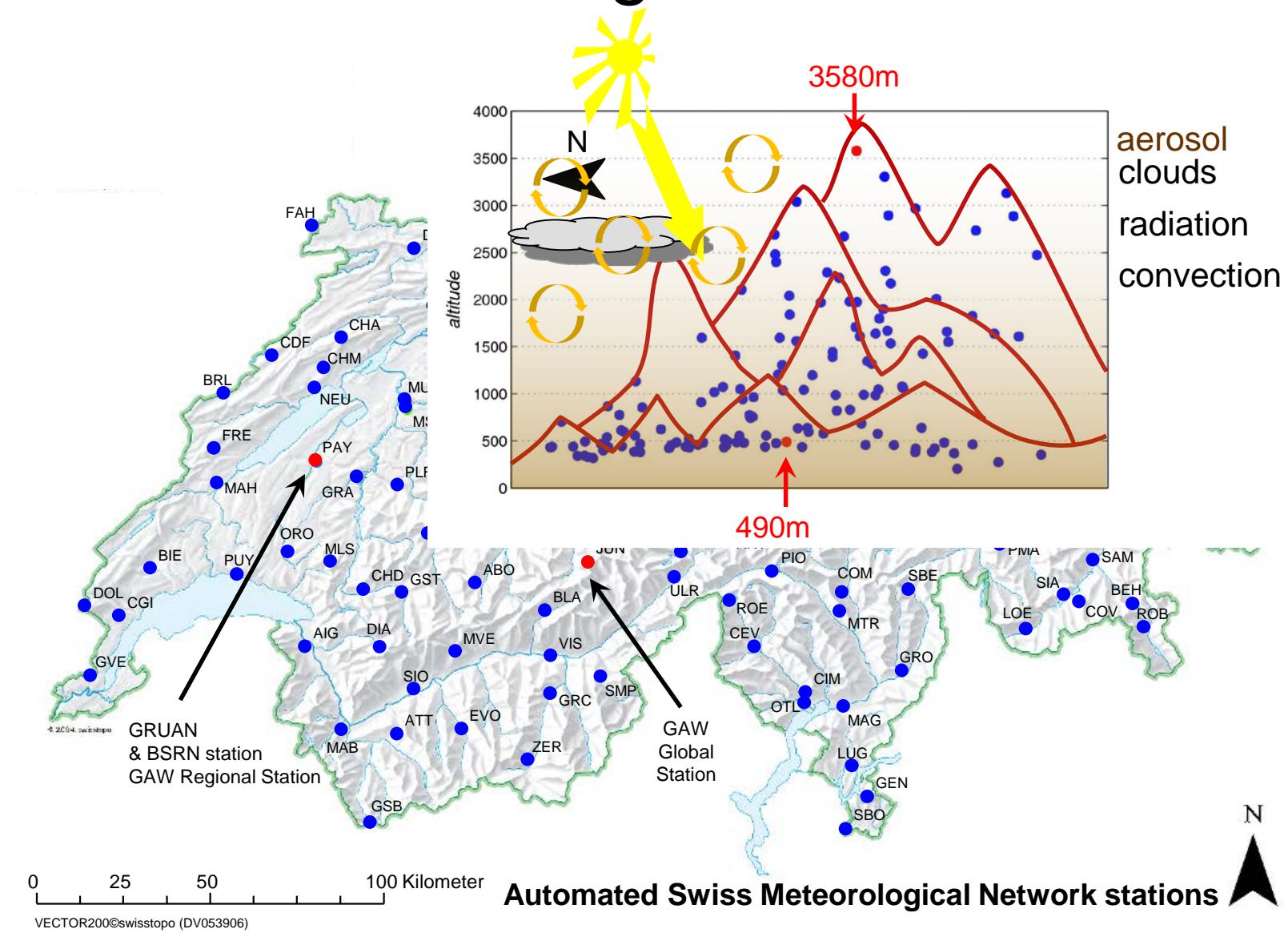
# Automated measurements since 1980







# Measurement integration

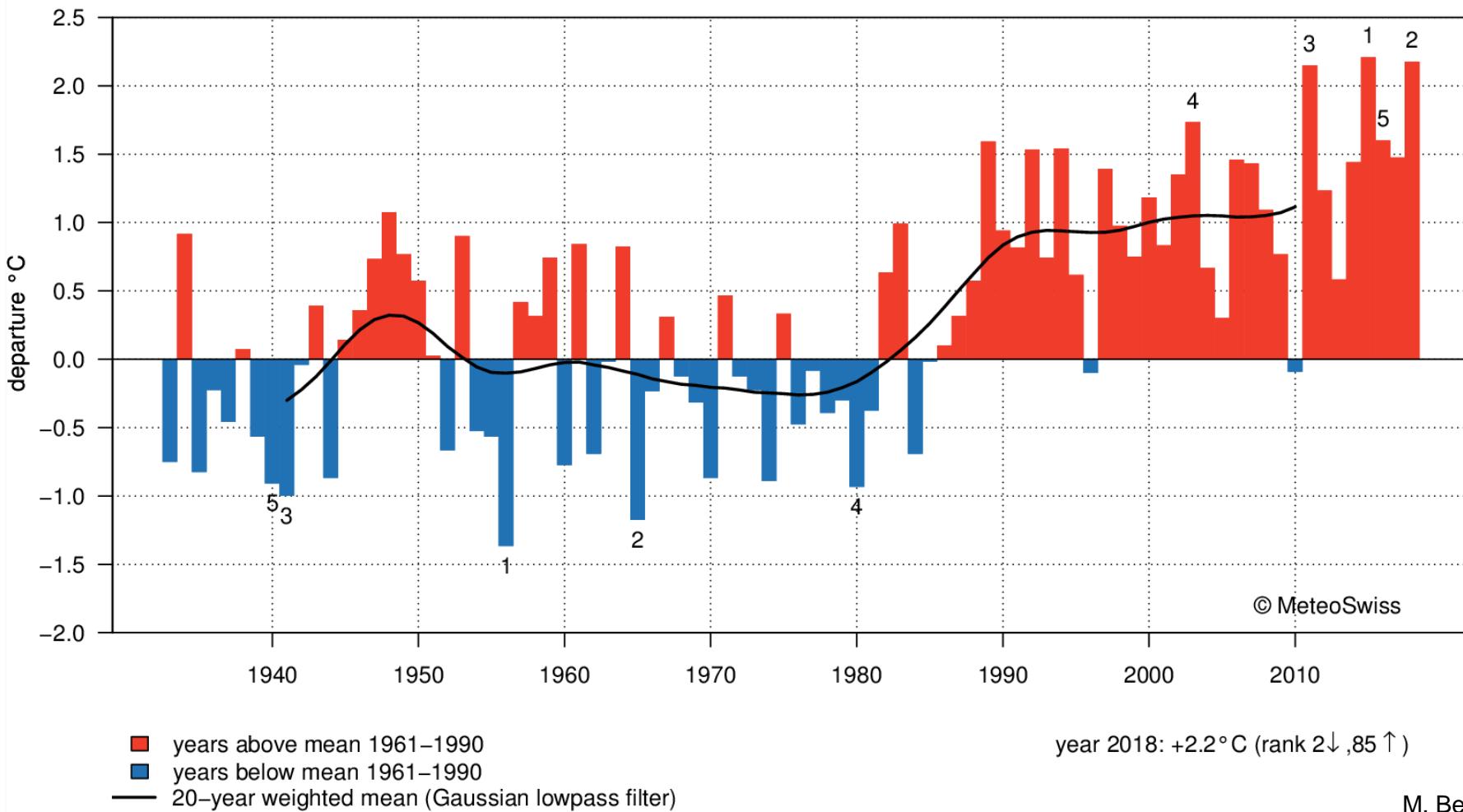




# Long term climatological record (I)

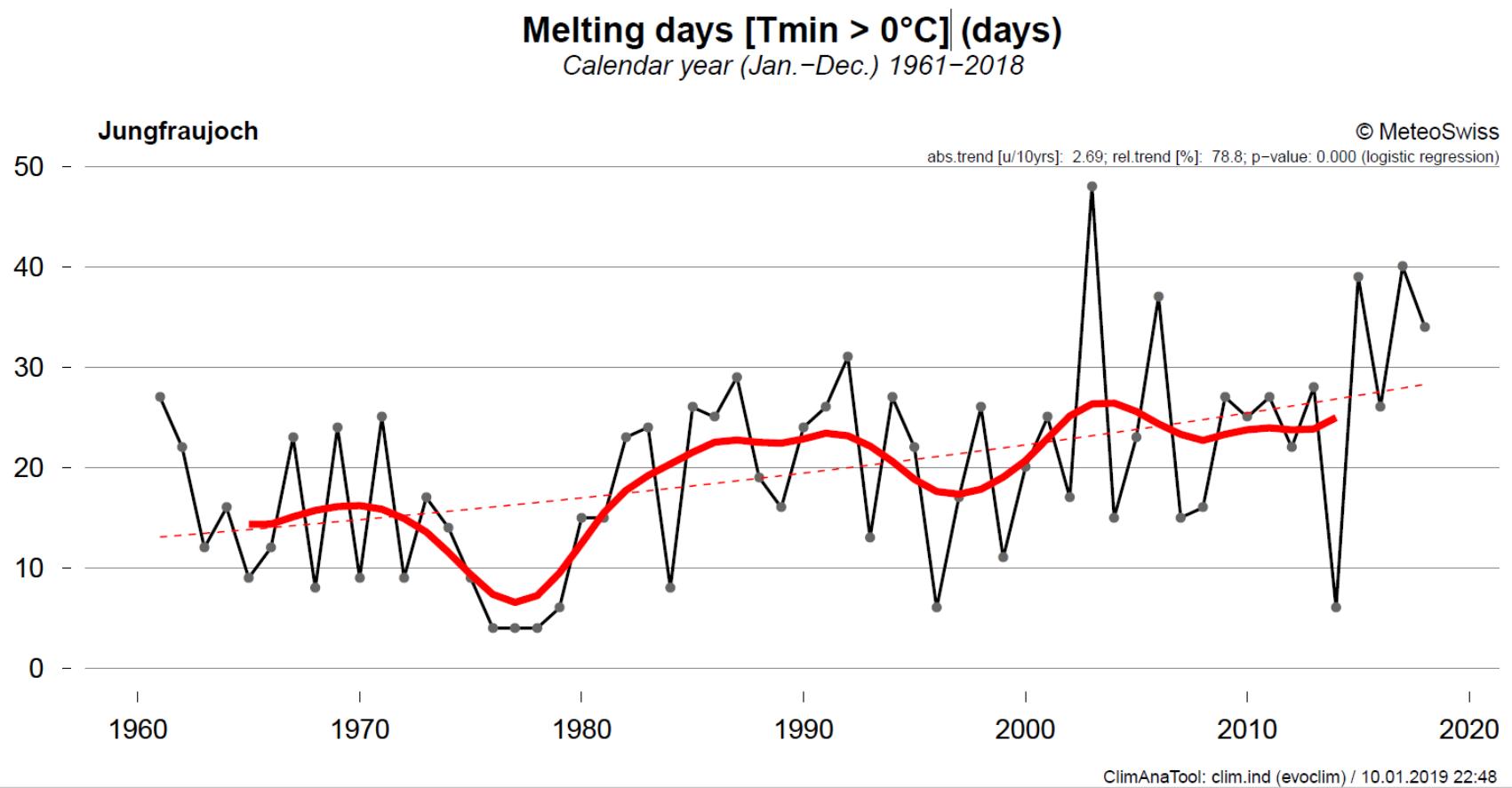
Annual temperature – Jungfraujoch – 1933–2018

