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# ERA-40 downscaling for Belgium

**Alex Deckmyn**  
KMI

Oslo, April 24, 2007

# ERA-40

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- 1957.09.01-00 UTC to 2002.08.31-18 UTC
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- Special Project **SPFRCOUP** for coupling of ALADIN and AROME to data from ECMWF and ERA.
- Excellent documentation and help from Sándor Kertész.

# ERA-40 downscaling

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- We chose a double nesting strategy:  
120 → 40 → 10

# ERA-40 downscaling

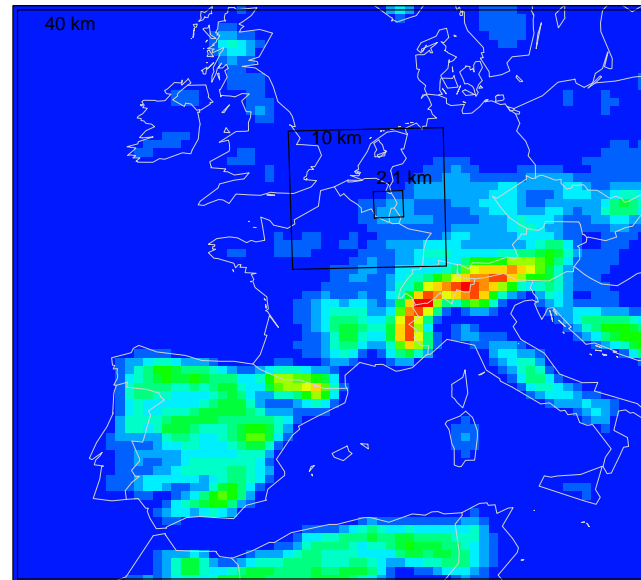
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- Several previous results in ALADIN community.
- We chose a double nesting strategy:  
120 → 40 → 10
- Additional dynamical adaptation at high resolution for small regions.

# Domain choice

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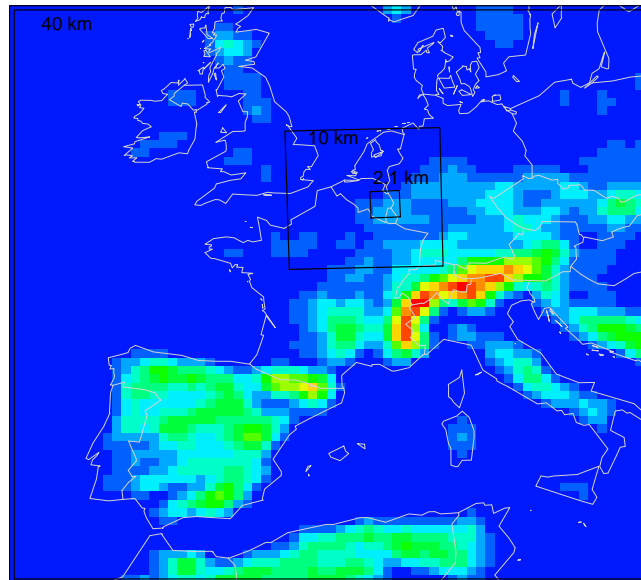
ERA-40 downscaling domains



