Air pollution modelling in highly complex terrain: The GRAMM/GRAL modelling system

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Air Quality Department Styria: ….our duties

Source: https://www.bohler-edelstahl.com/de/web-cam/

200 – 300 Air Quality Assessments per year carried out by 6 experts mostly in highly comlex terrain

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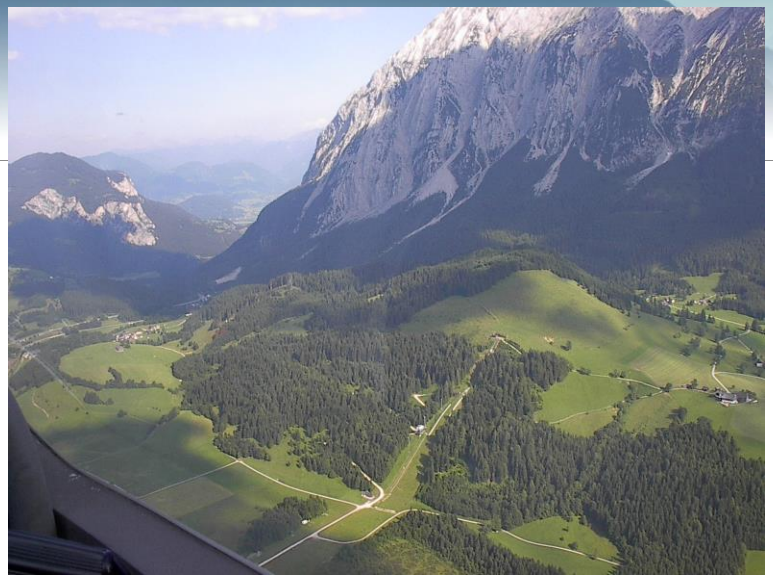
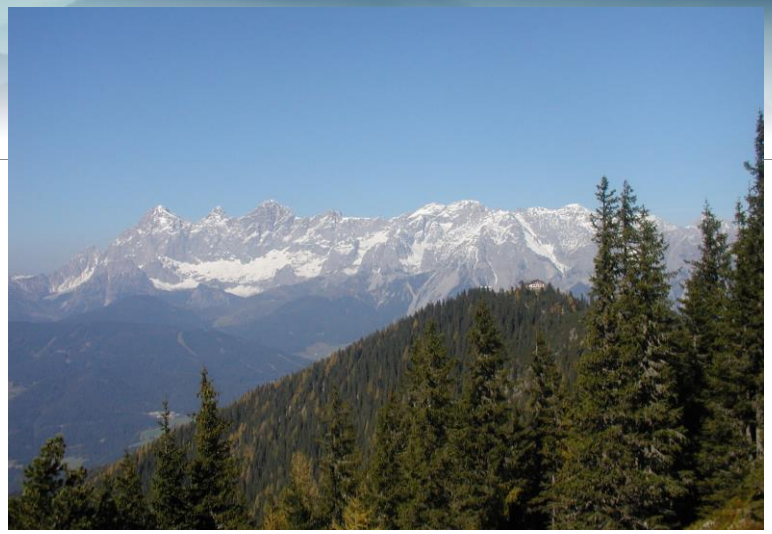
Styria – beautiful landscape, but…





