

Thermodynamics and airstreams of a South Foehn event in different Alpine valleys

Lukas Jansing¹, Michael Sprenger¹

¹ Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

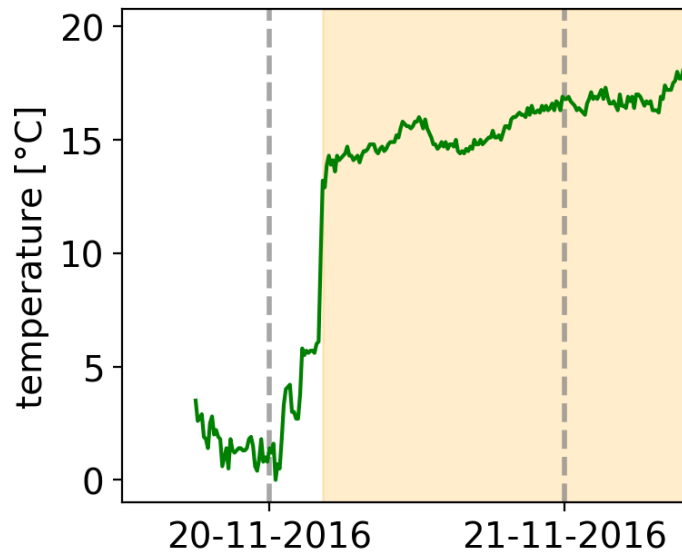
Check out the accepted article:

Jansing, L. and Sprenger, M. (2022), Thermodynamics and airstreams of a South Foehn event in different Alpine valleys. *Quarterly Journal of the Royal Meteorological Society*. Accepted Author Manuscript. <https://doi.org/10.1002/qj.4285>

Foehn air warming – a long-standing research question

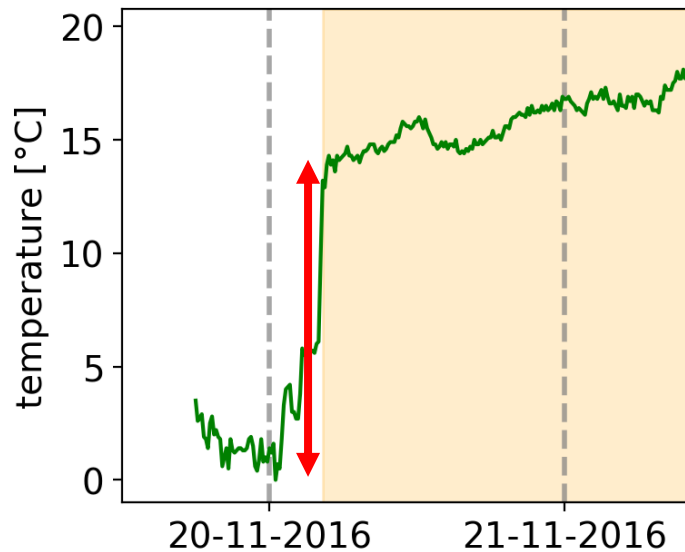
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Temperature increase during Foehn onset:
the Eulerian perspective



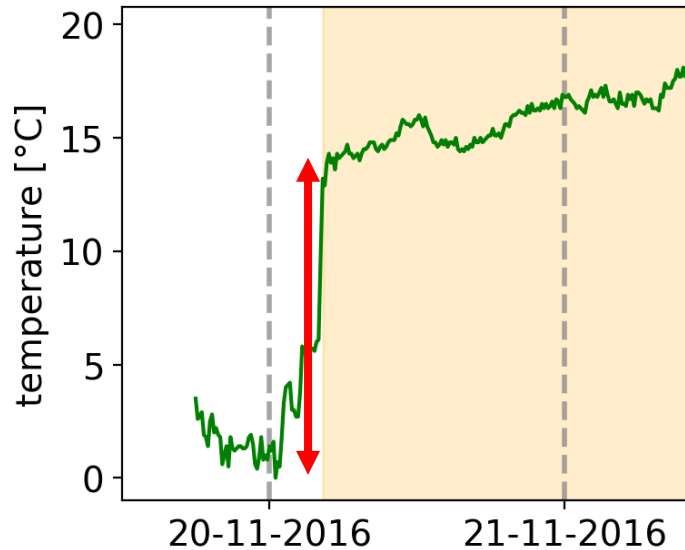
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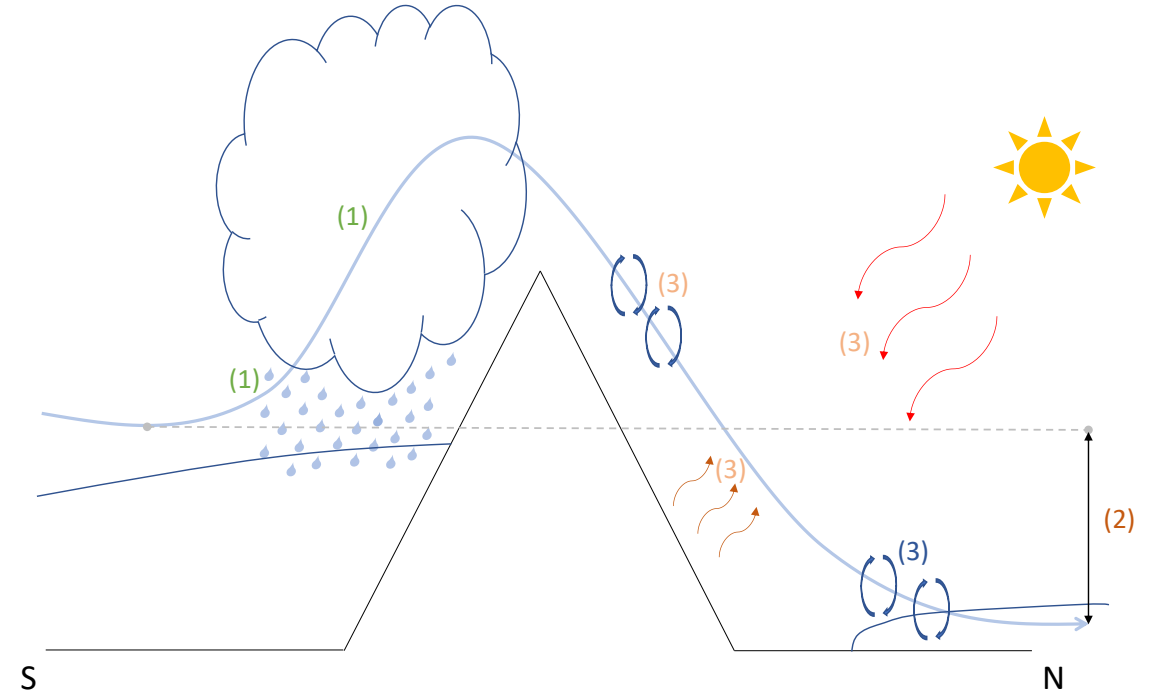


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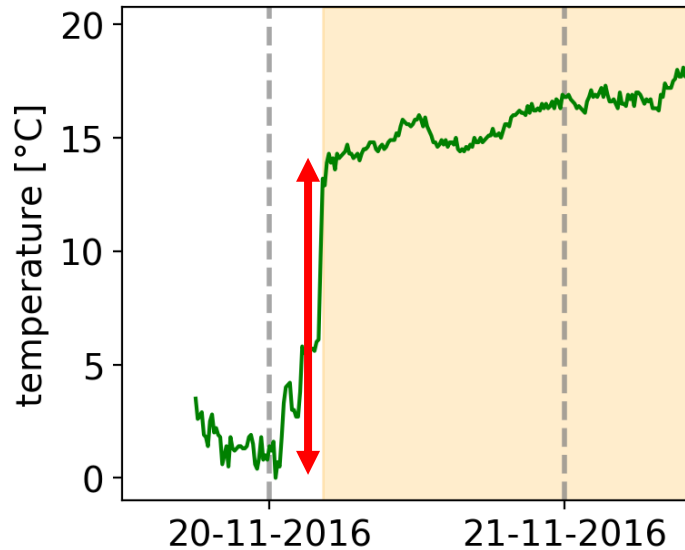