departure from the mean 1961–1990



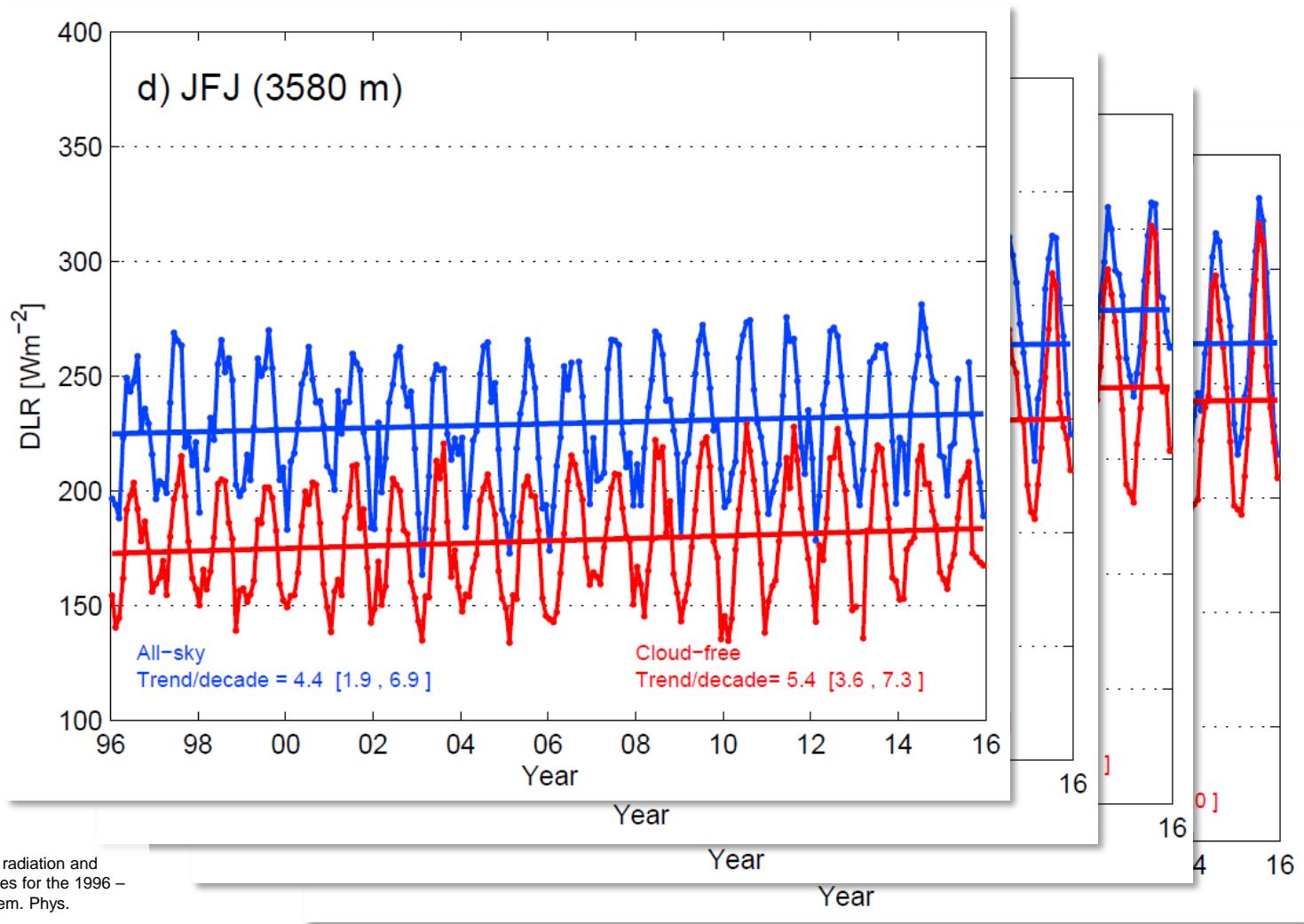


# Long term climatological record (II)





# 20 years of radiation monitoring



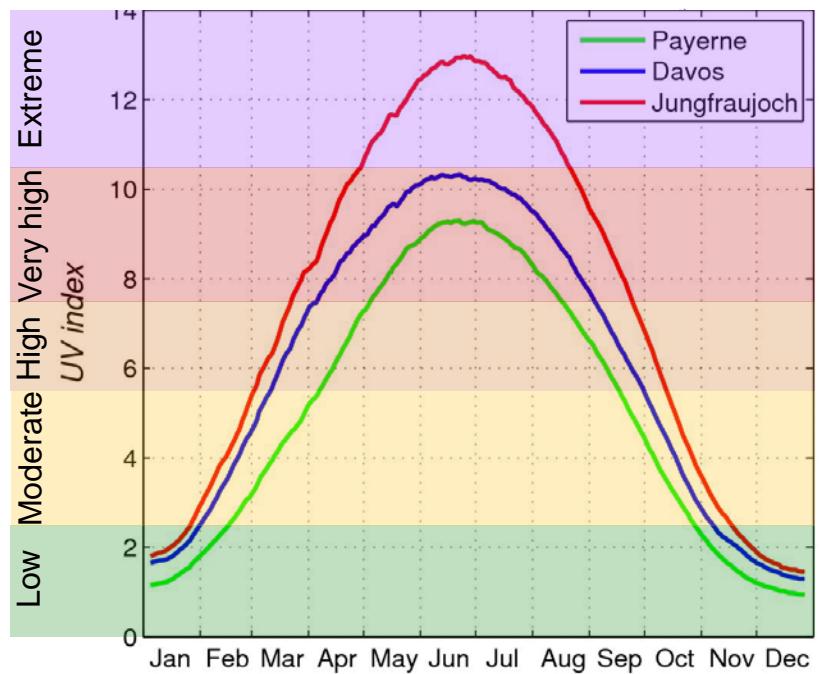
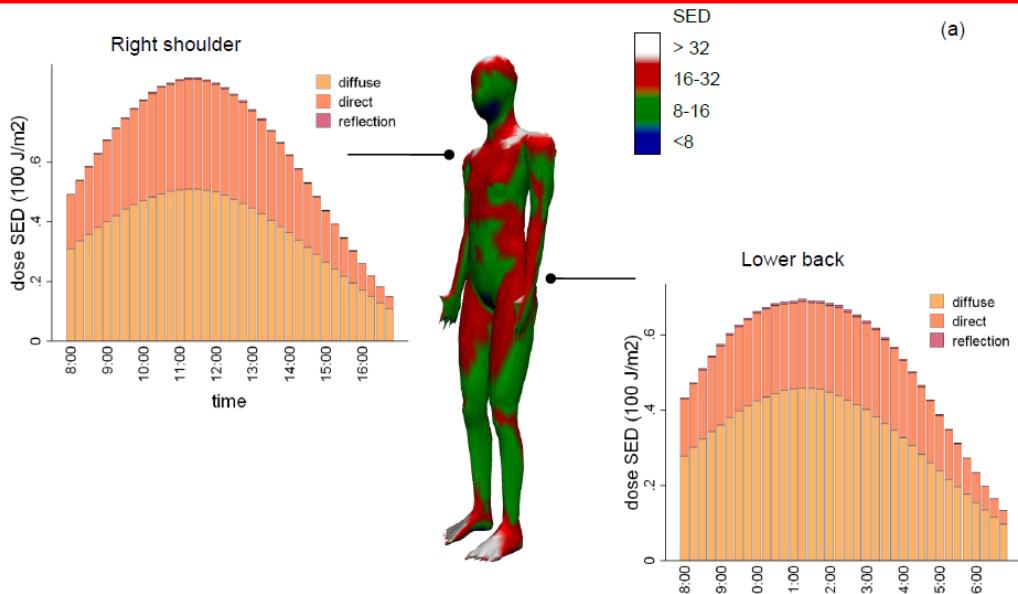
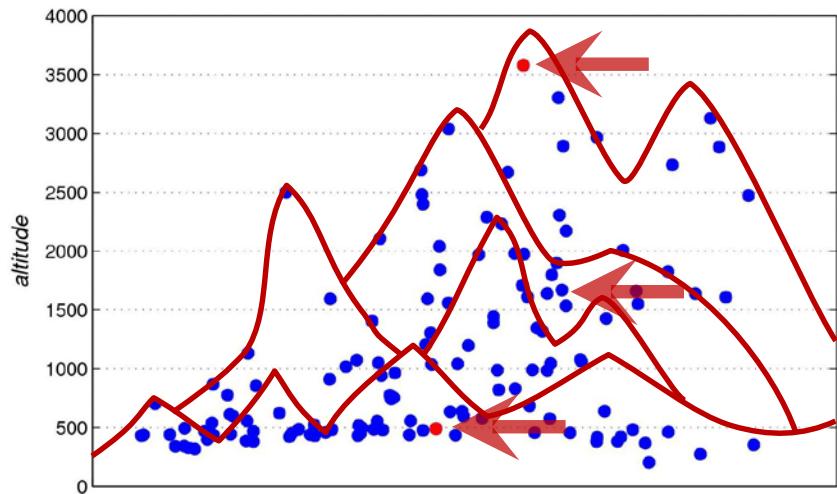
Nyeki, et al. 2019. Trends in surface radiation and cloud radiative effect at four Swiss sites for the 1996 – 2015 period, submitted to Atmos. Chem. Phys.



