Towards a scale-independent fractional snow-covered area parameterization (*fSCA*) for complex terrain

N. Helbig[1], Y. Bühler[1], L. Eberhard[1], C. Deschamps-Berger[2,3], S. Gascoin[2], M. Dumont[3], J. S. Deems[4], T. Jonas[1]

1 WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland
2 Centre d'Etudes Spatiales de la Biosphère (CESBIO), Toulouse Cedex 9, France
3 Univ. Grenoble Alpes, Université de Toulouse, Météo-France, CNRS, CNRM, Centre d'Études de la Neige, Grenoble, France
4 National Snow and Ice Data Center, University of Colorado, Boulder, CO, USA

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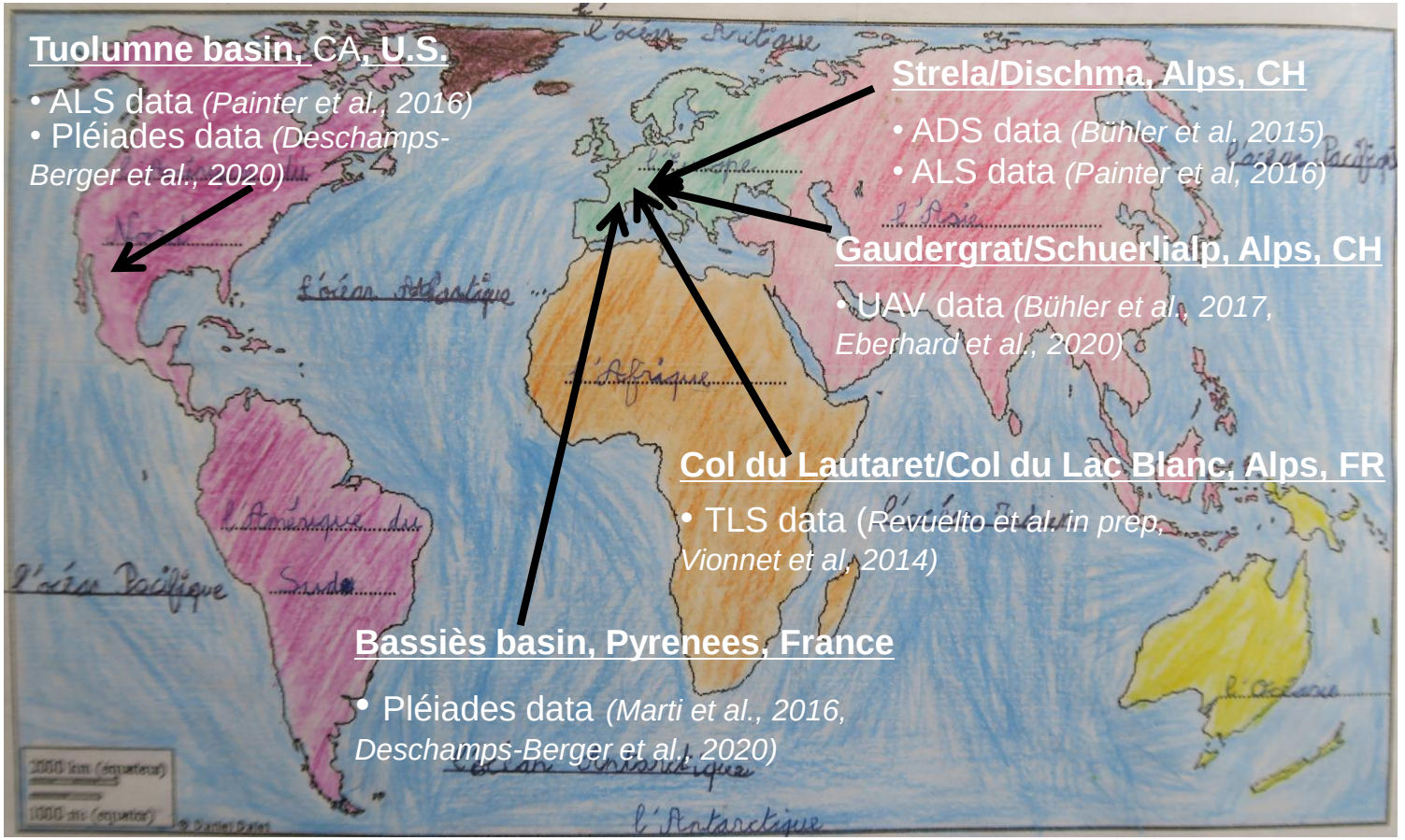
Towards a scale-independent peak of winter *fSCA* parameterization