Source: Steiermark.com

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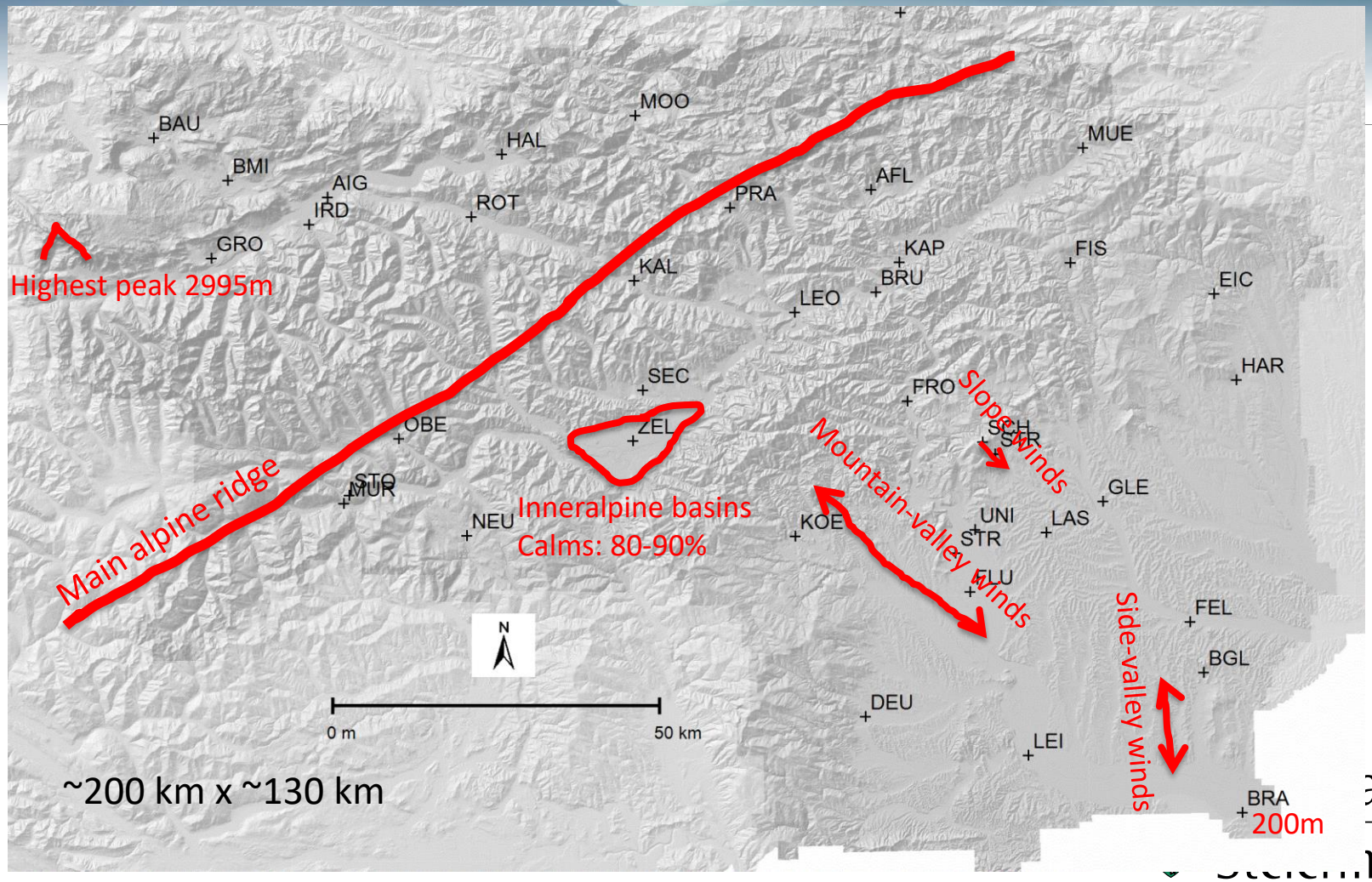