# UV index

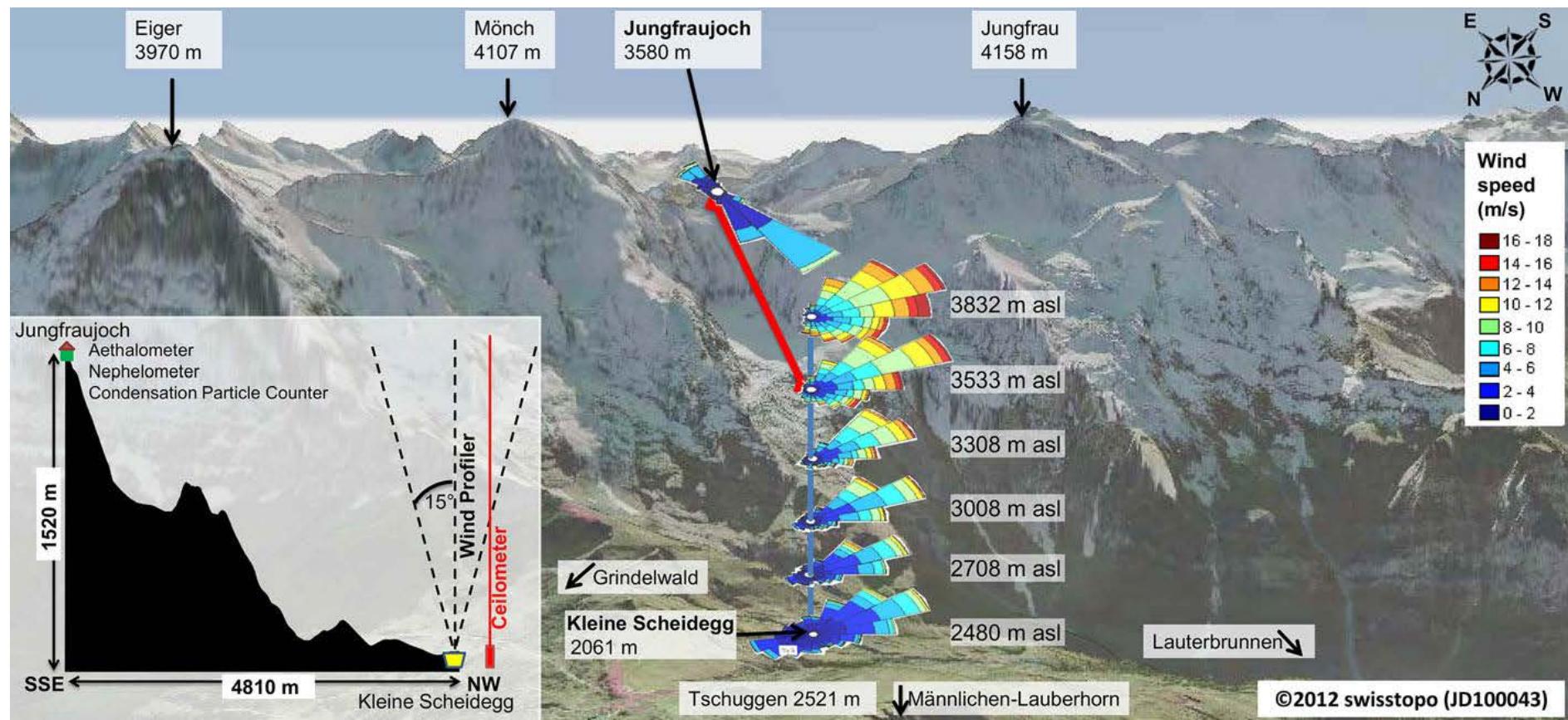
(a)

- Institute of Work and Health (IST), Lausanne
- Department of Information Systems, University of Geneva
- Cancer Epidemiology Unit, University of Lausanne
- Federal Office of Meteorology and Climatology MeteoSwiss





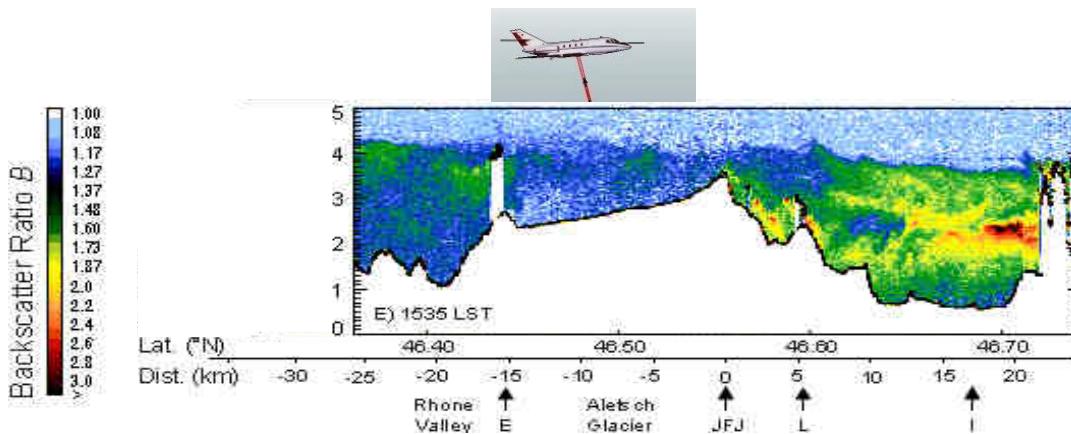
# Probing the boundary layer (I)



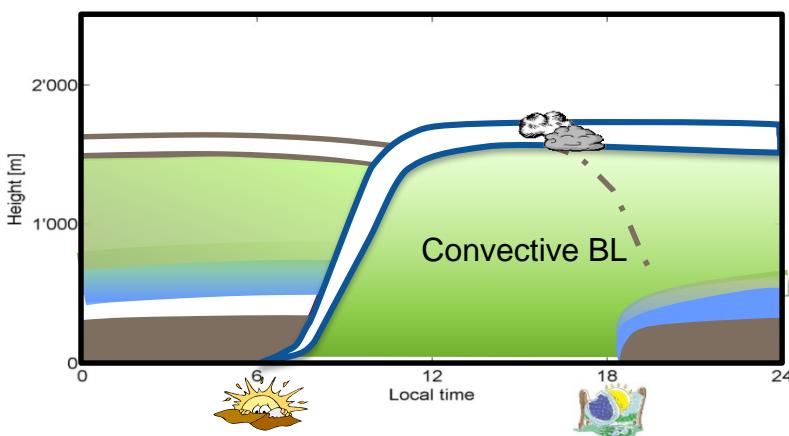
Ketterer et al., 2014. Investigation of the Planetary Boundary Layer in the Swiss Alps Using Remote Sensing and In Situ Measurements.  
*Boundary-Layer Meteorol.*, doi:[10.1007/s10546-013-9897-8](https://doi.org/10.1007/s10546-013-9897-8)



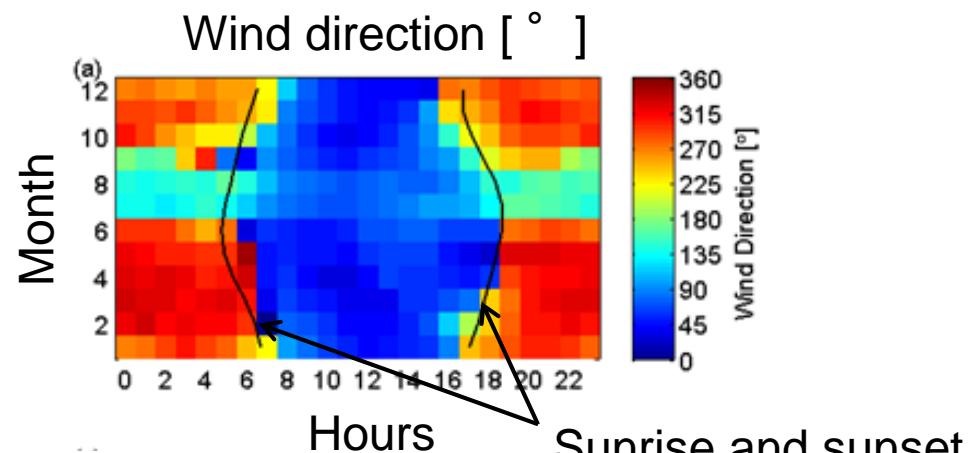
# Probing the boundary layer (II)