# Domain choice

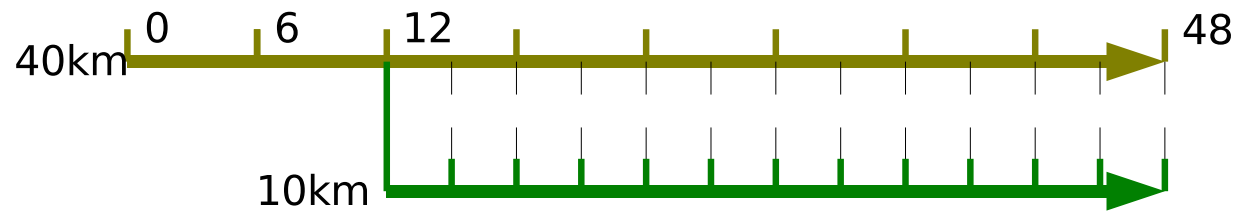
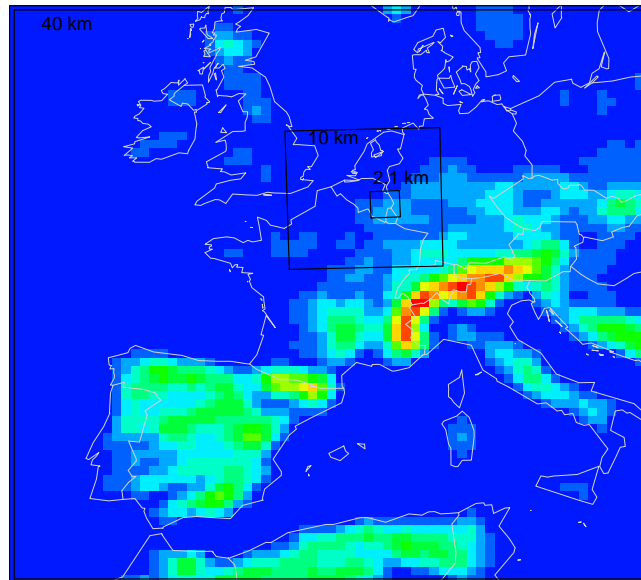
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ERA-40 downscaling domains



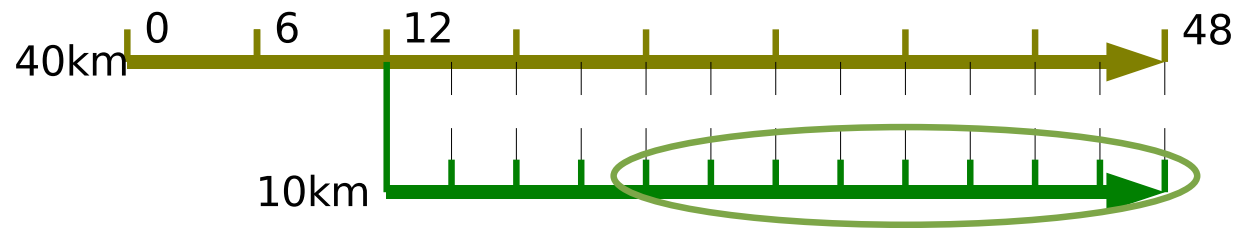
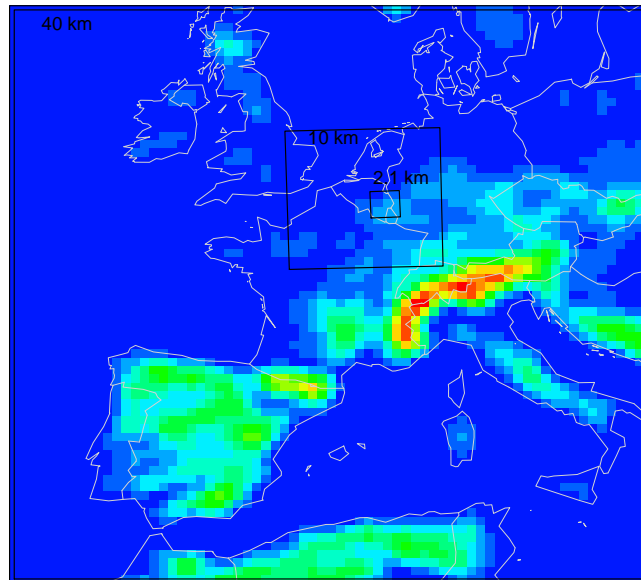
# Domain choice