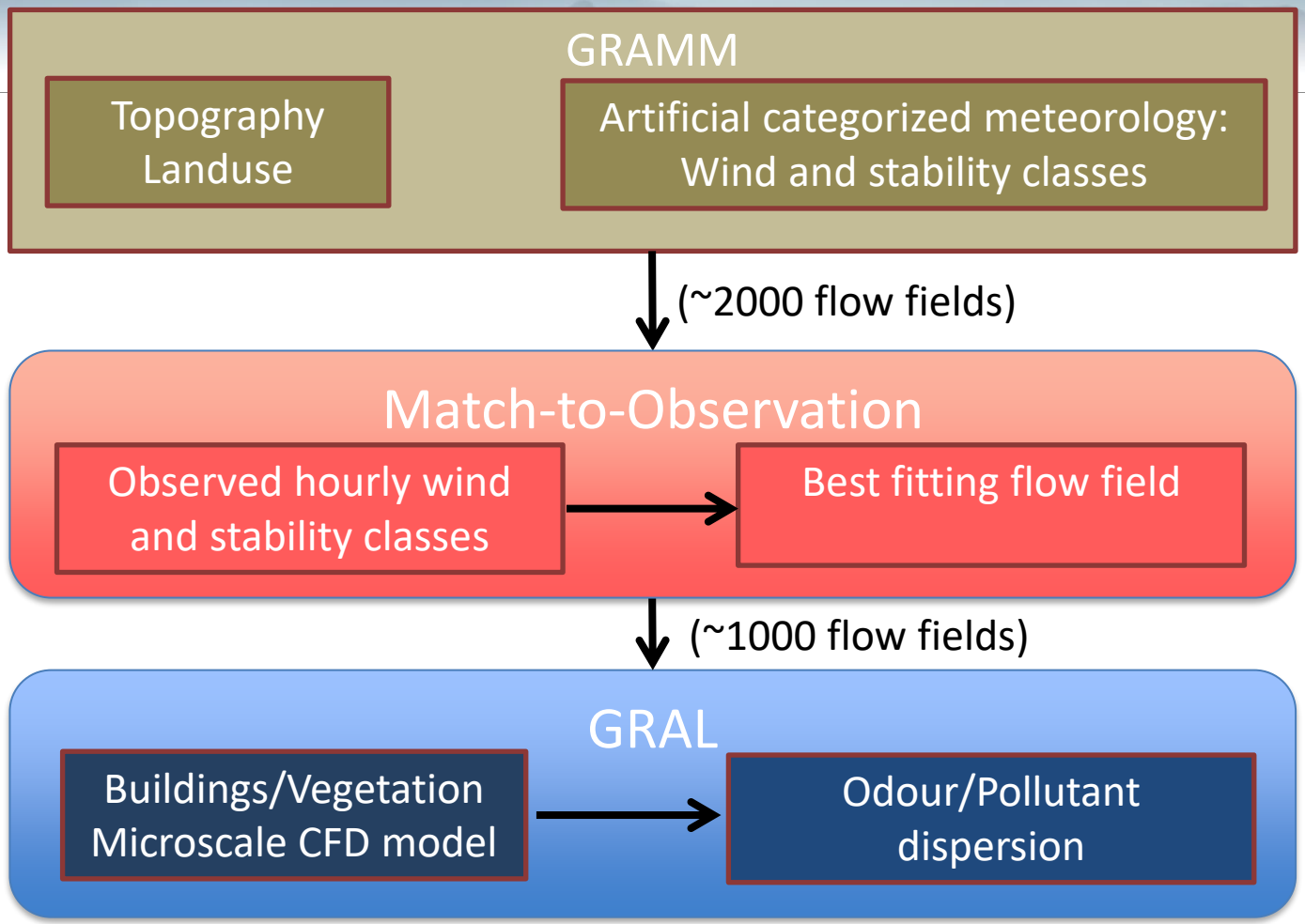
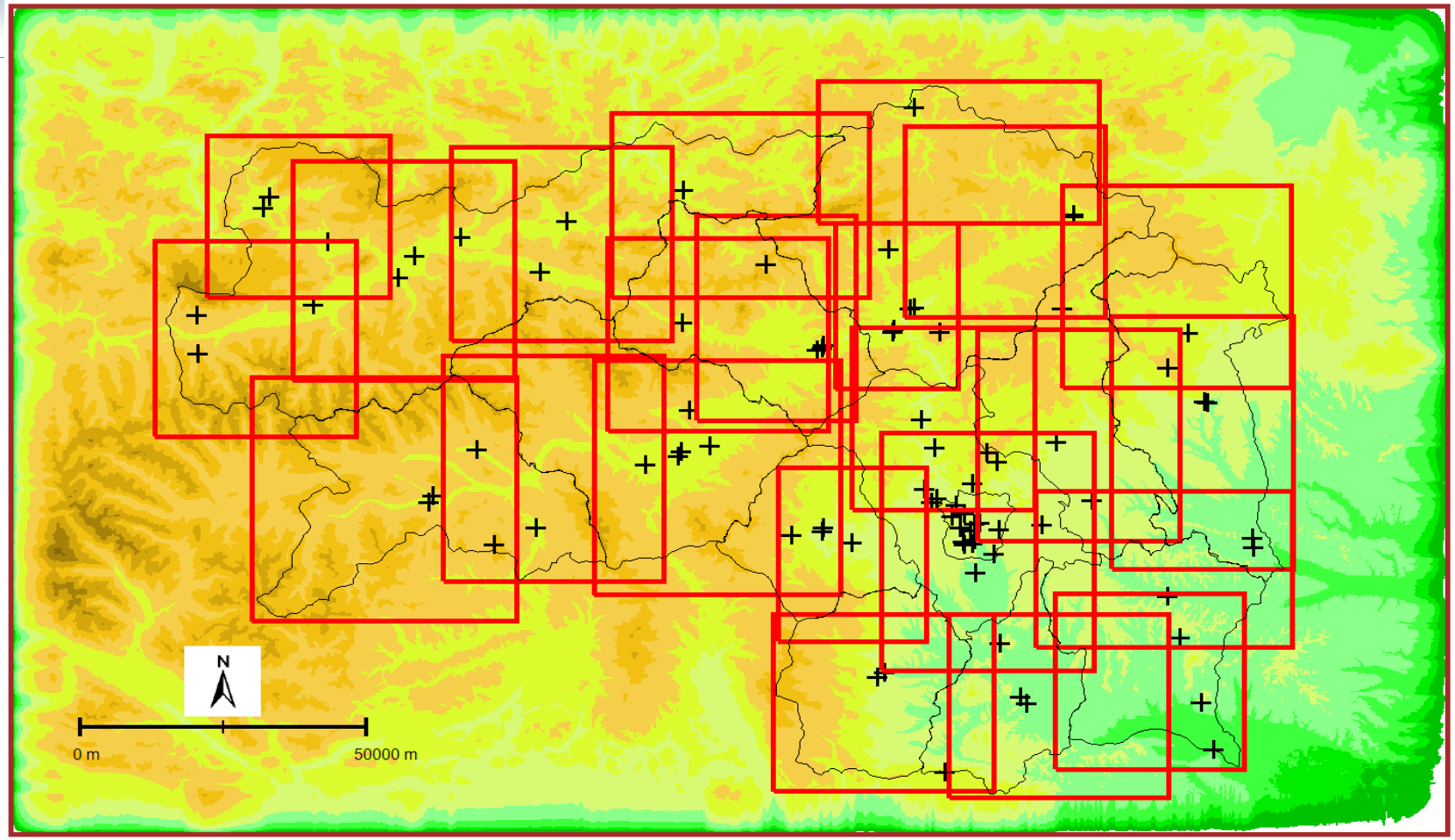