Airborne lidar above the JFJ range  
Nyeki et al., 2000



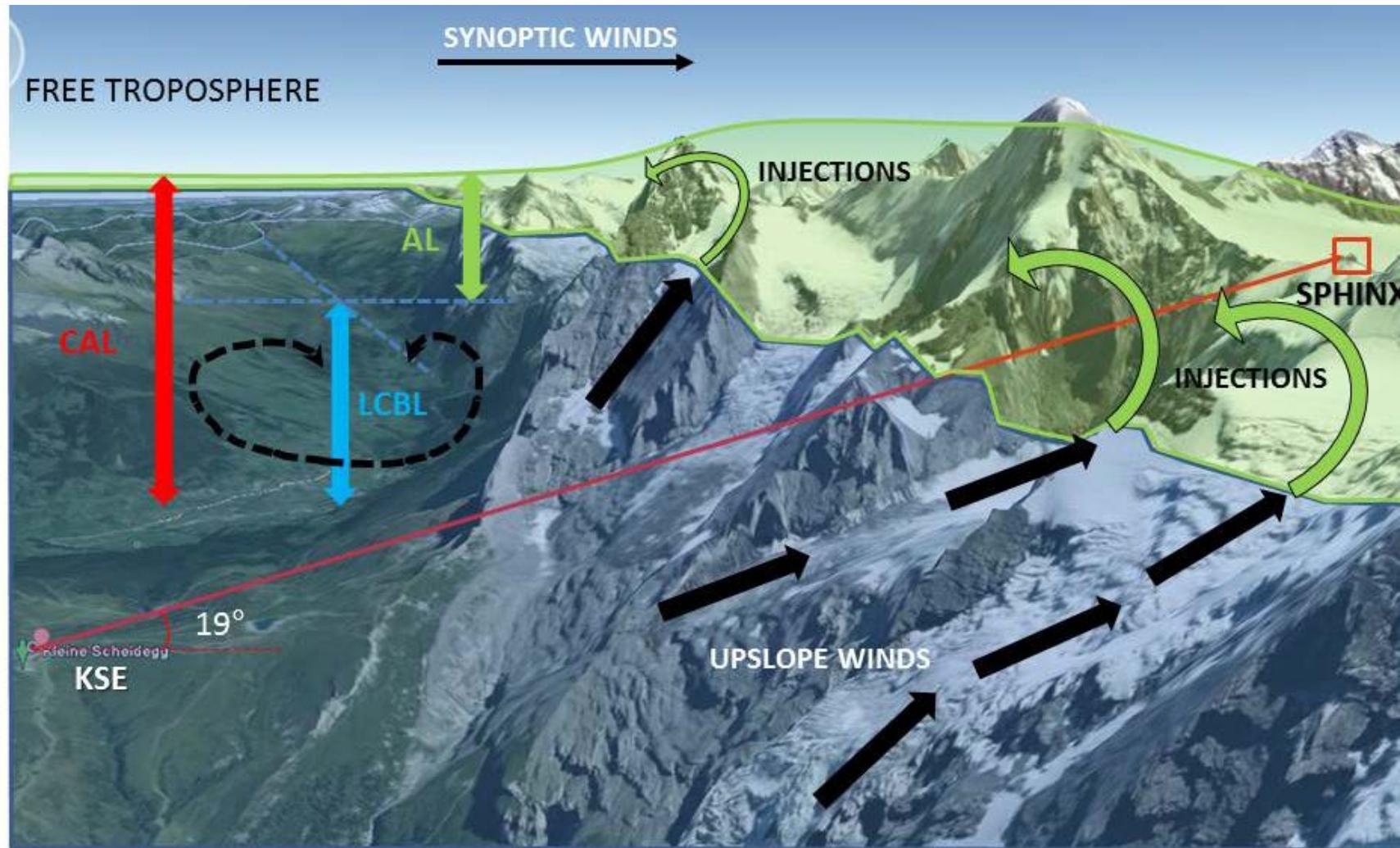
Usual CBL development,  
Collaud Coen et al., ACP 2014



Wind direction at Mukteshwar,  
Hooda et al., 2018



# Probing the boundary layer (III)



Poltera et al., 2017. PathfinderTURB: an automatic boundary layer algorithm. Development, validation and application to study the impact on in situ measurements at the Jungfraujoch, ACP, doi:[10.5194/acp-2016-962](https://doi.org/10.5194/acp-2016-962)