ERA-40 downscaling domains



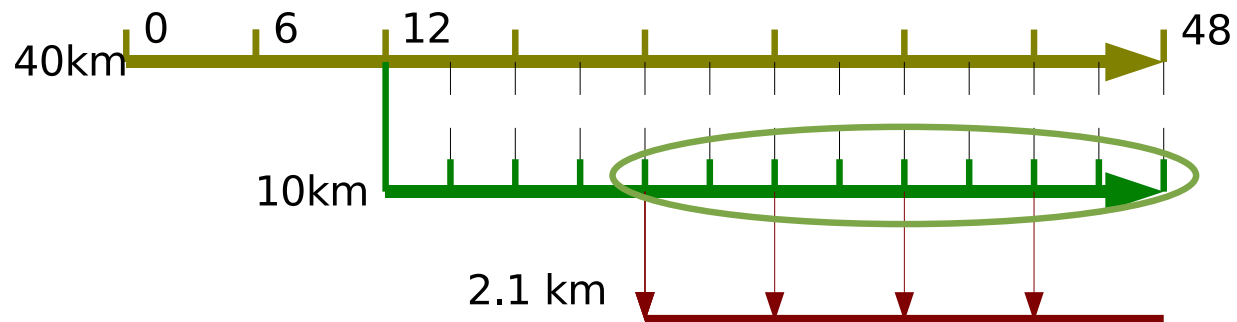
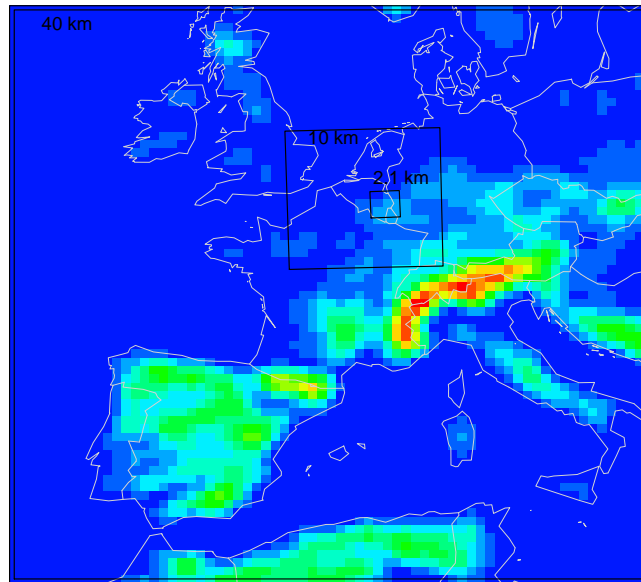
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ERA-40 downscaling domains



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# Downscaling strategy

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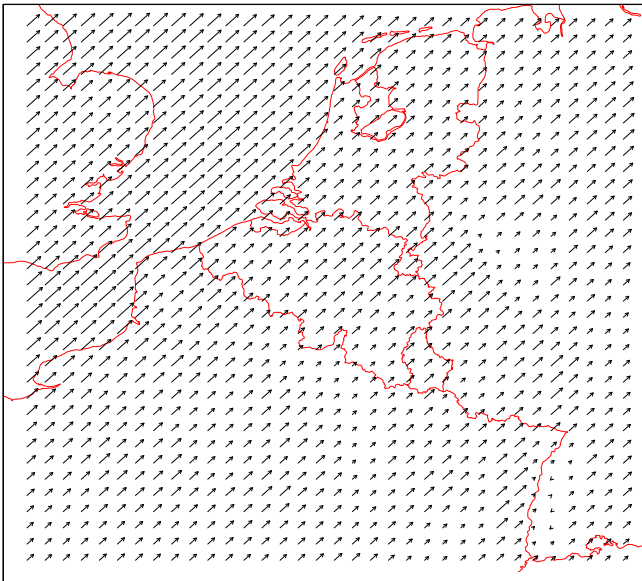
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- 46 levels (same as operational model)
- cy29T2