GRAMM/GRAL modelling system

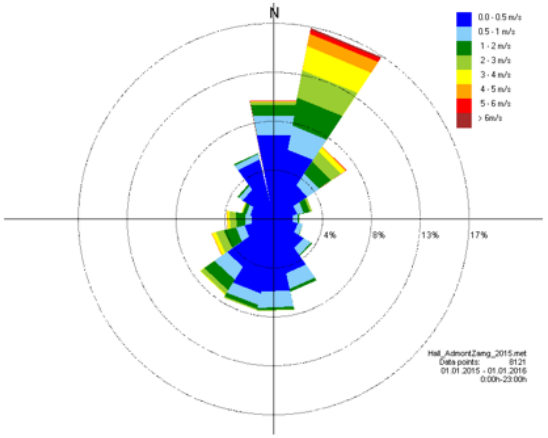


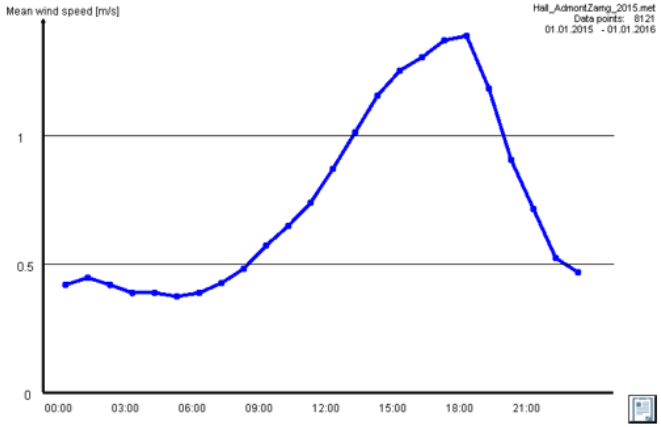
Windfield-Library
Reference year 2015, horizontal resolution 200m