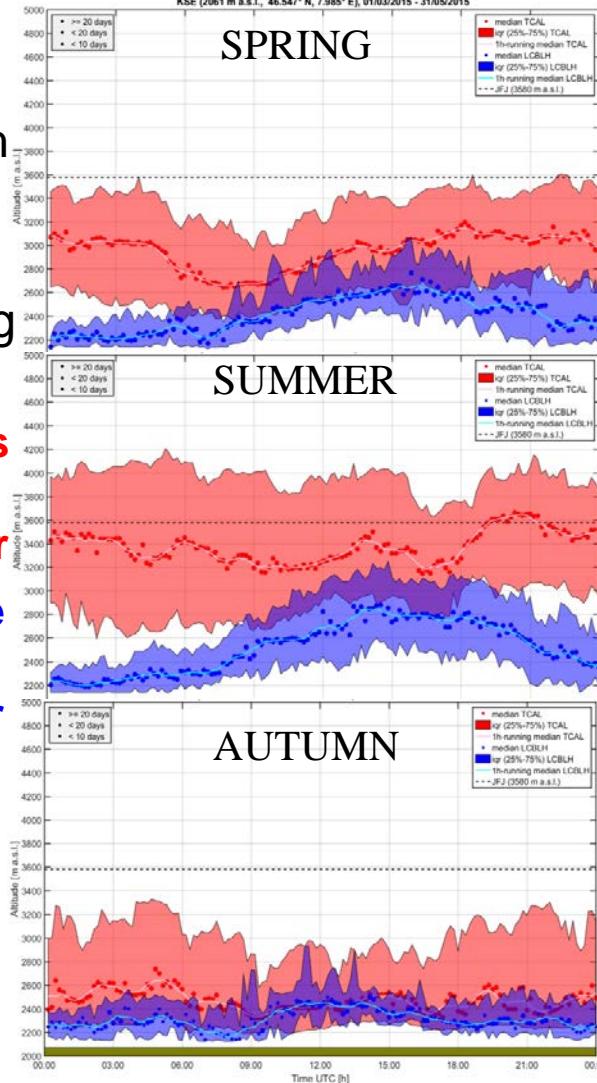


# Aerosol influence @ JFJ

2014-2015

KSE (2061 m a.s.l., 46.547° N, 7.985° E), 01/03/2015 - 31/05/2015

SPRING



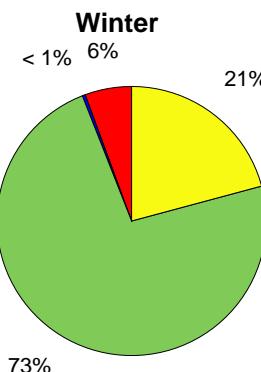
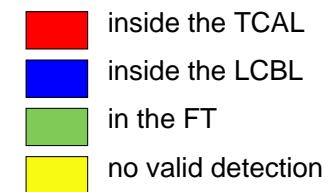
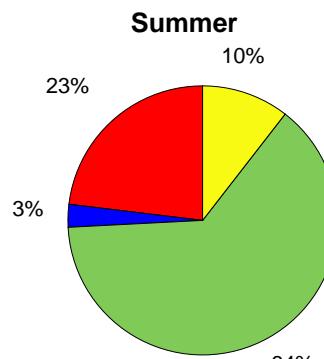
Jungfraujoch