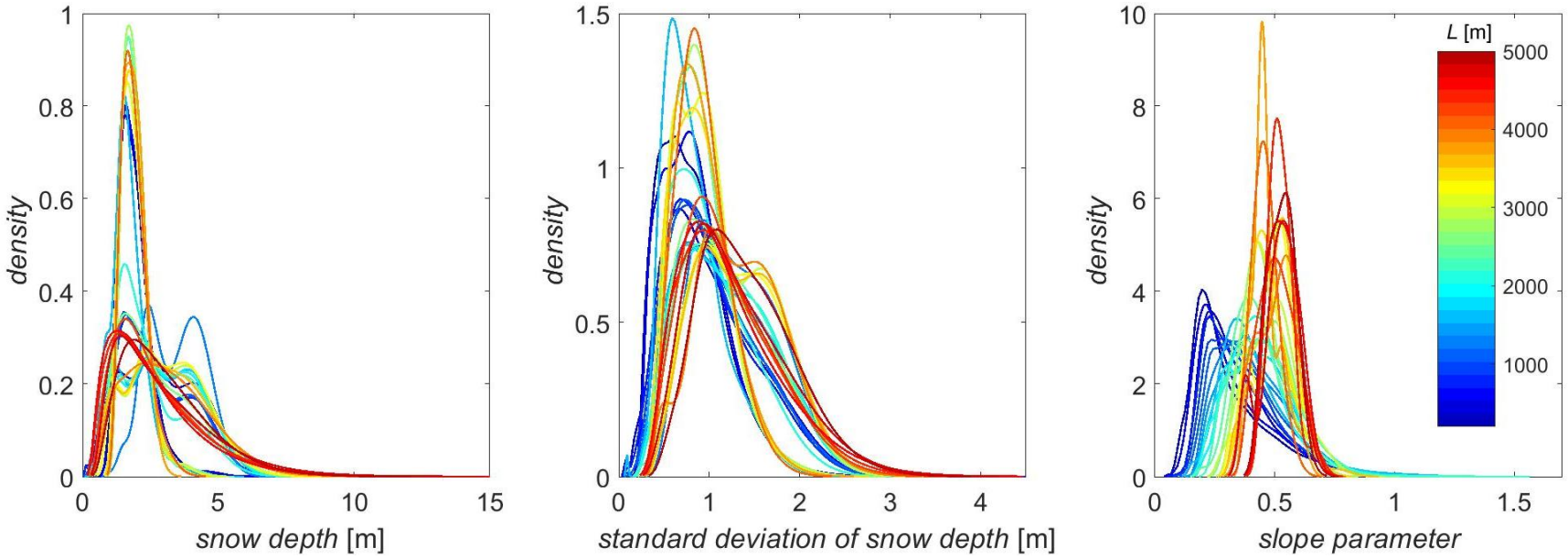
…we compiled snow depth data sets from various sites and platforms:



map from https//vie-de-maitresse.ek.la

Towards a scale-independent peak of winter *fSCA* parameterization

…we compiled snow depth data sets with a range in spatial snow depth variability and topographic characteristics in domain sizes *L*:



- *L* is the *domain size* equivalent to the coarse grid cell size for which *fSCA* is derived
- Variables such as *snow depth* or *slope* are spatial means per domain size *L*