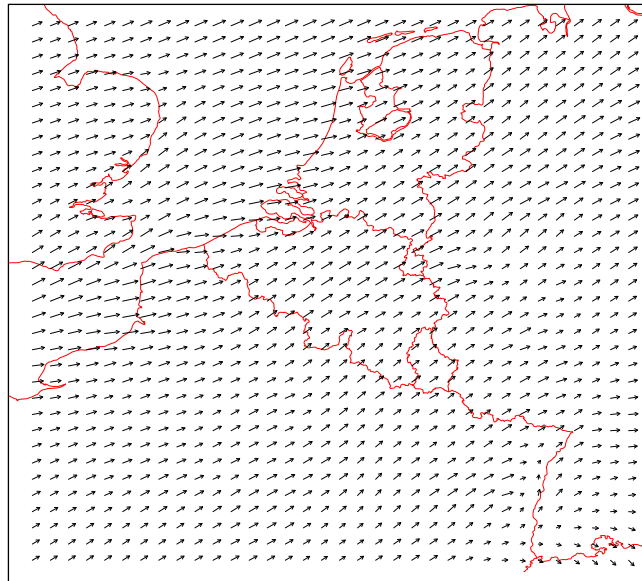
# Wind fields

Belgium is quite homogeneous.

Mean 50m wind, 00h



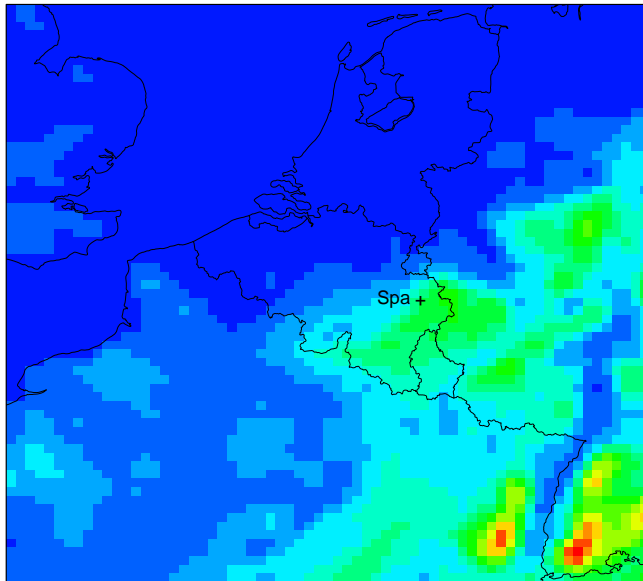
Mean 50m wind, 12h



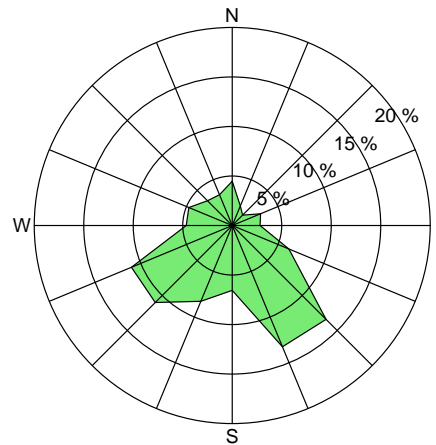
# 1 case: Spa

In the most “orographic” region of Belgium.

SPECSURFGEOPOTEN  
1/1/15 z0:0 Uninitialized



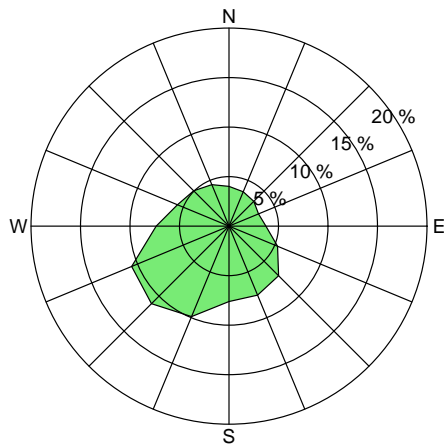
Spa observations  
1992–2001



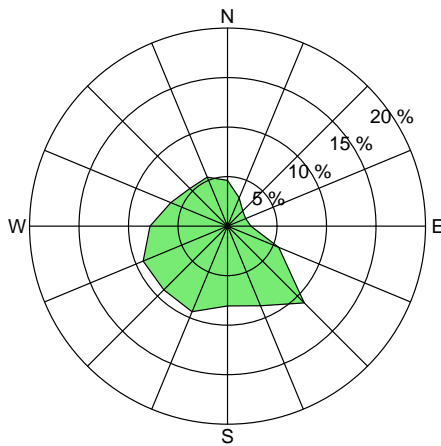
# Spa Downscaled Wind (50m)