Explanations for the warming: Invoking
the Lagrangian perspective

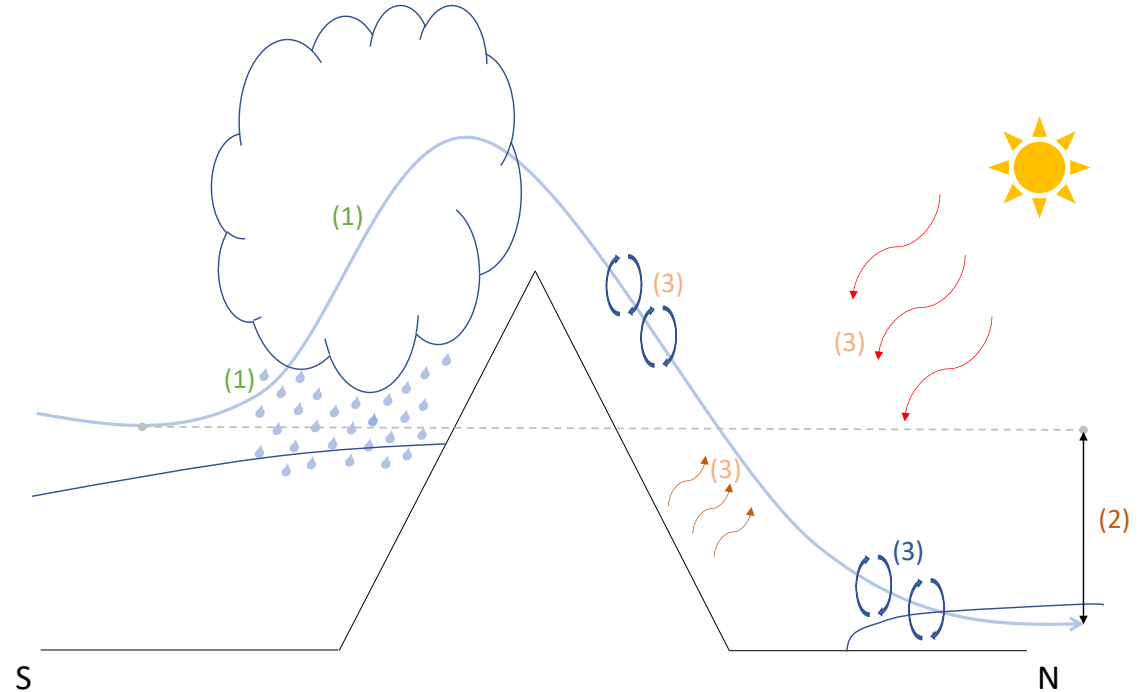


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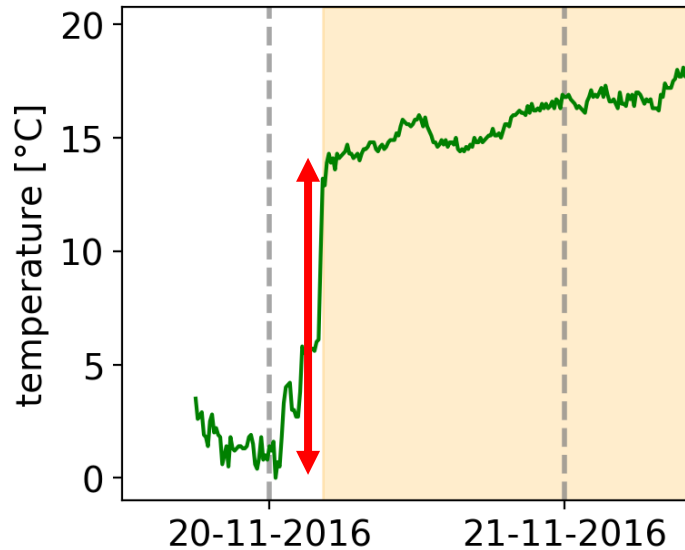
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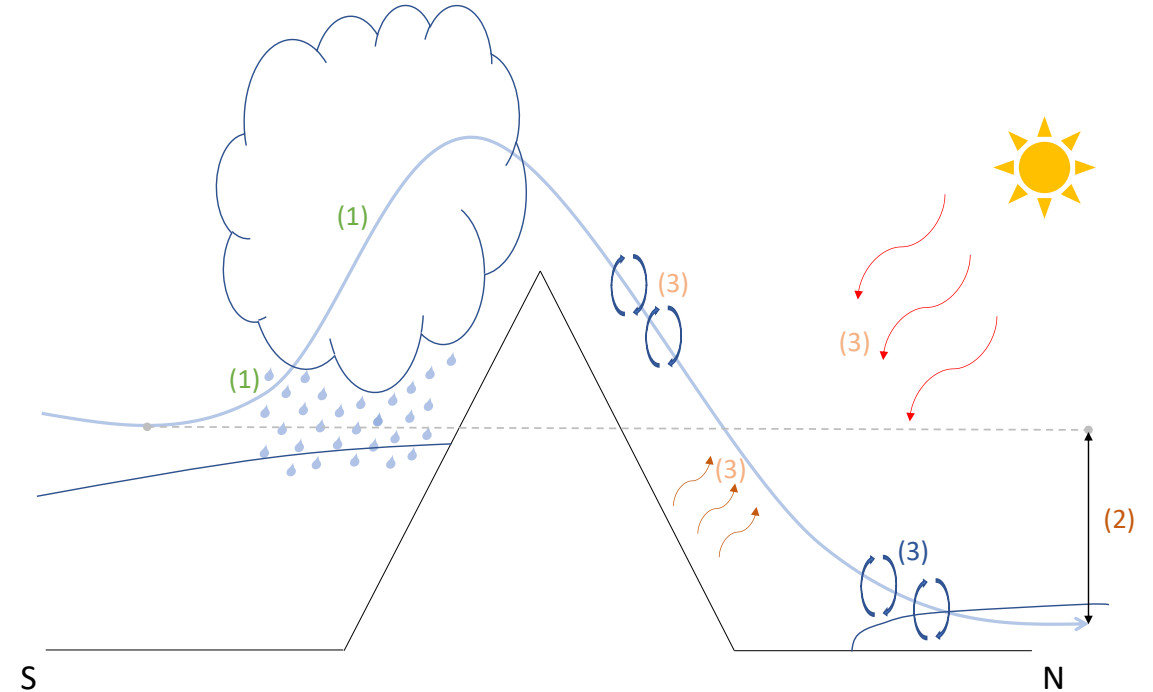
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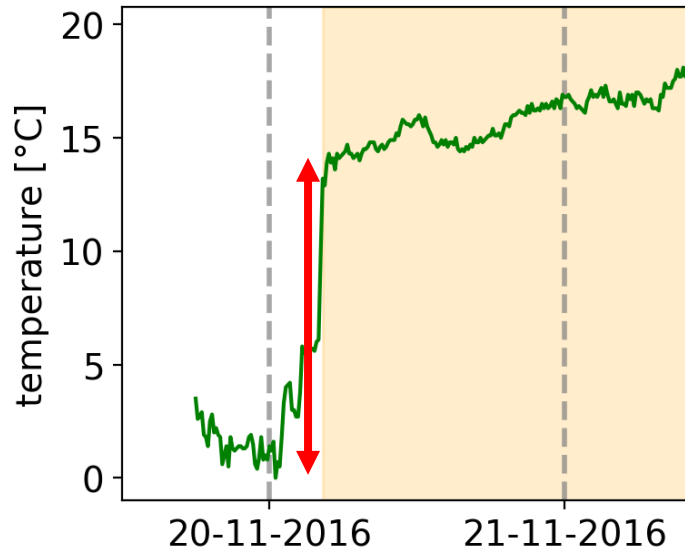


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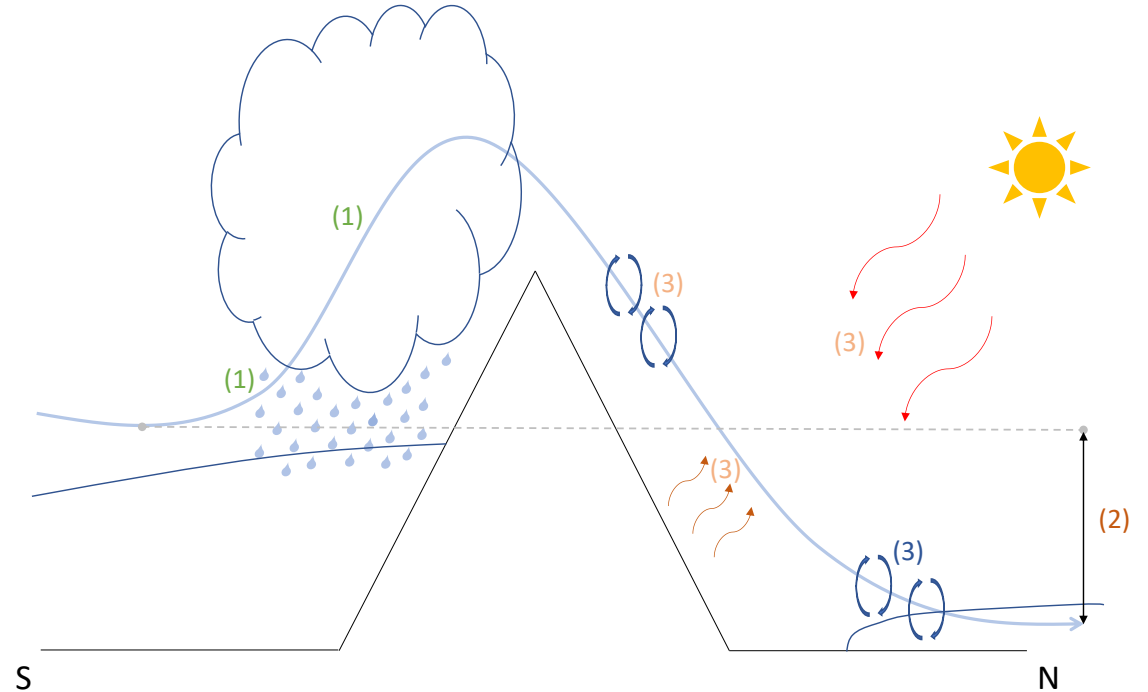
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(1) Upstream latent heating in clouds (e.g., Hann, 1866)