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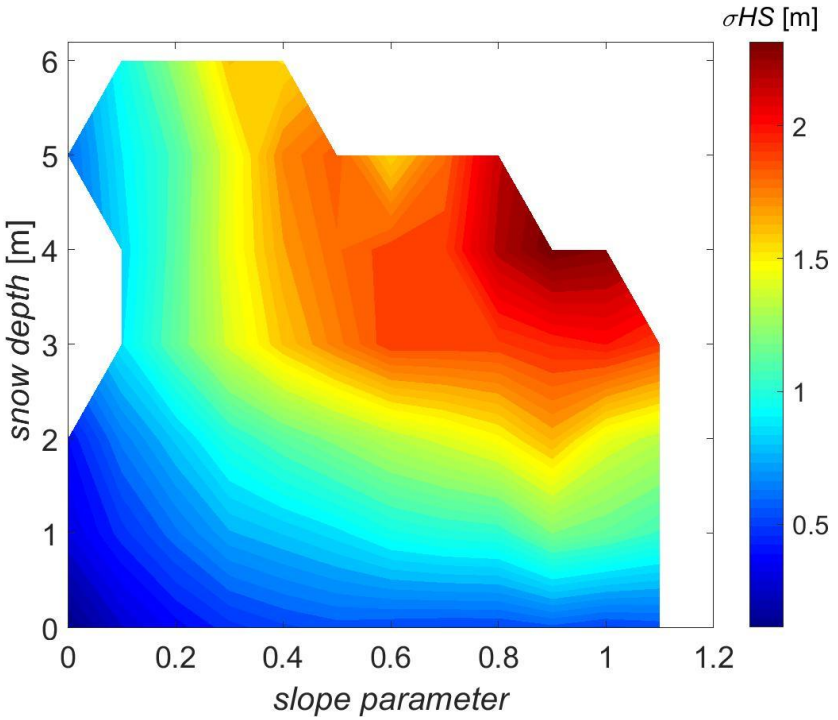
…we compiled different snow depth data sets to best describe the dominant topographic impacts shaping the spatial snow depth variability:



• *snow depth* and *a slope related parameter* are the main scaling parameter for the spatial variability of snow depth

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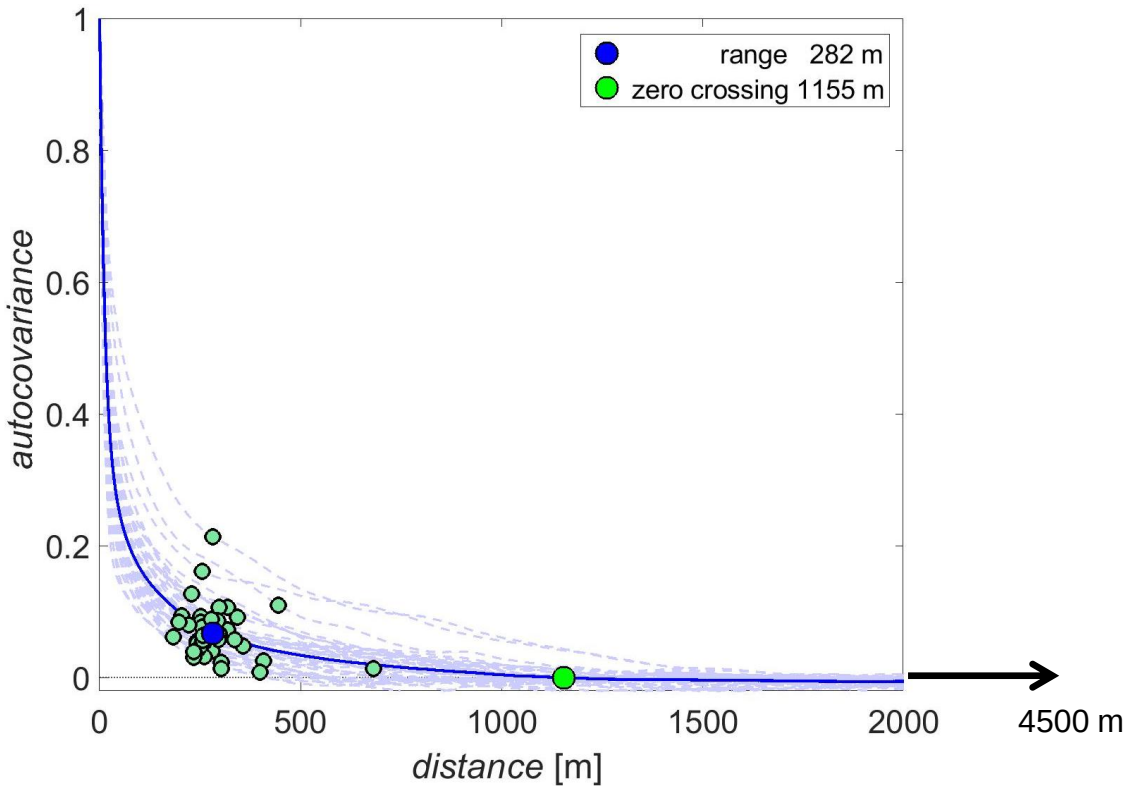
…we analyzed scale breaks for fine-scale snow depth data in coarse domain sizes *L*:



- domain size *L* is 3 km with Δx = 2m or Δx = 3 m

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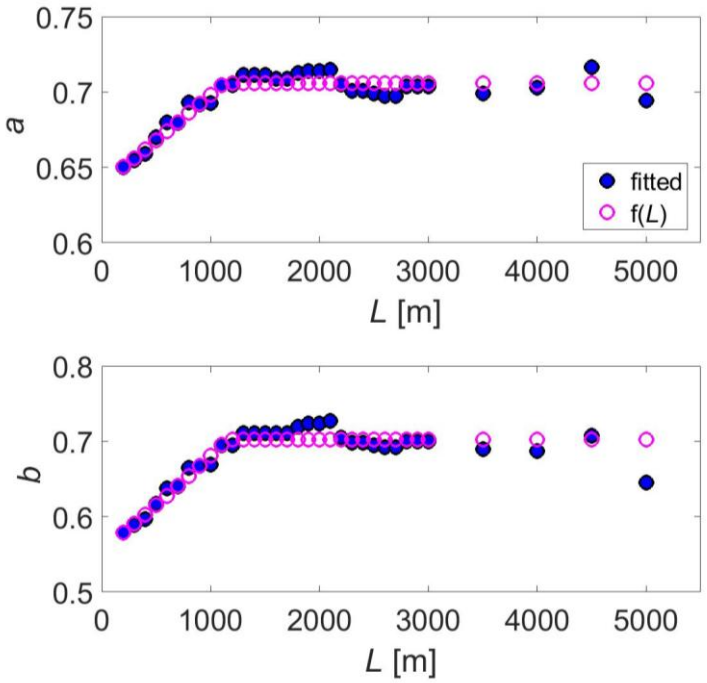
…we parameterize σHS using scale-dependent parameters for $L \geq 200$ m

• Based on *Helbig et al., 2015,* we obtain for the standard deviation of snow depth (σHS) at peak of winter and the fractional snow-covered area (*fSCA*) for $L \geq 200$ m :

$$\sigma HS = HS^{a} \mu^{b}$$

$$fSCA = \tanh\left(1.3 \frac{HS}{\sigma HS}\right)$$

using a slope related parameter μ and domain size L dependent parameters a and b.



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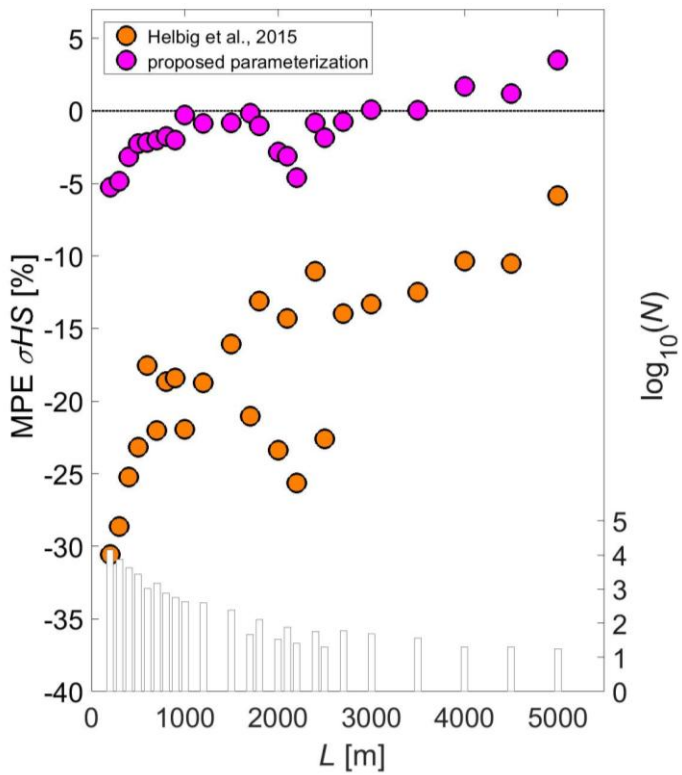
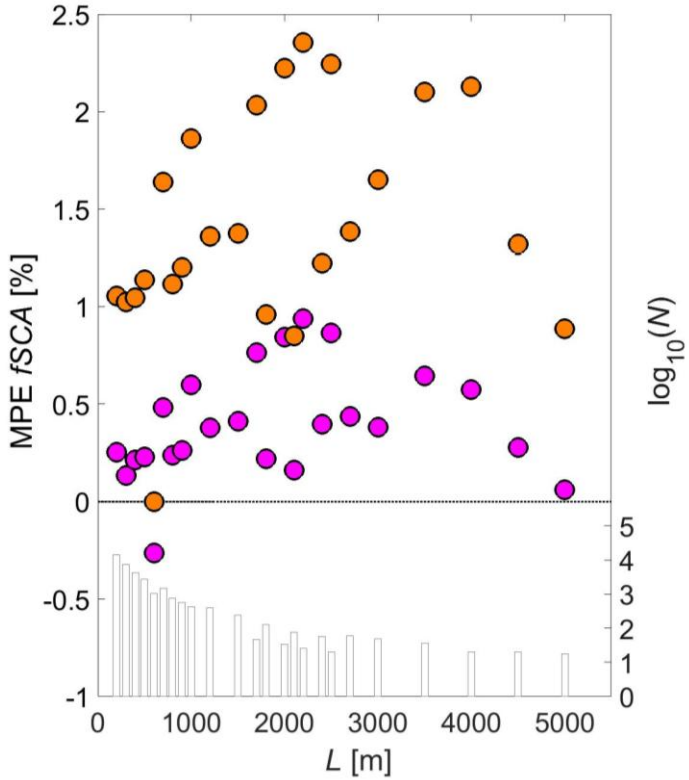
…we obtain improved mean percentage errors (MPE) for σ*HS* and *fSCA* :