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Spa 10km downscaling  
1992-2001



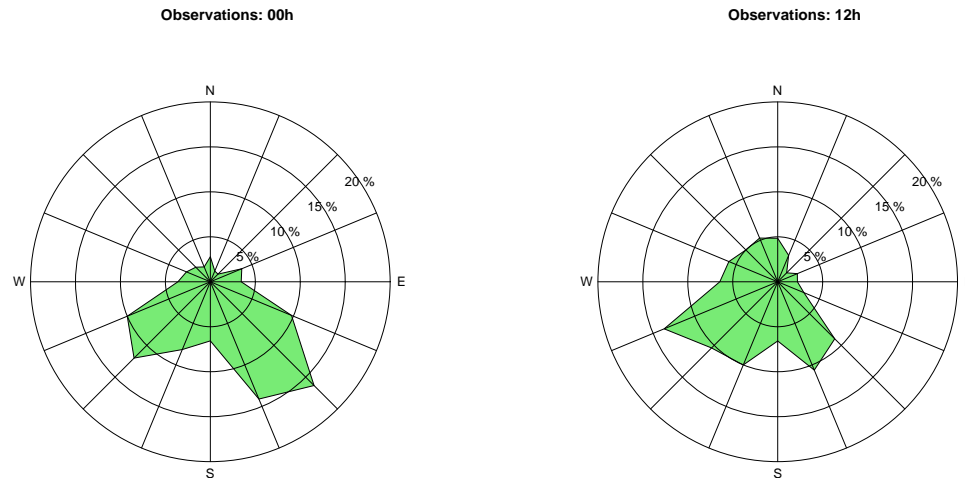
Spa 2km downscaling  
1992-2001



# Diurnal effects

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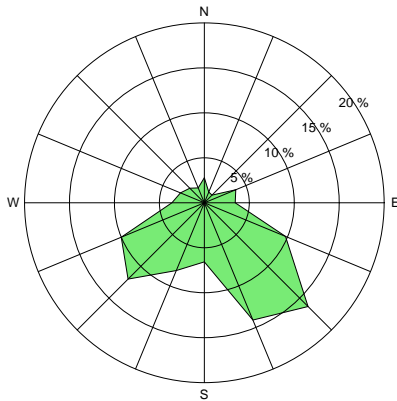
The orographic effect is much more pronounced at night.



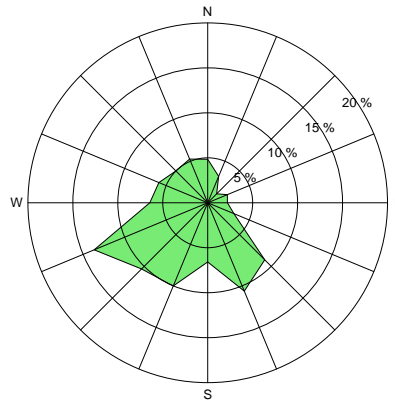
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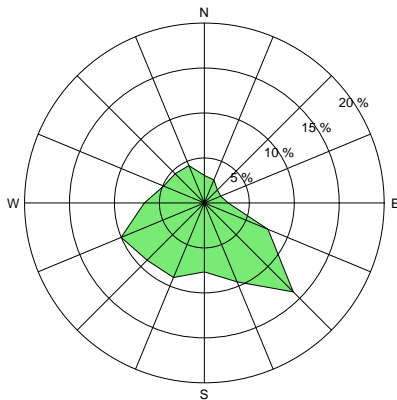
Observations: 00h