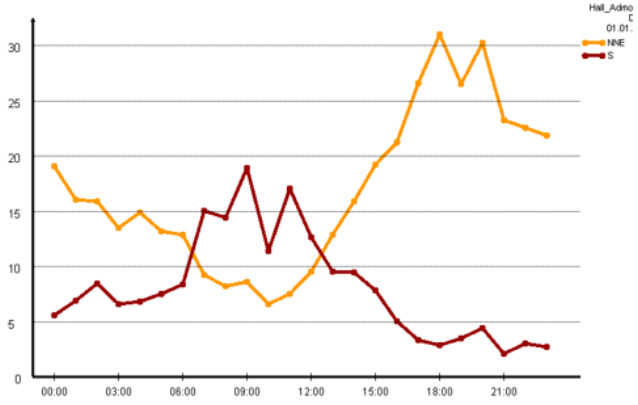


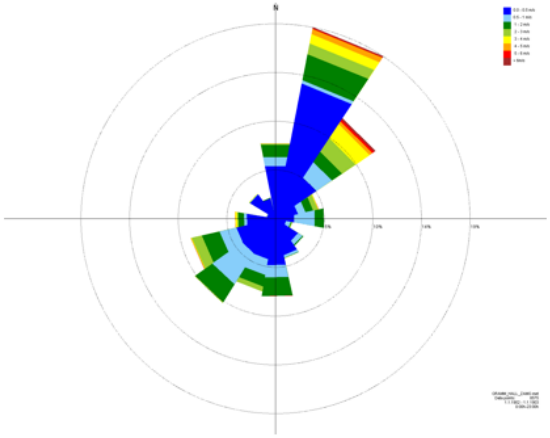
Windfield-Library Results

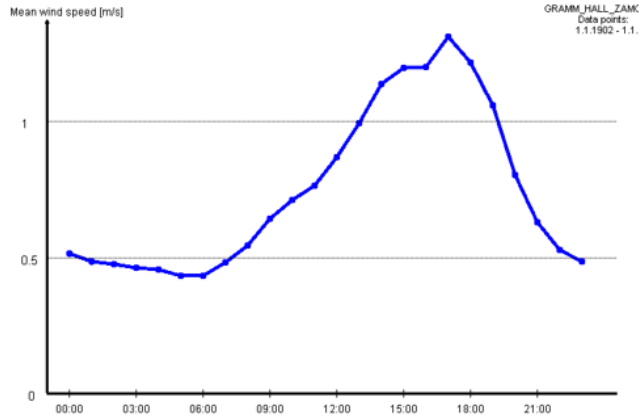
Valley station

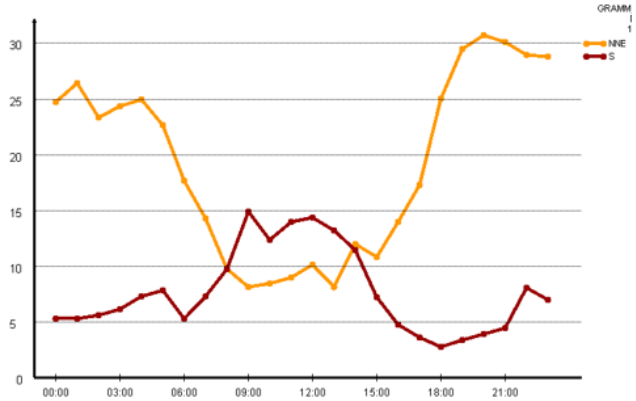






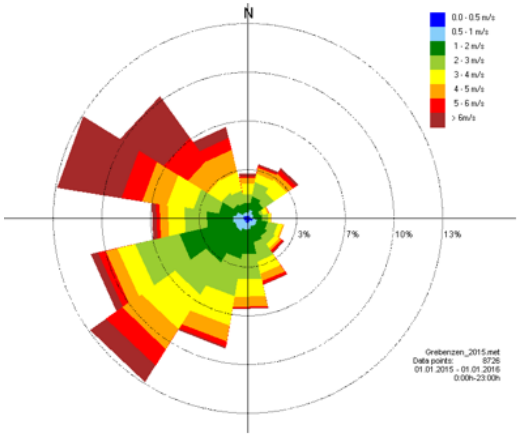


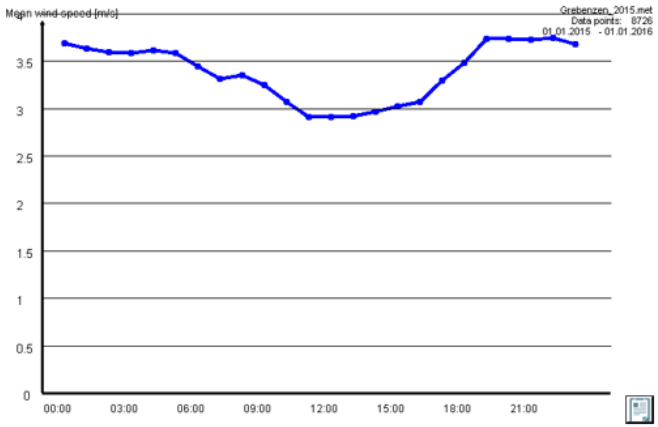