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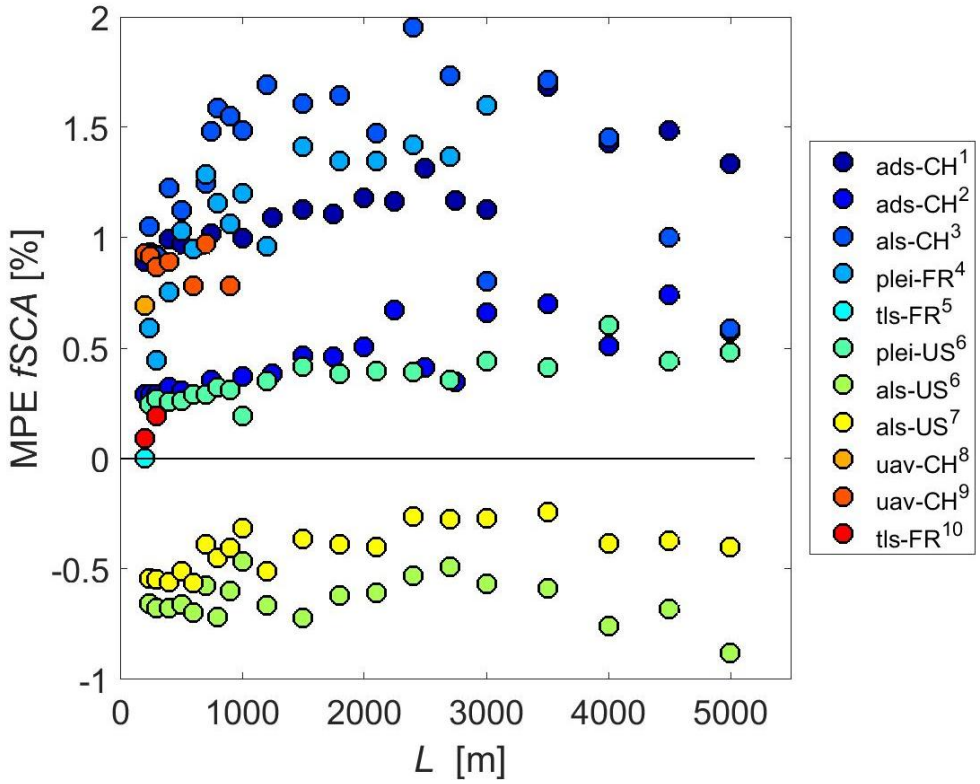
… some site and platform dependence of MPE:



Towards a scale-independent peak of winter *fSCA* parameterization

…Conclusions

- Compiled large data base of spatial snow depth from various geographic regions and platforms
- Scale break consistently around 200 m for domain size up to 5 km
- Improved peak of winter *fSCA* parameterization when including spatial scale

Towards a scale-independent peak of winter *fSCA* parameterization

…References

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