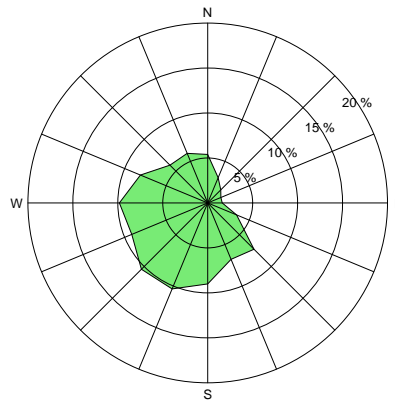
Observations: 12h



2km downscaling: 00h



2km downscaling: 12h





# Time window

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- The 48h downscaling corresponds to the 24h downscaling starting the next day.
- Do these 24h and 48h downscaling runs yield the same results?
- → robustness of the procedure.

# 24h vs 48h

## “Forecast” verification statistics for Ukkel:

### TEMPERATURE

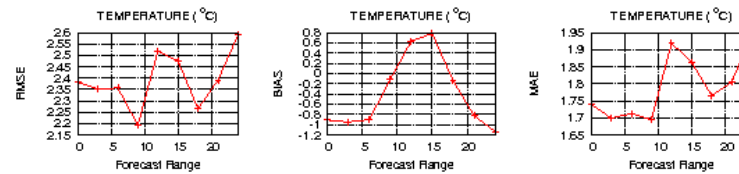


Figure 1: Temperature - 00h run

### WIND SPEED

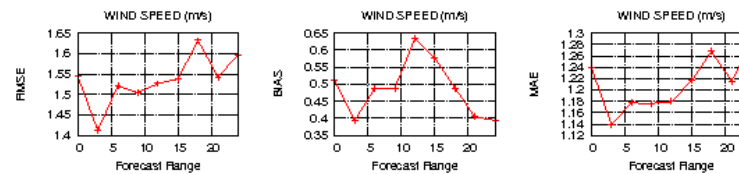


Figure 2: Wind Speed - 00h run

### MSL Pressure

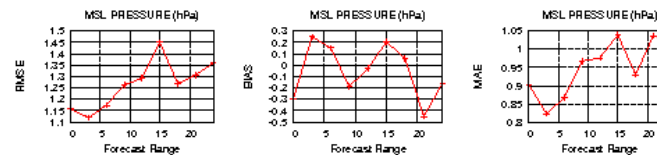


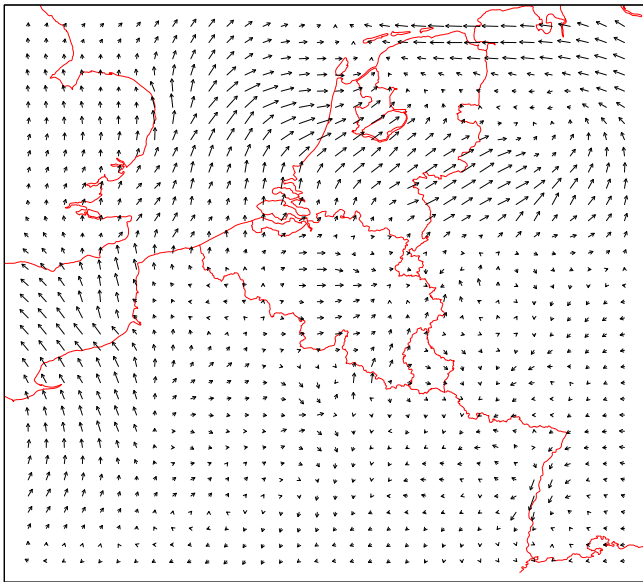
Figure 3: MSL Pressure - 00h run