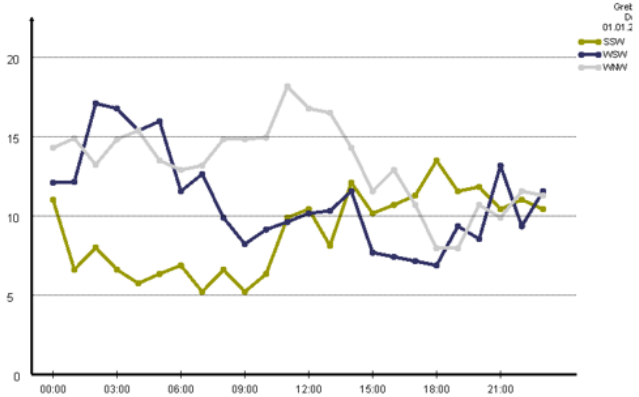


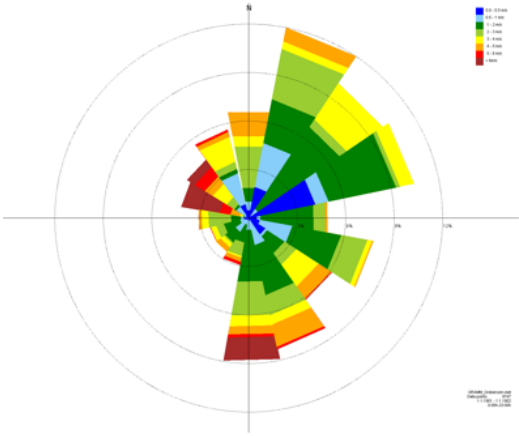
Windfield-Library Results

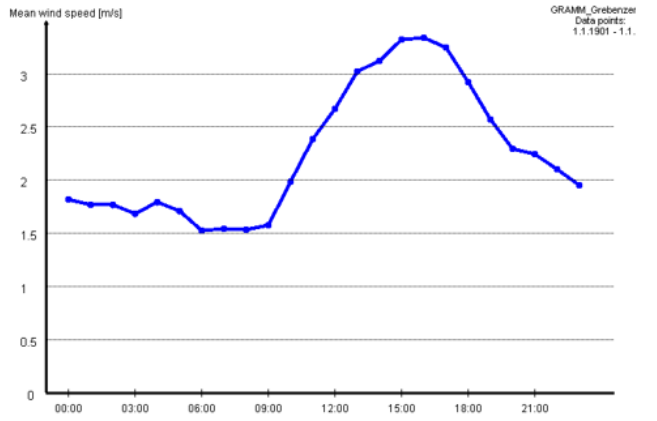
Mountain station

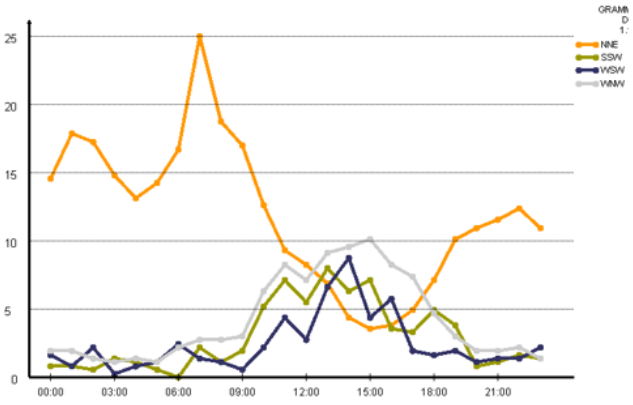






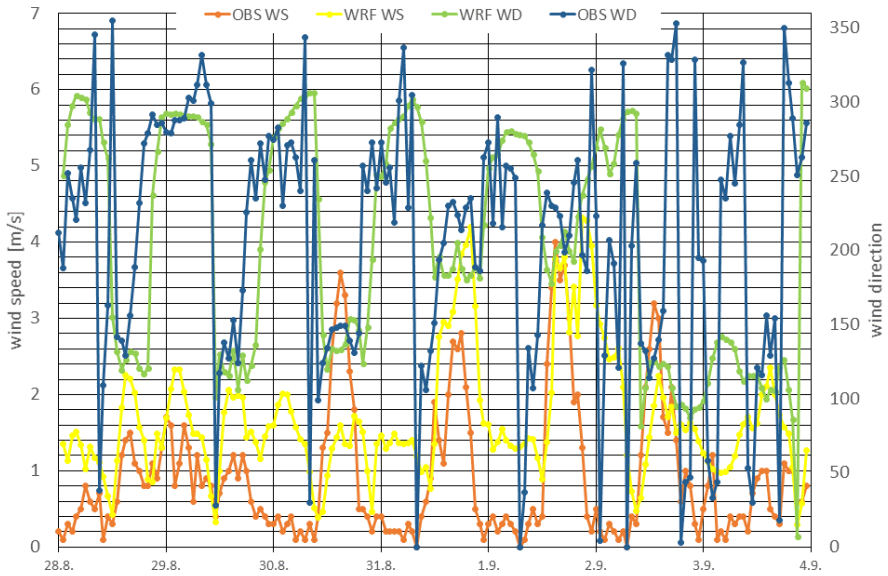