(2) Adiabatic warming / isentropic drawdown (e.g., Seibert, 1990)

(3) Other diabatic processes (e.g., Elvidge and Renfrew, 2016)

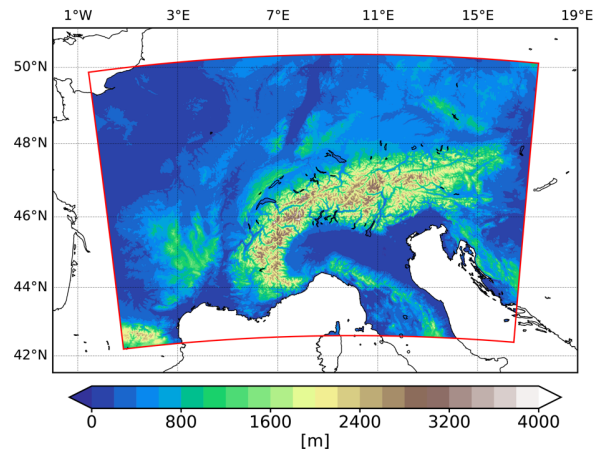
Foehn air warming – methods

We investigate a long-lasting South Foehn case from November 2016:

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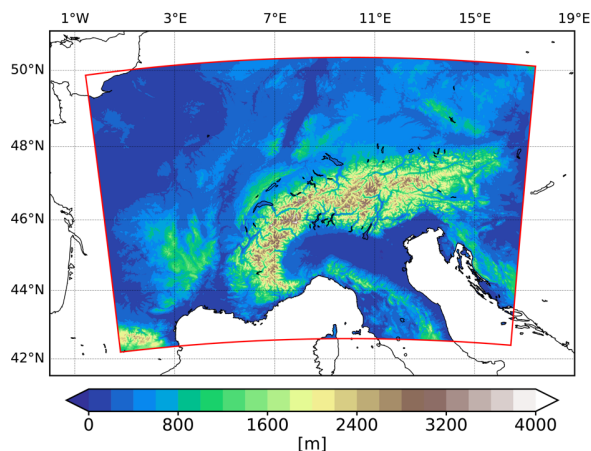
- COSMO-1 model simulation (Steppeler et al., 2003; Baldauf et al., 2011):



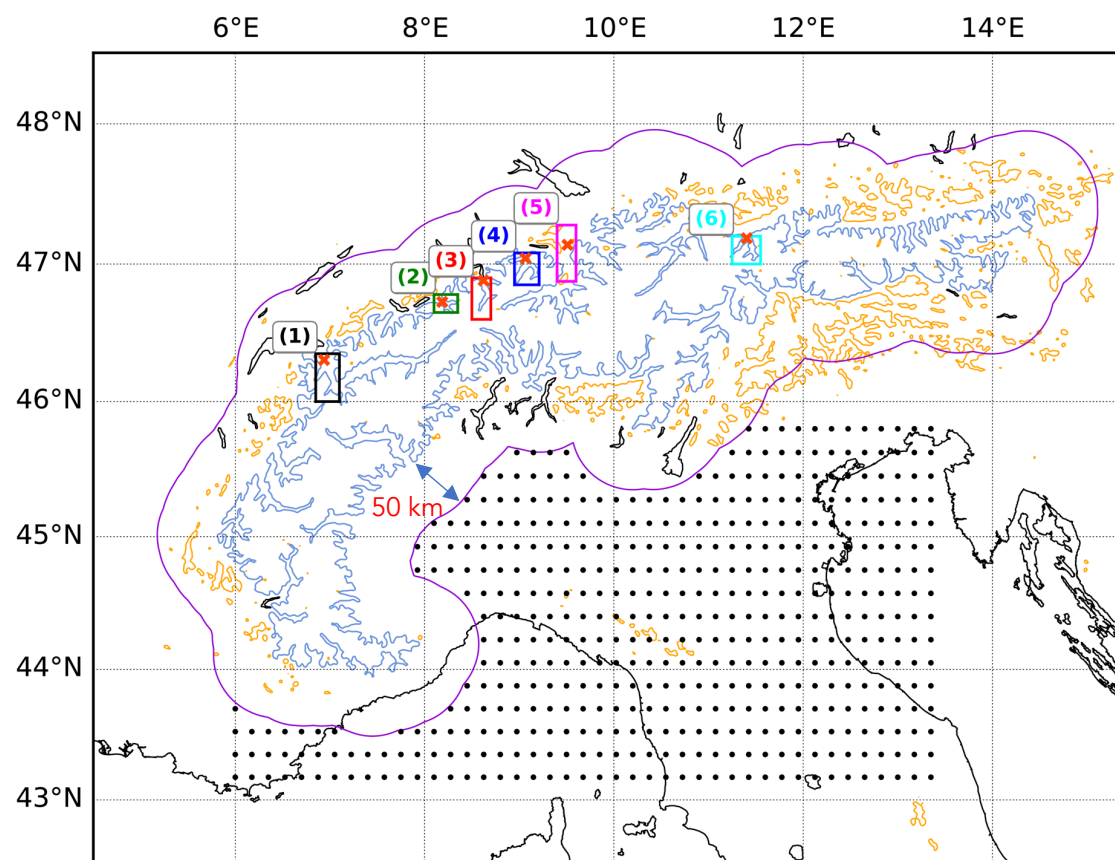
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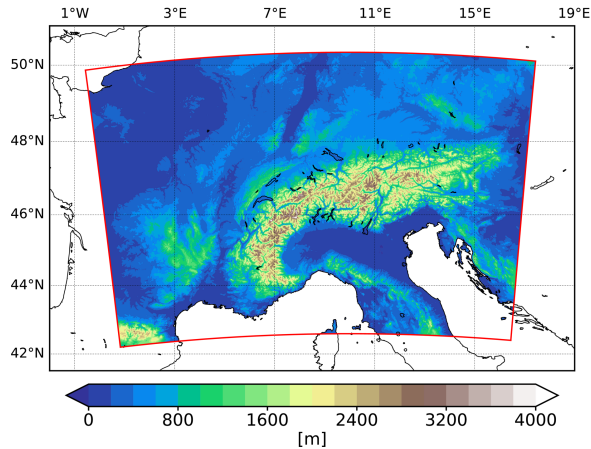


- 1) Lower Valais
- 2) Hasli Valley
- 3) Reuss Valley
- 4) Linth Valley
- 5) Rhine Valley
- 6) Wipp Valley

Foehn air warming – methods

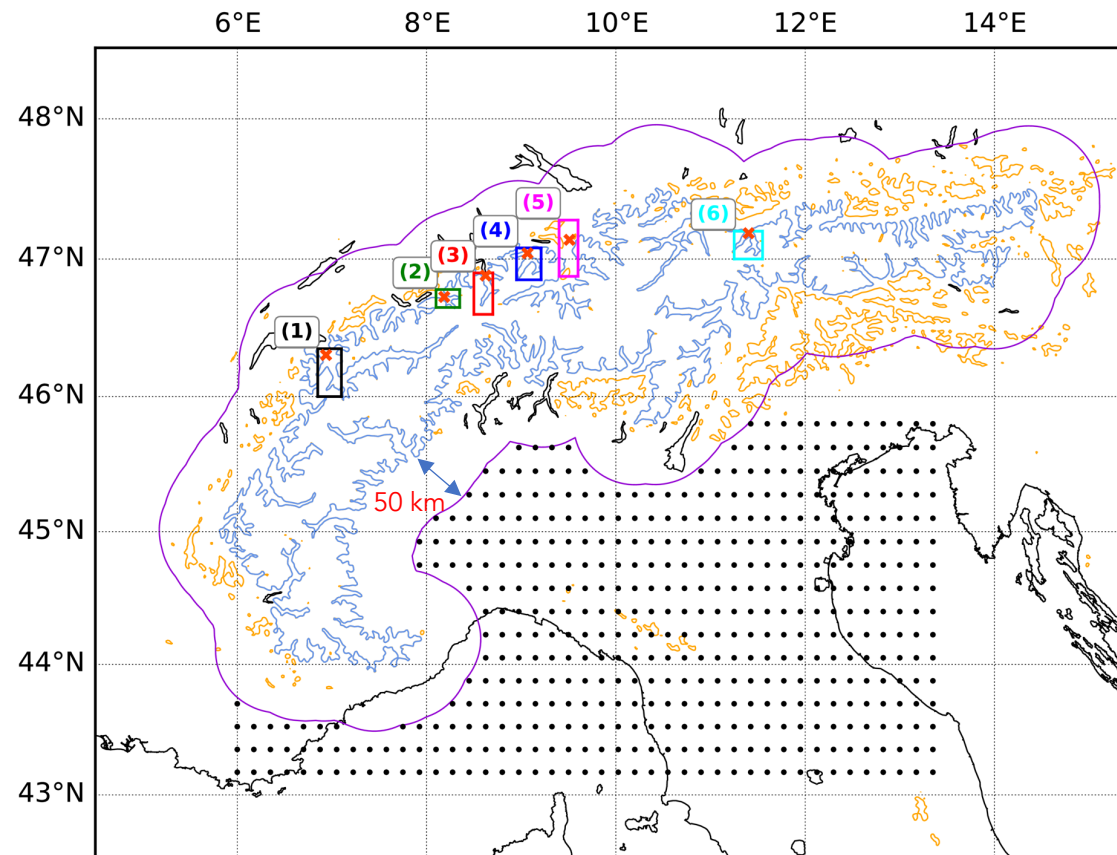
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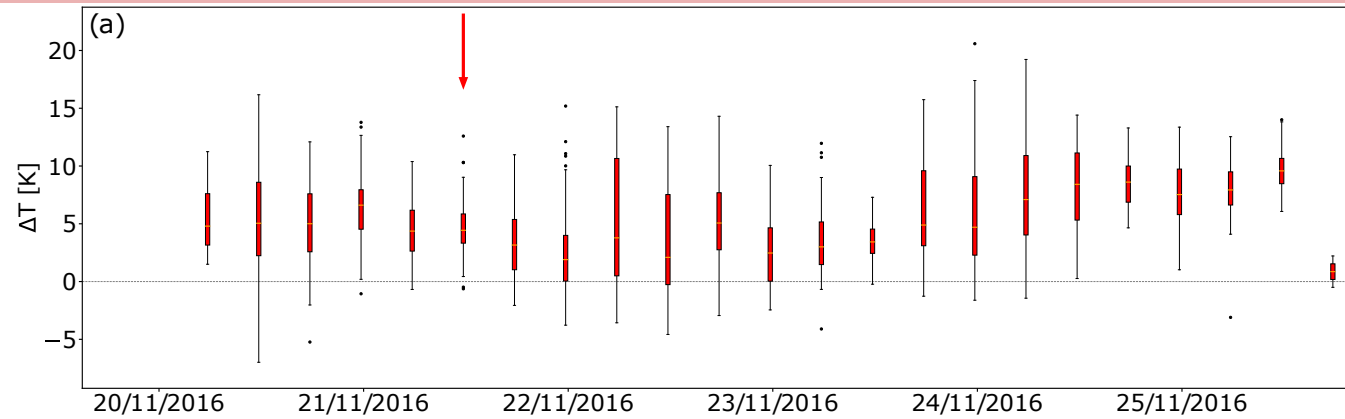
- Lagrangian heat budget