# 24h vs 48h

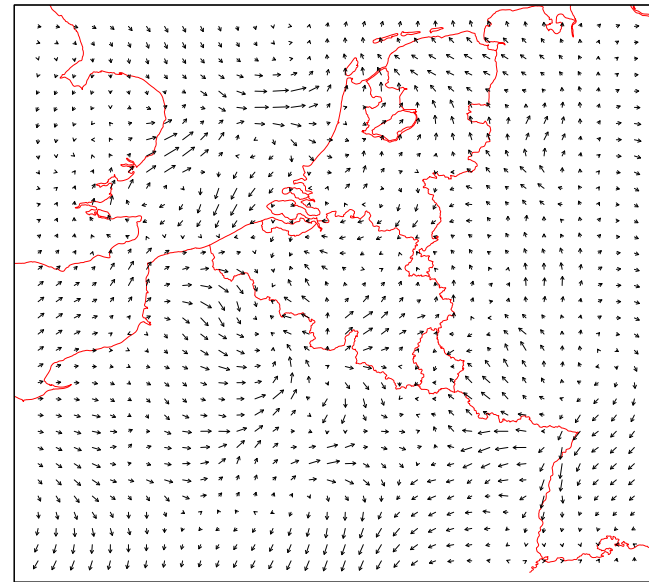
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Mean wind differences (January and July 2001):

January mean wind: 24h – 48h



July mean wind: 24h – 48h

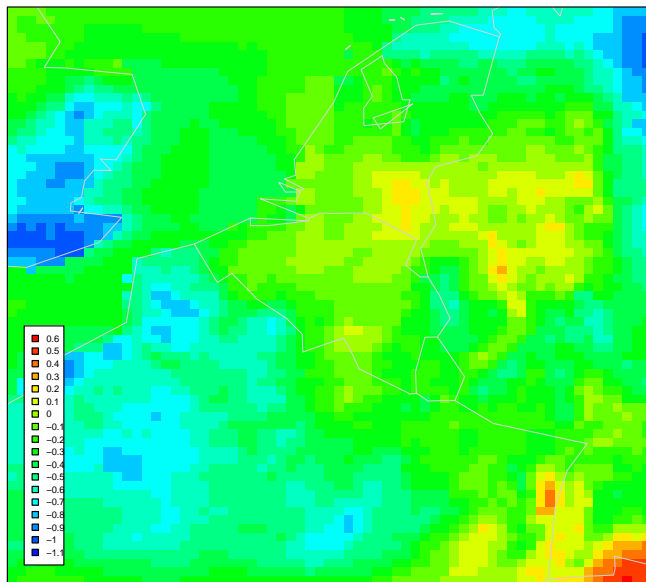


up to 0.8 m/s difference in wind components.

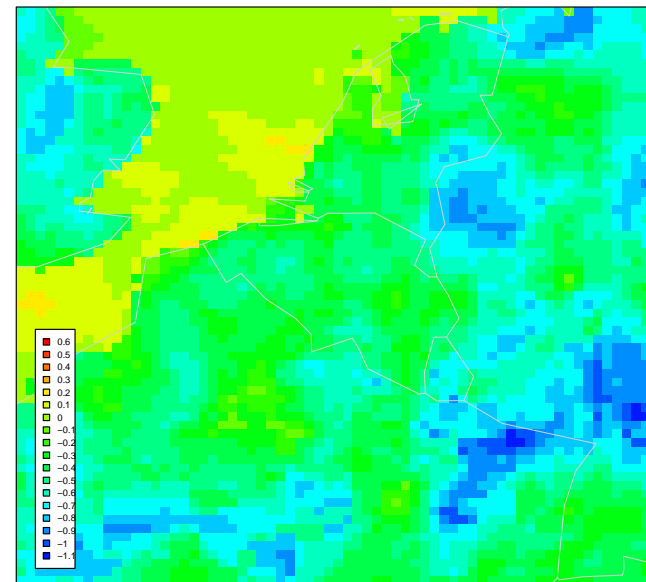
# 24h vs 48h

Mean temperature difference (January and July 2001):

January mean T2m: 24h – 48h



July mean T2m: 24h – 48h



# Future

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- Optimal “schedule” (e.g. 12-36, 24-48...)
- Other fields (T, precipitation...)
- Surfex (see Rafiq’s talk).
- Improved orography at 2 km resolution.
- Single nesting (Zagar et al.).
- Coupling zone.
- DFI Blending (Beck et al.)