Kl. Scheidegg

Continuous  
Aerosol  
Layer

Convective  
Boundary  
Layer

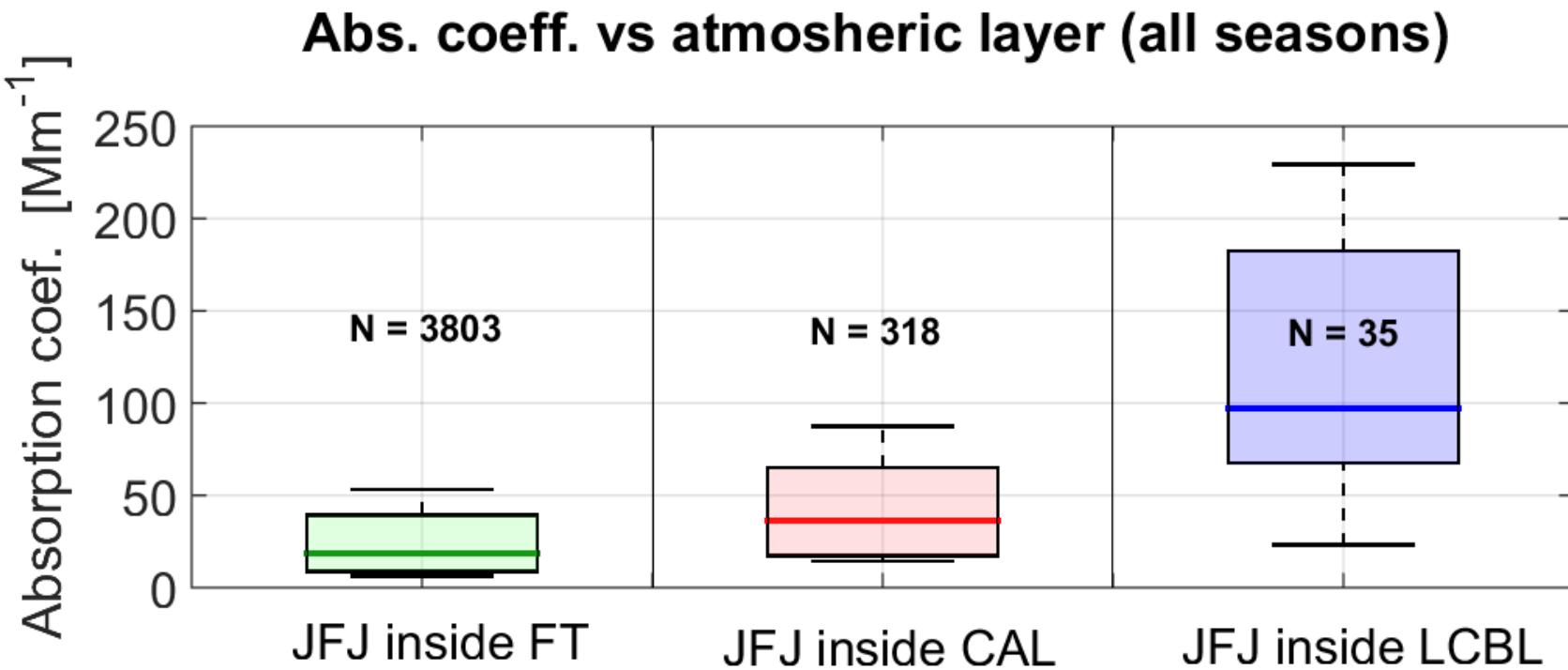
Climatology: 2014-2018





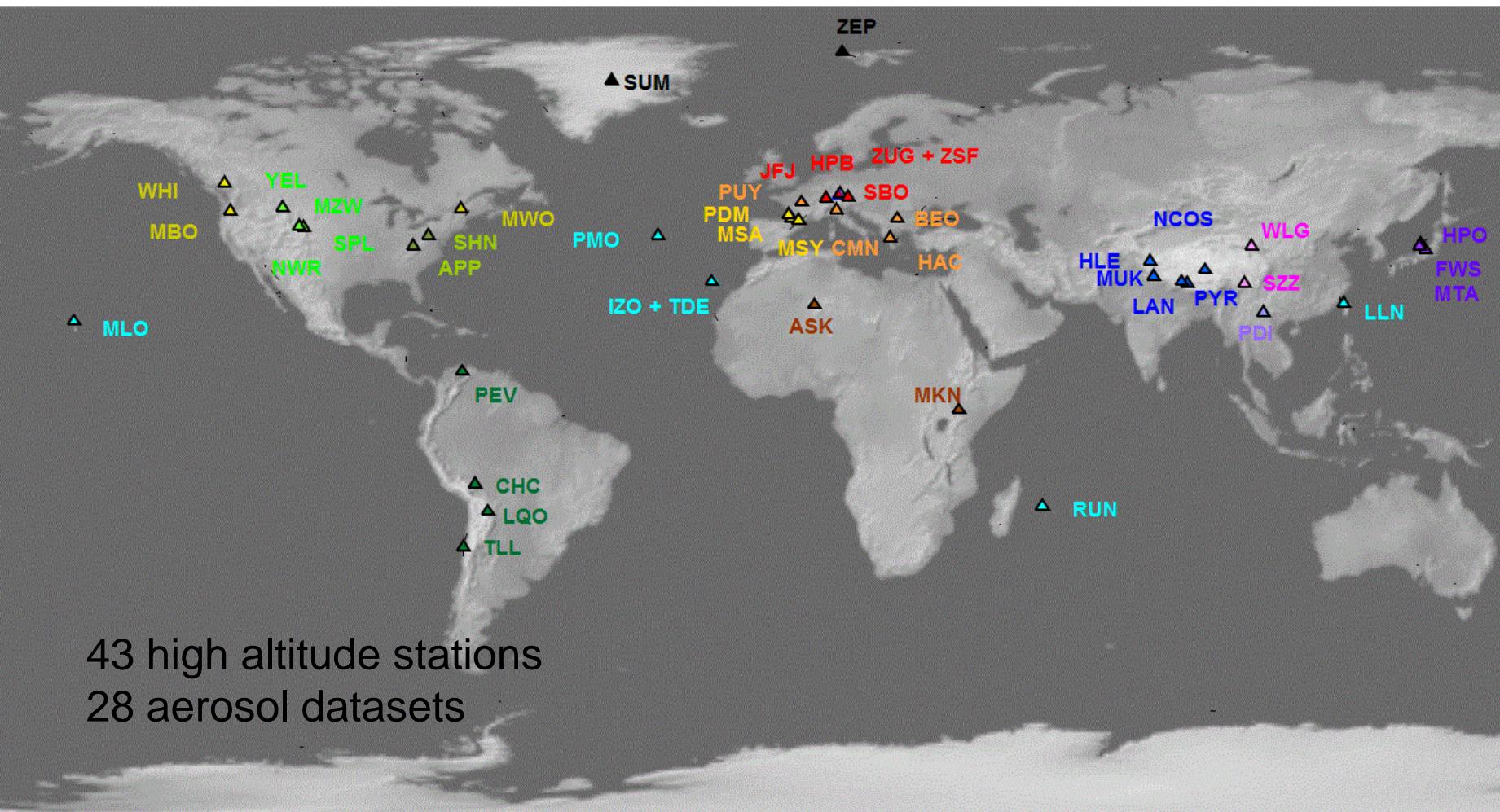
# Absorption coefficient vs air masses

N= 1 ceilometer profile over 30 min





# From JFJ to global high altitude stations



Collaud Coen et al., 2018. Identification of topographic features influencing aerosol observations at high altitude stations, Atmos. Chem. Phys., doi:[10.5194/acp-18-12289-2018](https://doi.org/10.5194/acp-18-12289-2018)