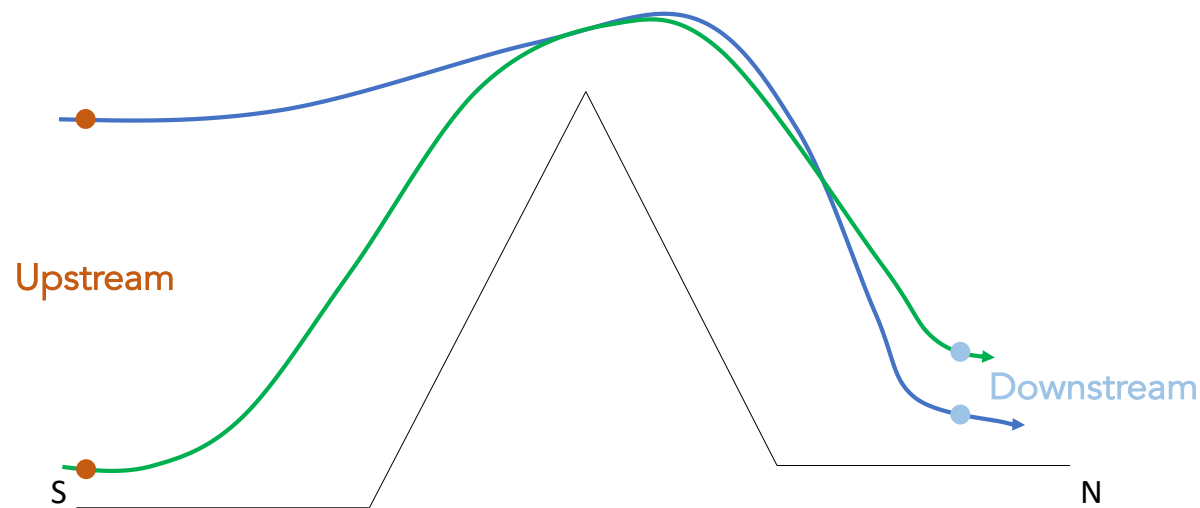
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Foehn air warming – temporal evolution

Net warming:

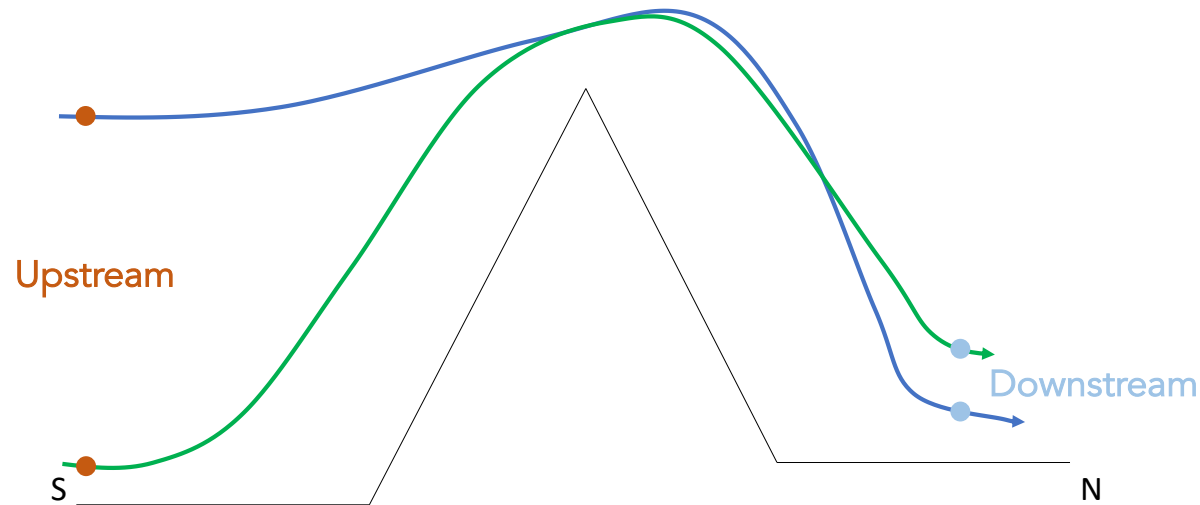
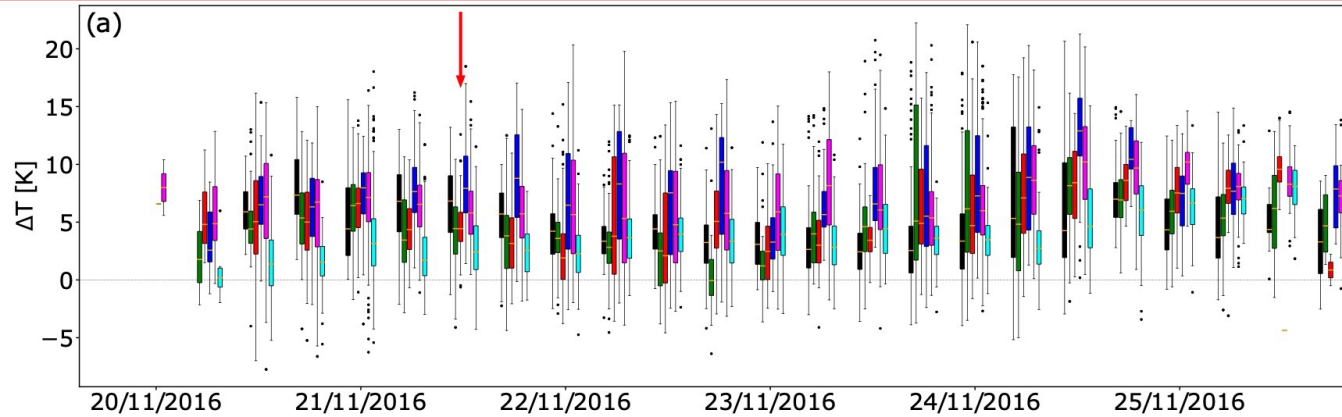