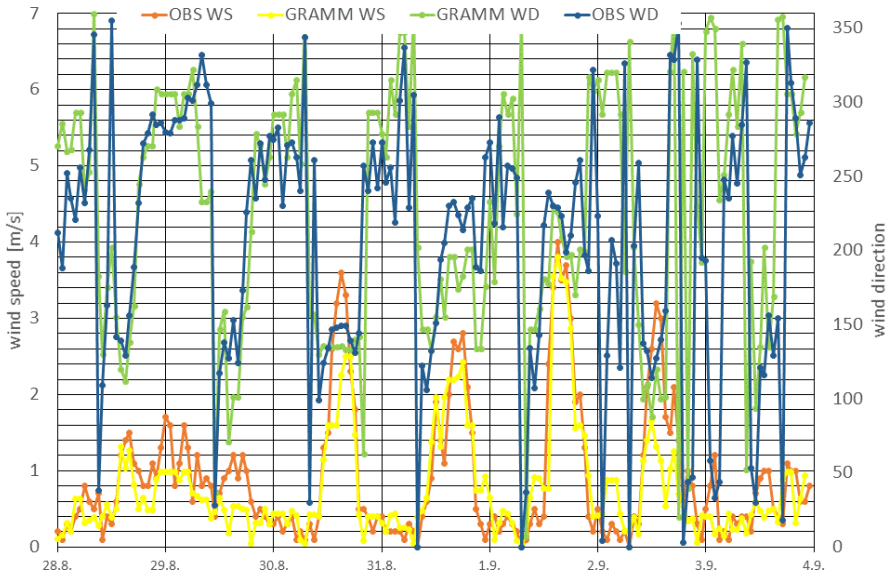


Windfield-Library
Time series comparison with WRF simulations

WRF simulation, 1000m resolution



GRAMM, MtO, 200m resolution



Valley station

Windfield-Library
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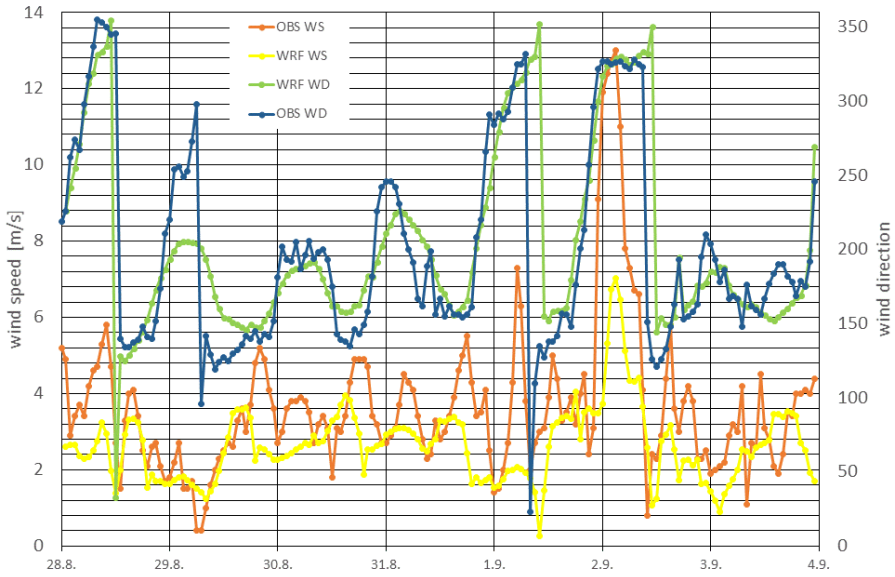