# TopoIndex Principles

The site has low ABL influence if :

1. the station is one of the highest points in the mountainous massif,
2. there is a large altitude difference between the station and adjacent valleys, plateaus or the average domain elevation
3. the slopes around the station are steep
4. the «drainage basin» for air convection is small

Low ABL influence



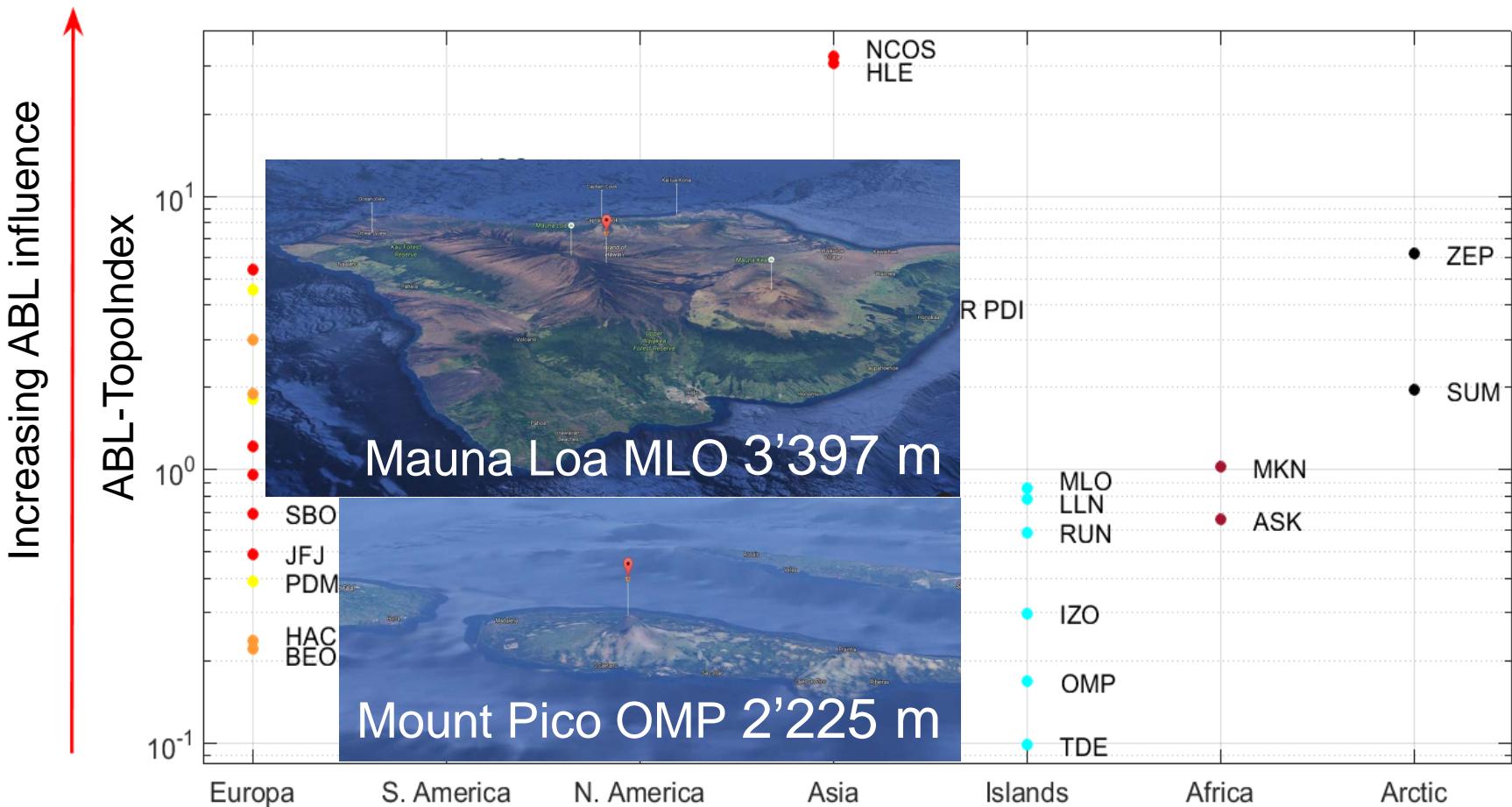
Higher ABL influence



Collaud Coen et al., 2018. doi:[10.5194/acp-18-12289-2018](https://doi.org/10.5194/acp-18-12289-2018)