3) Reuss Valley



Foehn air warming – temporal evolution

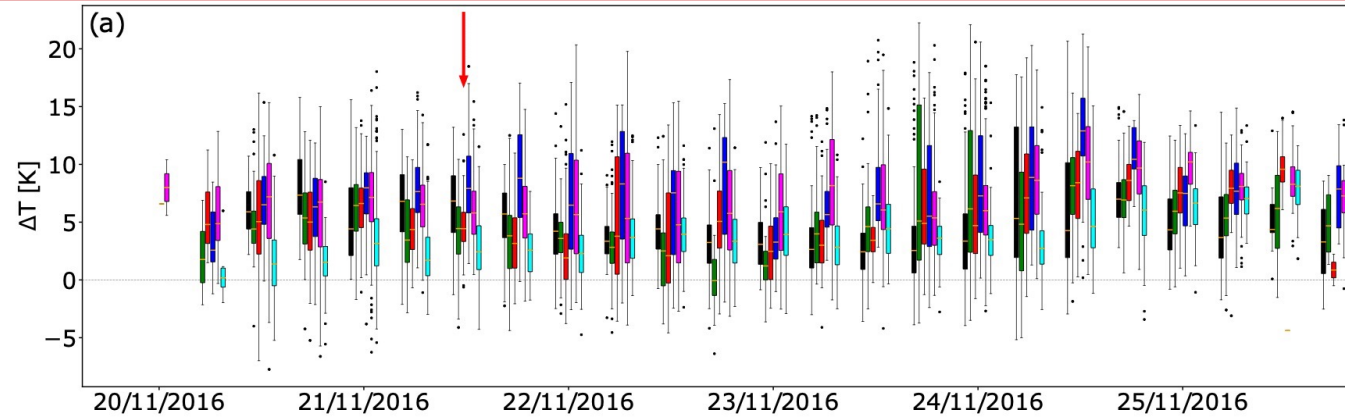
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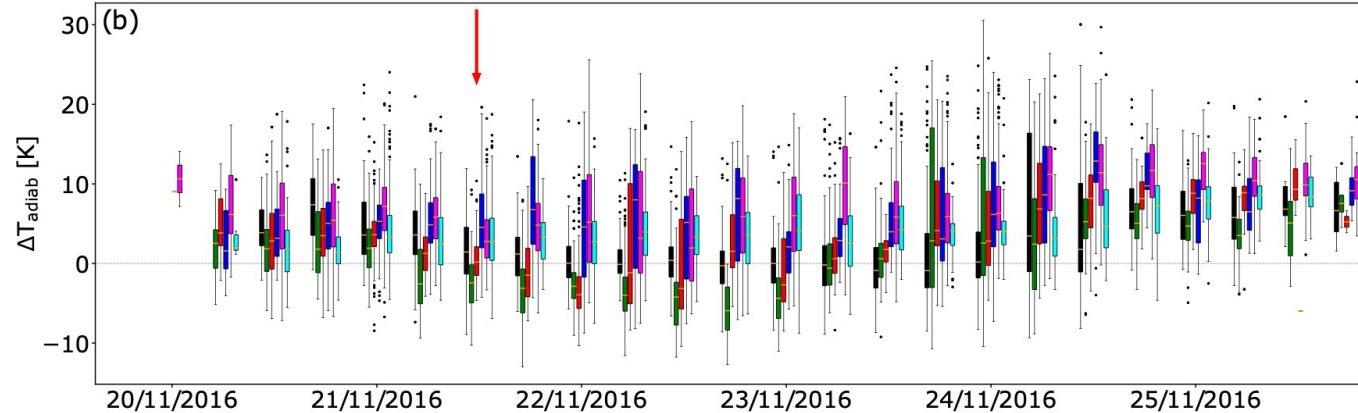
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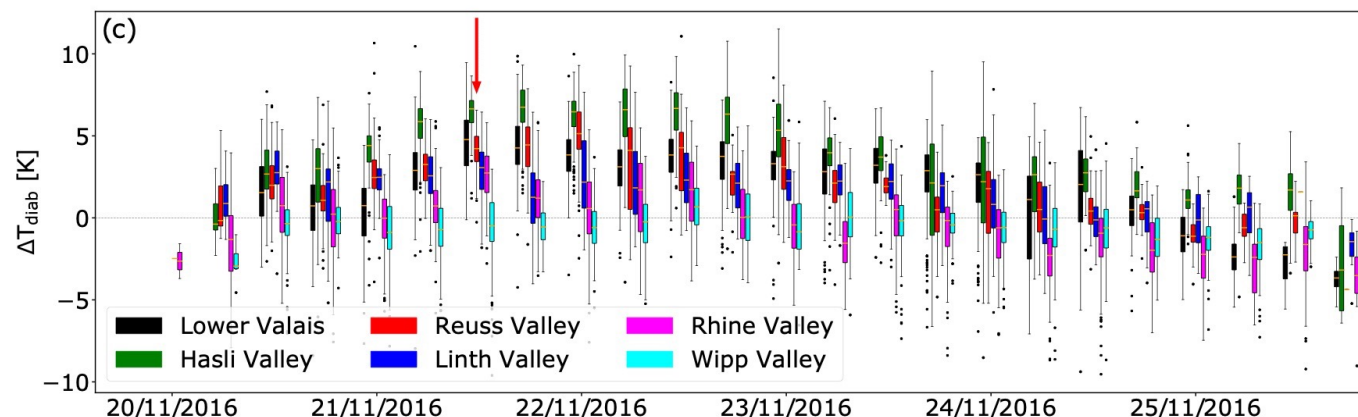
Net warming:



Adiabatic warming:

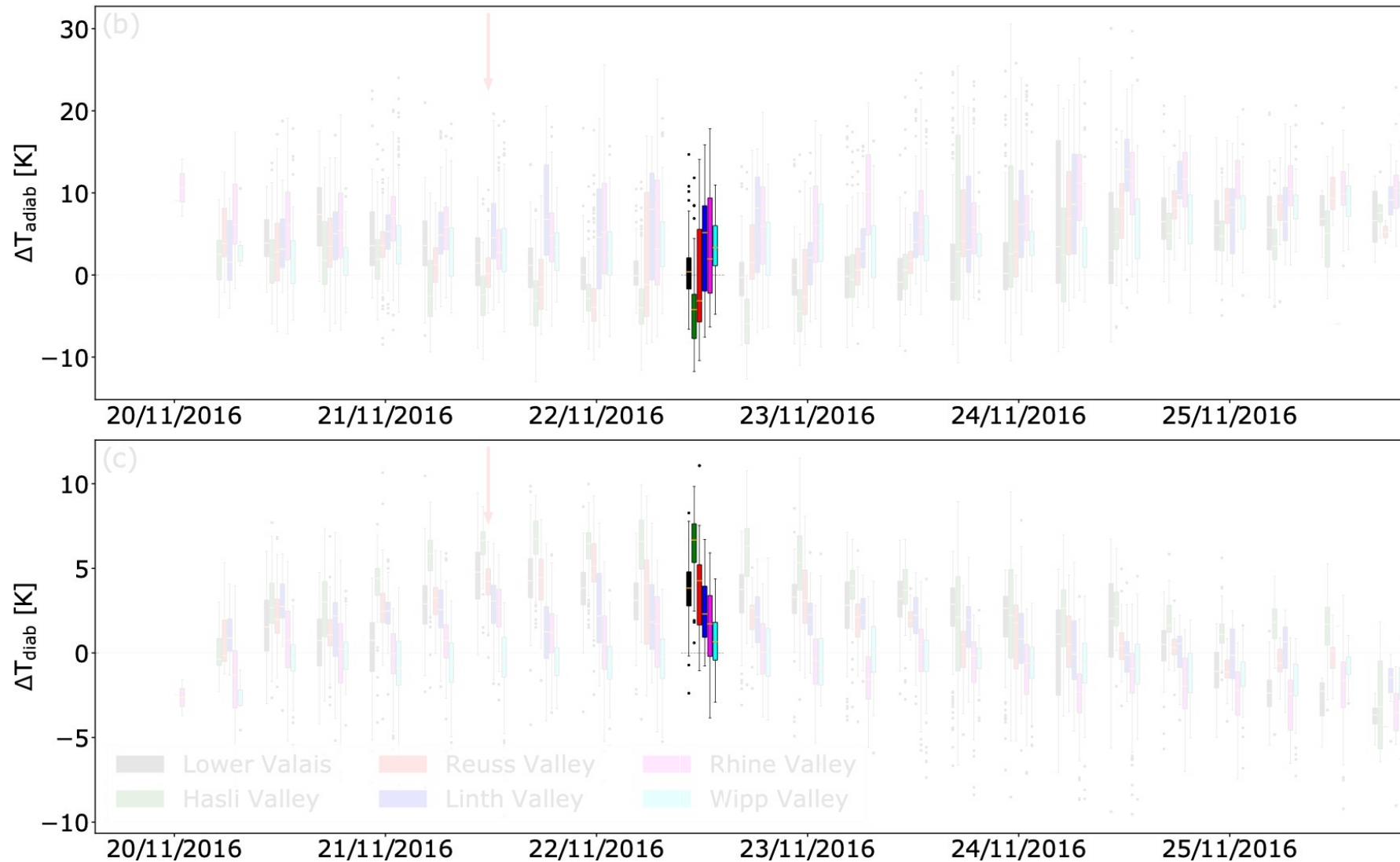


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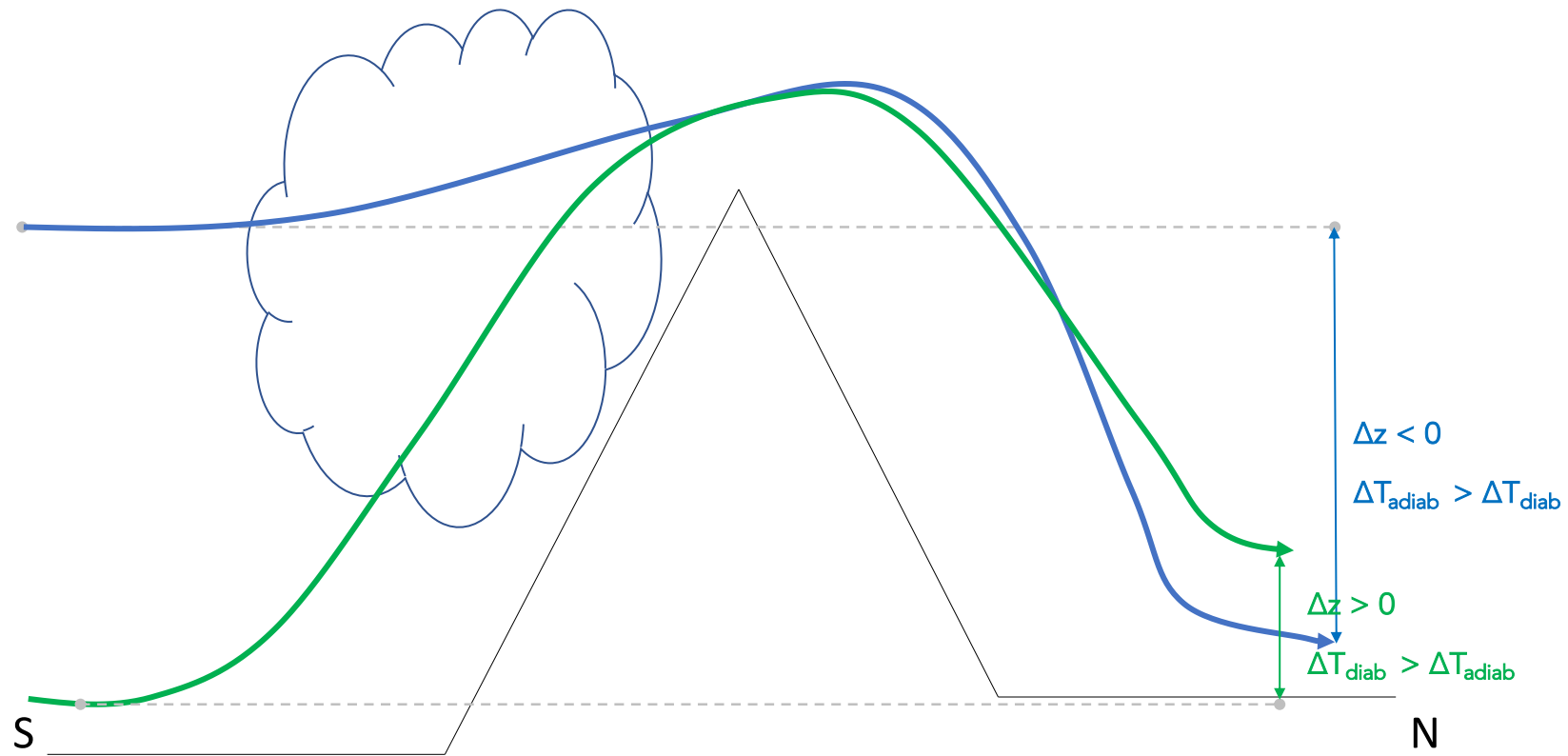
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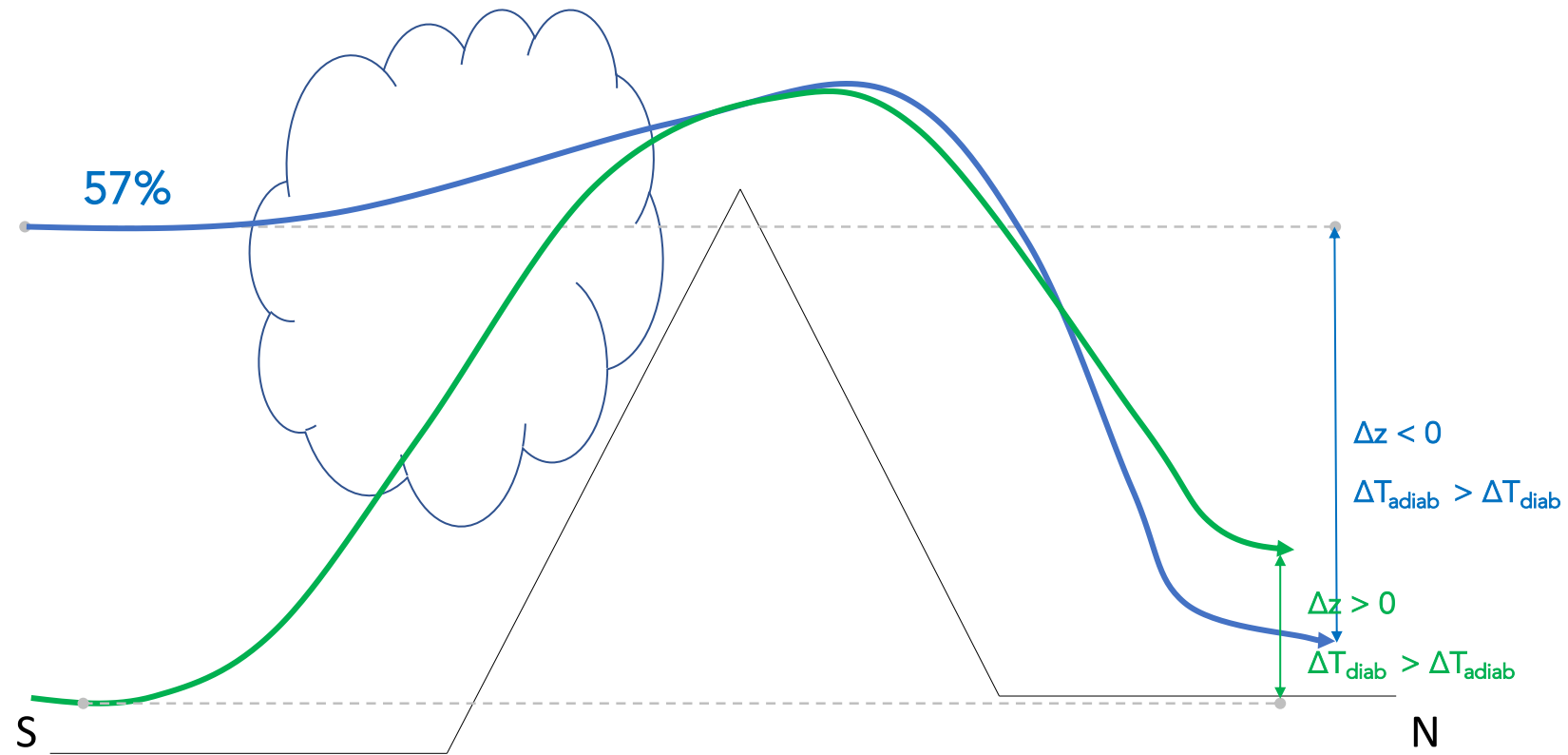


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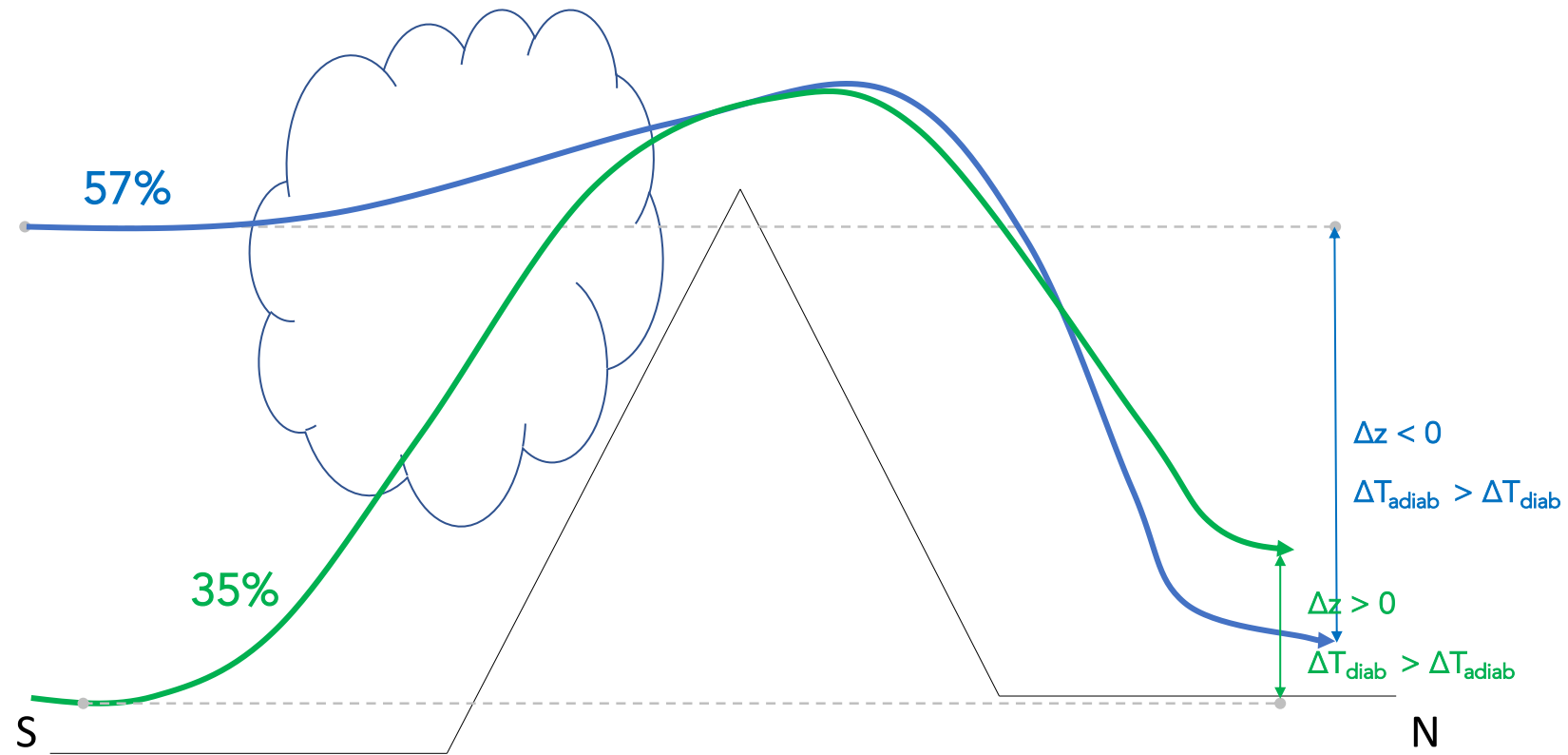
Foehn air warming – a balanced view on the dominating mechanism