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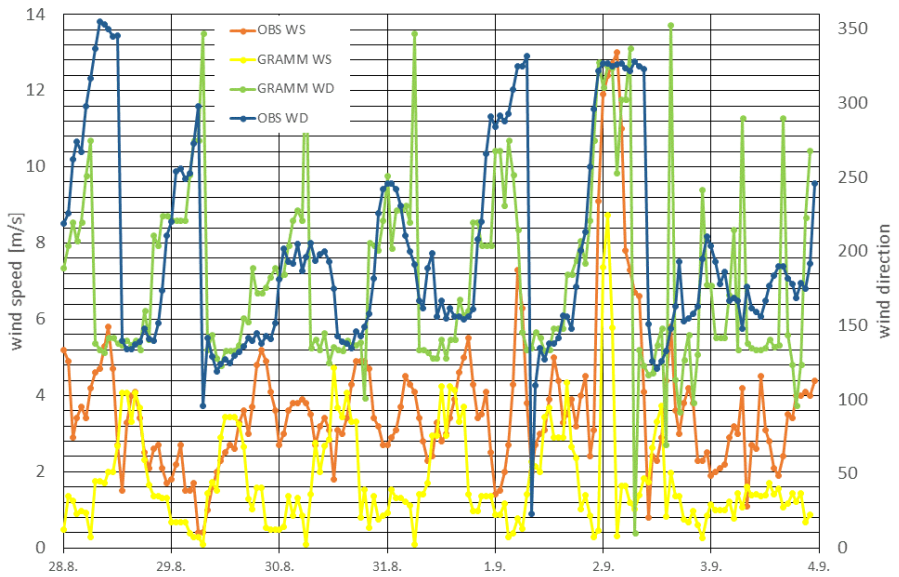


Mountain station

Conclusions

Pros:

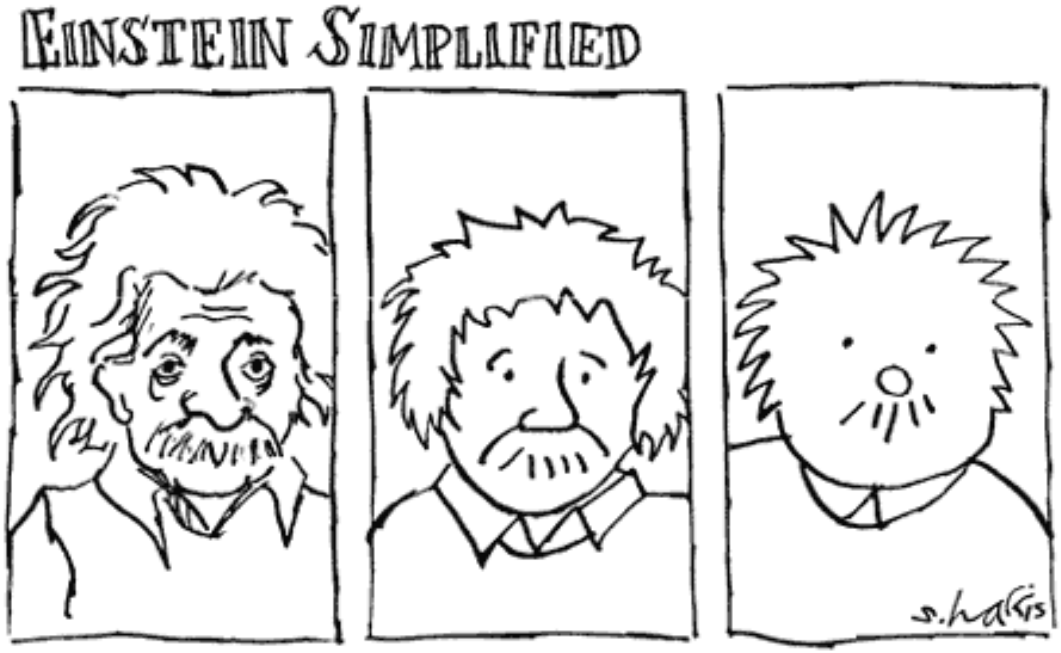
- Current methodology based on the ‚match-to-observation' methodology provides very accurate and highly resolved wind data in very complex terrain for long time periods (e.g. calendar year)
- The usage of categorized meteorological input data reduces the computational times, which is very important for the dispersion modelling including the microscale CFD model to take into account buildings/vegetation

Cons:

- Match-to-observation method may result in poor wind fields farther away from the stations used for the fitting
- The simple initialization procedure for GRAMM is not able to capture the complex interaction between synoptic scale flows and mountain-valley wind systems

Thanks for listening…

The proper art of modeling:



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