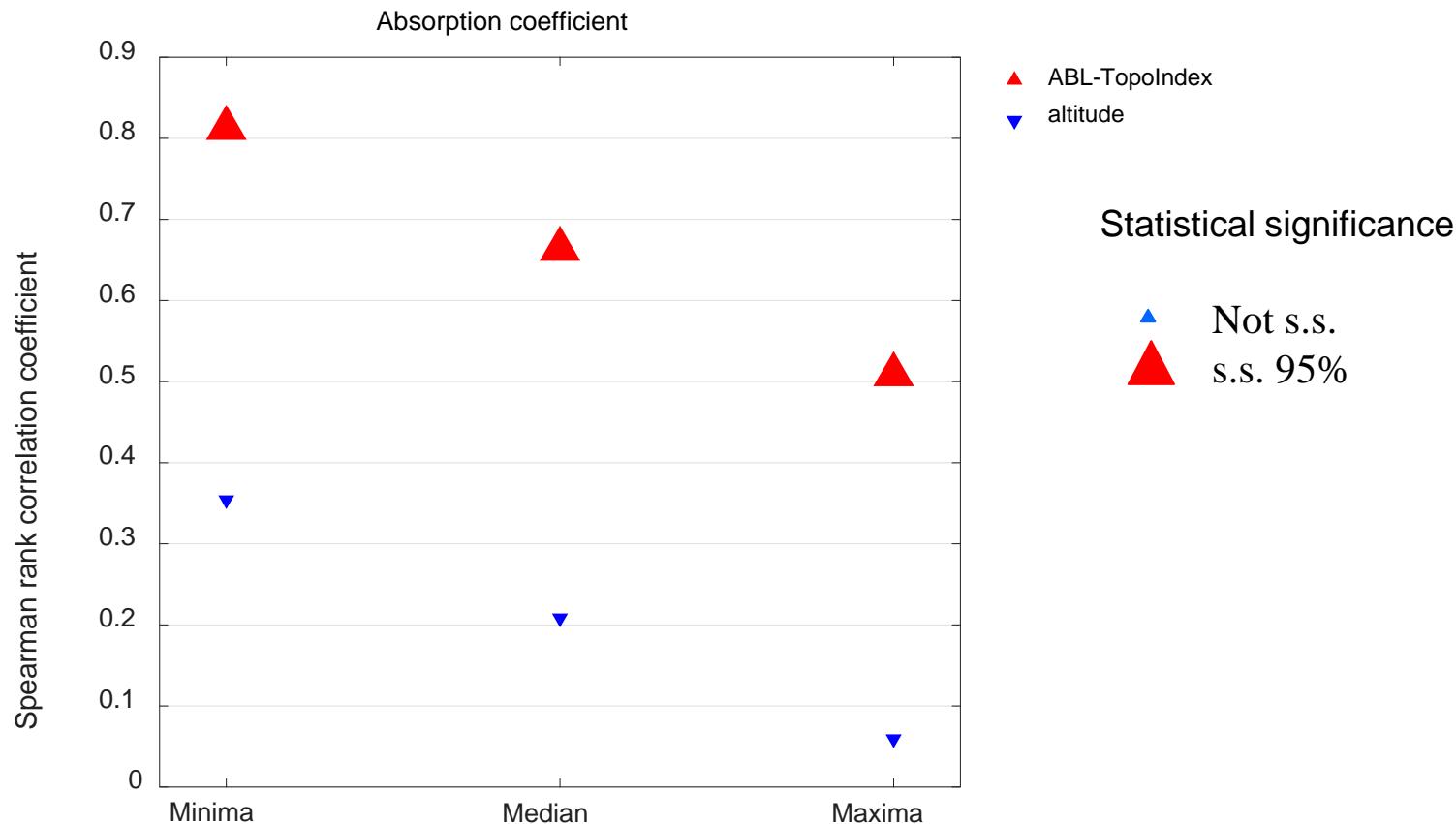
# ABL-TopolIndex: Station Ranked by ABL influence



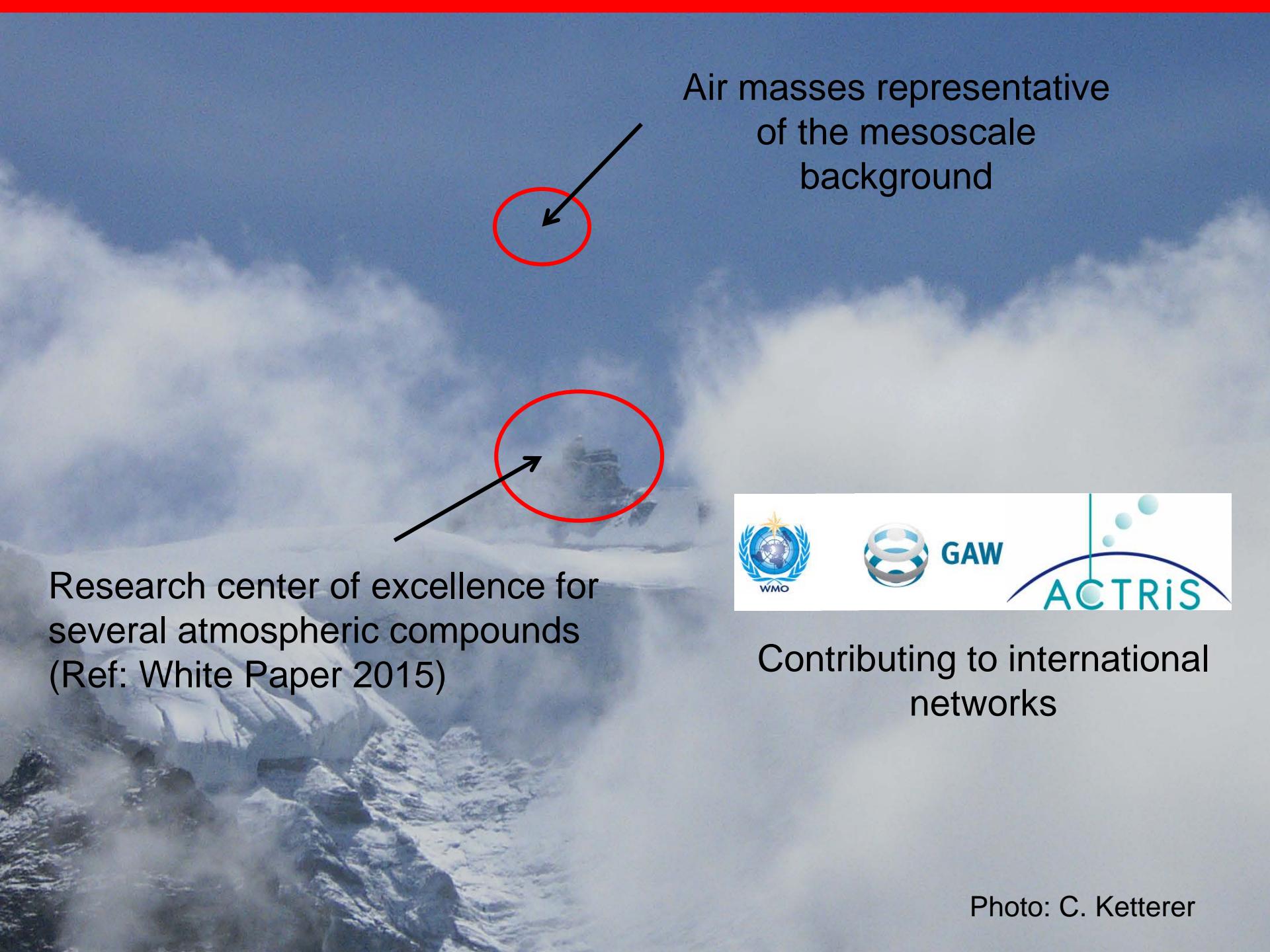
Collaud Coen et al., 2018. doi:[10.5194/acp-18-12289-2018](https://doi.org/10.5194/acp-18-12289-2018)



# Validation with aerosol concentrations (all “aerosol stations” / 28 )



Collaud Coen et al., 2018. doi:[10.5194/acp-18-12289-2018](https://doi.org/10.5194/acp-18-12289-2018)



Research center of excellence for several atmospheric compounds  
(Ref: White Paper 2015)

Air masses representative of the mesoscale background



Contributing to international networks

Photo: C. Ketterer



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