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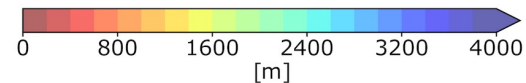
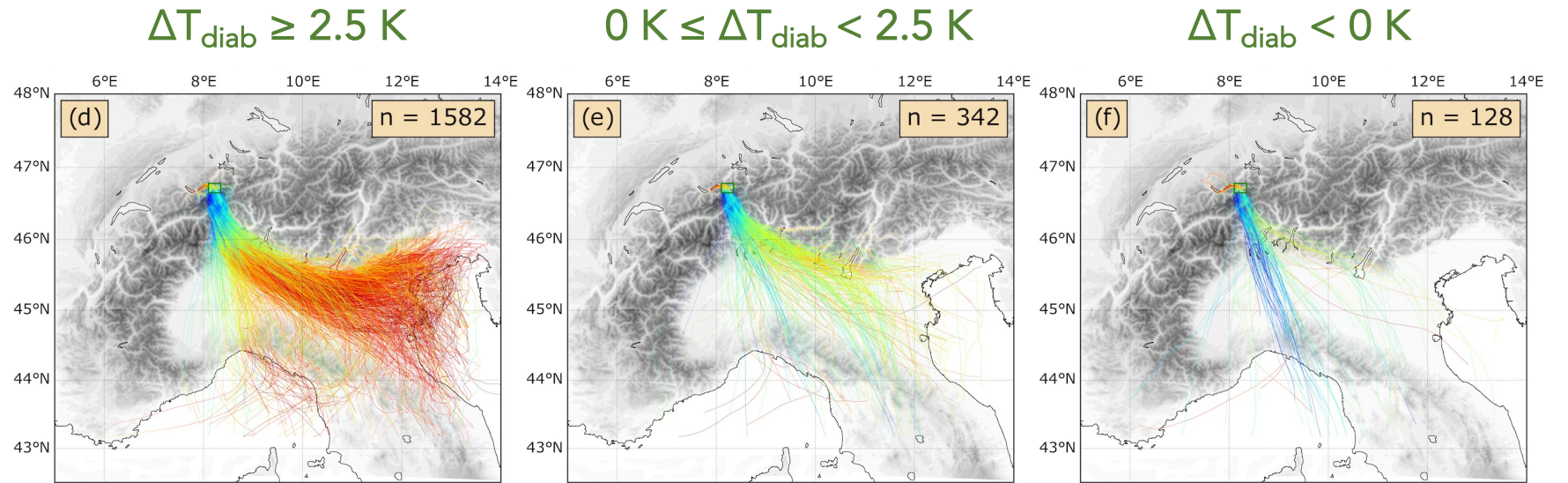


Foehn air warming – a balanced view on the dominating mechanism



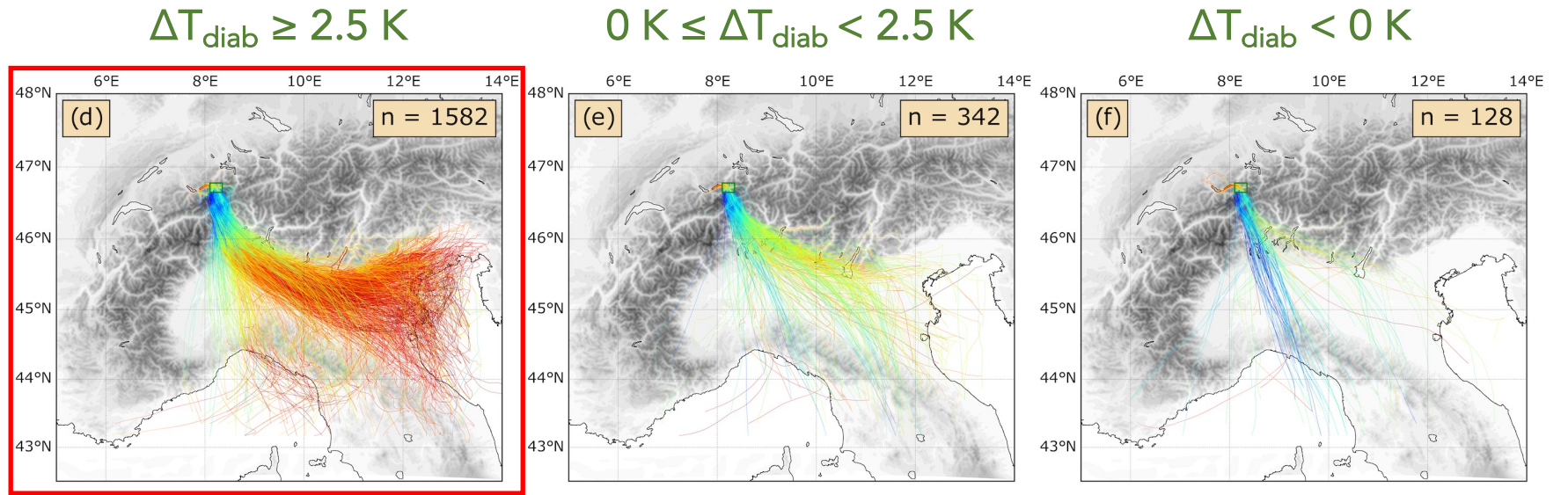
Diabatic airstreams – western and eastern valleys

Hasli Valley



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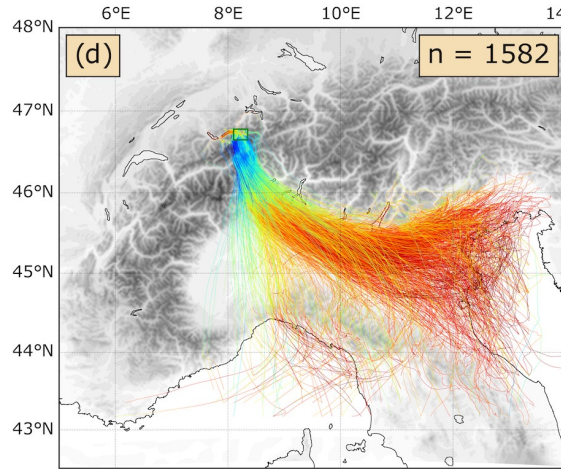
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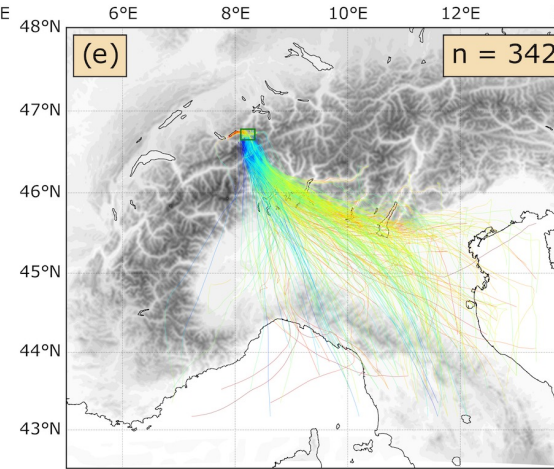
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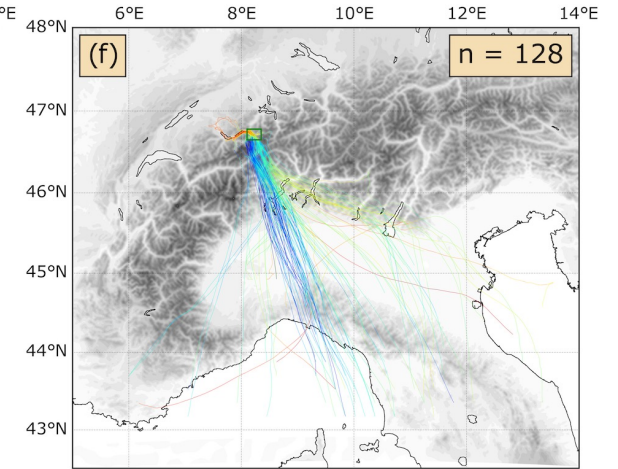
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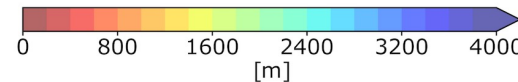
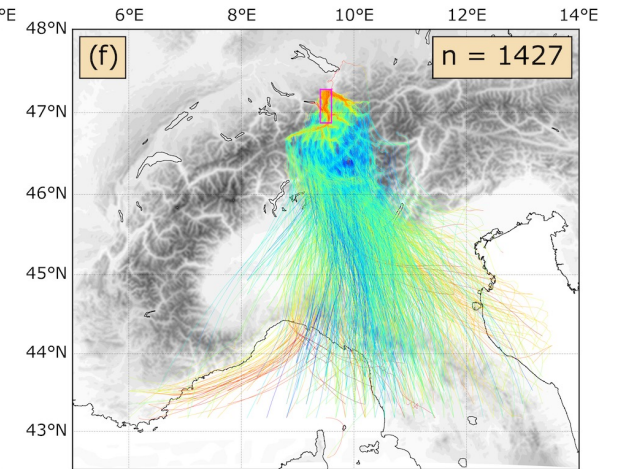
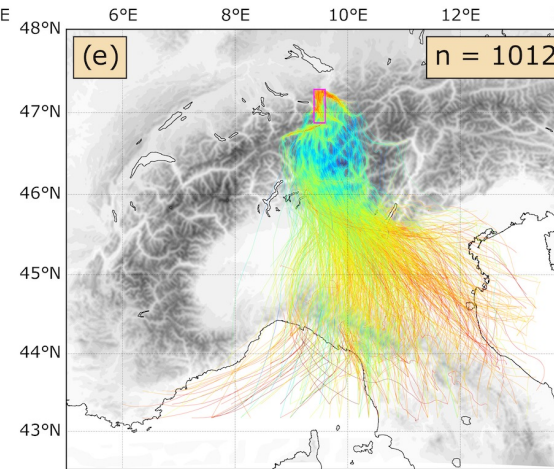
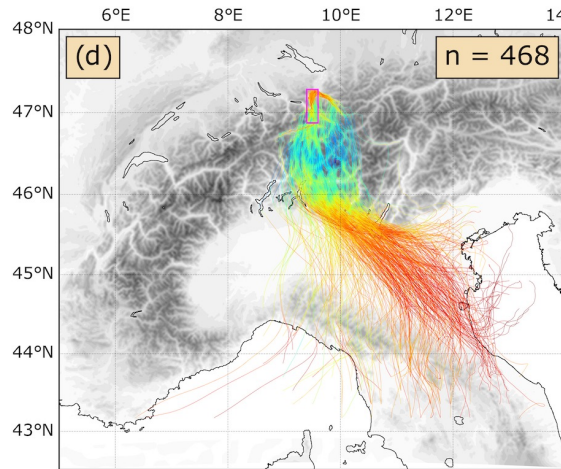
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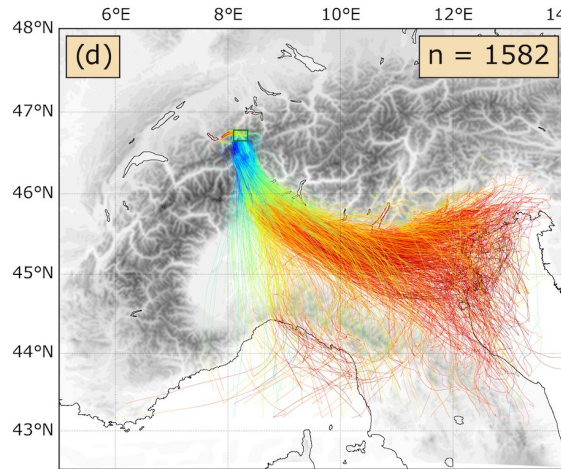
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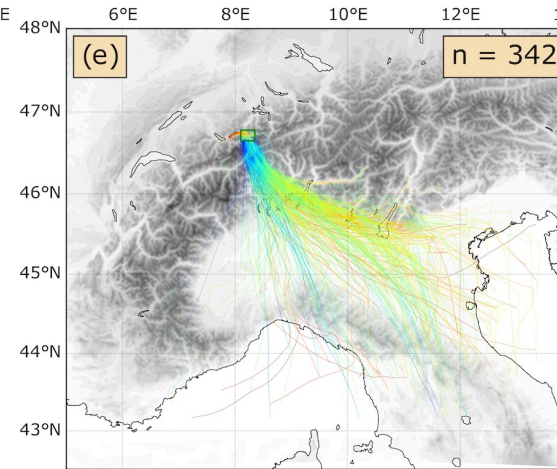
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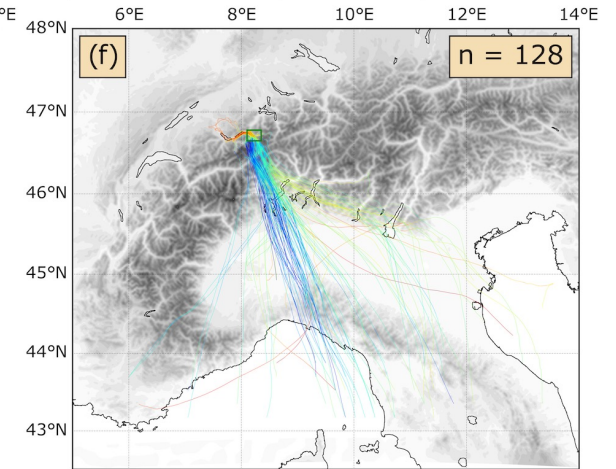
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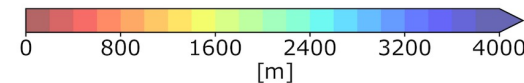
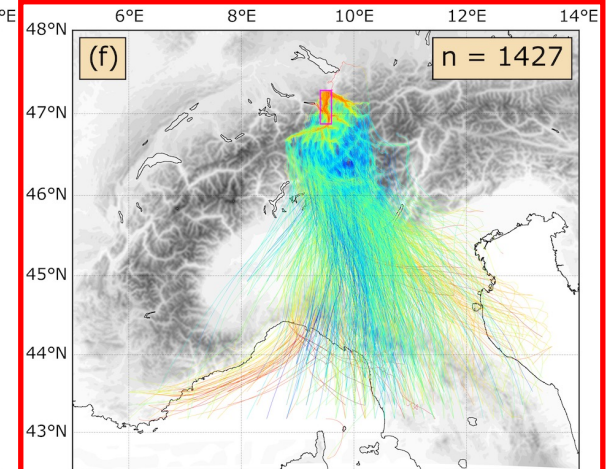
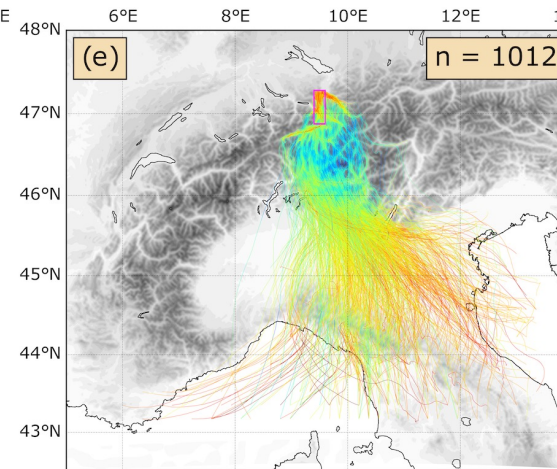
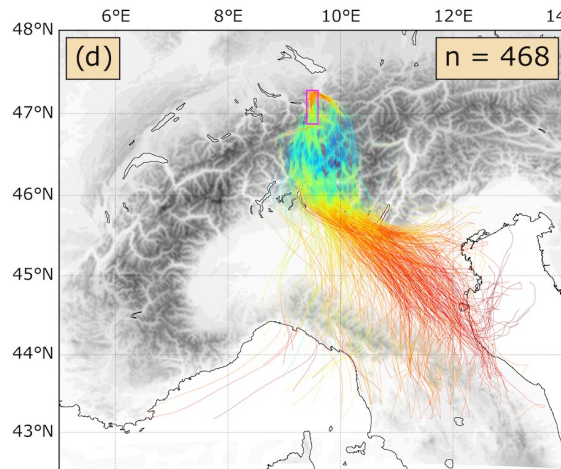
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Rhine Valley



Foehn case study Nov 2016

Interested?

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→ Get in contact: lukas.jansing@env.ethz.ch