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Faculty of Mathematics and Physics

ARSO METEO
Slovenia

Regional Cooperation for
Limited Area Modeling in Central Europe

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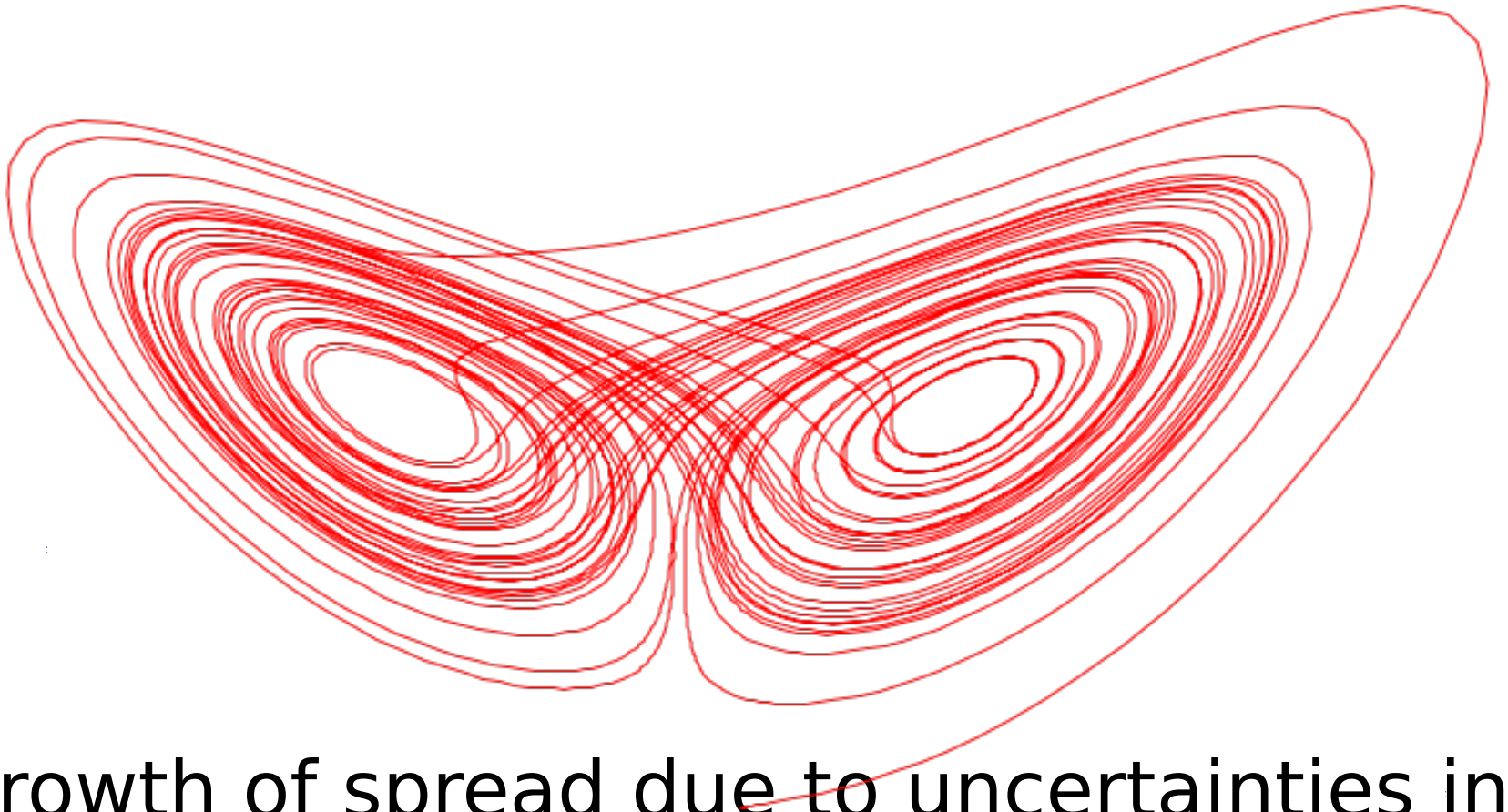

Growth of spread due to uncertainties in initial conditions and lateral boundaries

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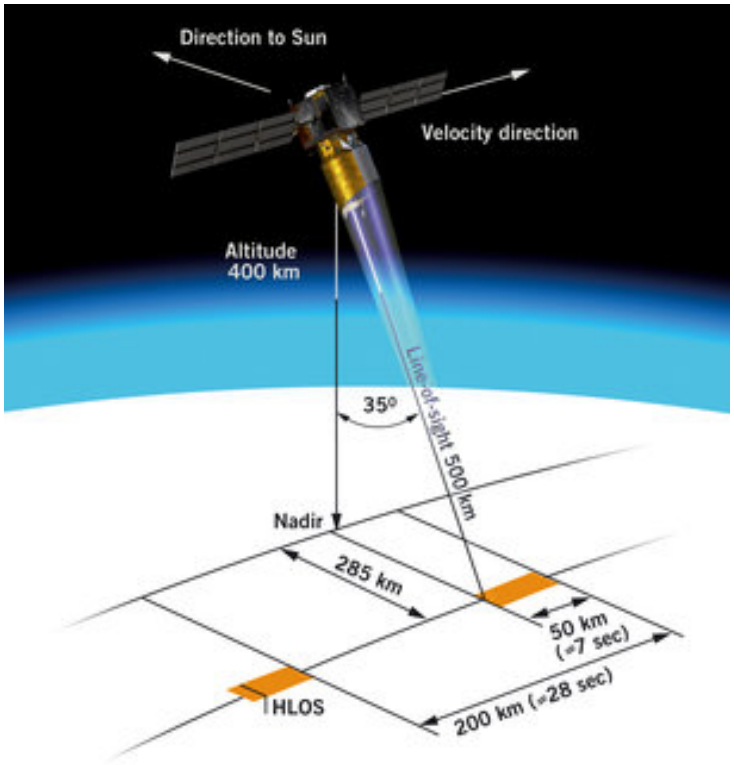
Background

A by-product of an ESA study on
Mesoscale wind profiles and data assimilation for numerical weather prediction



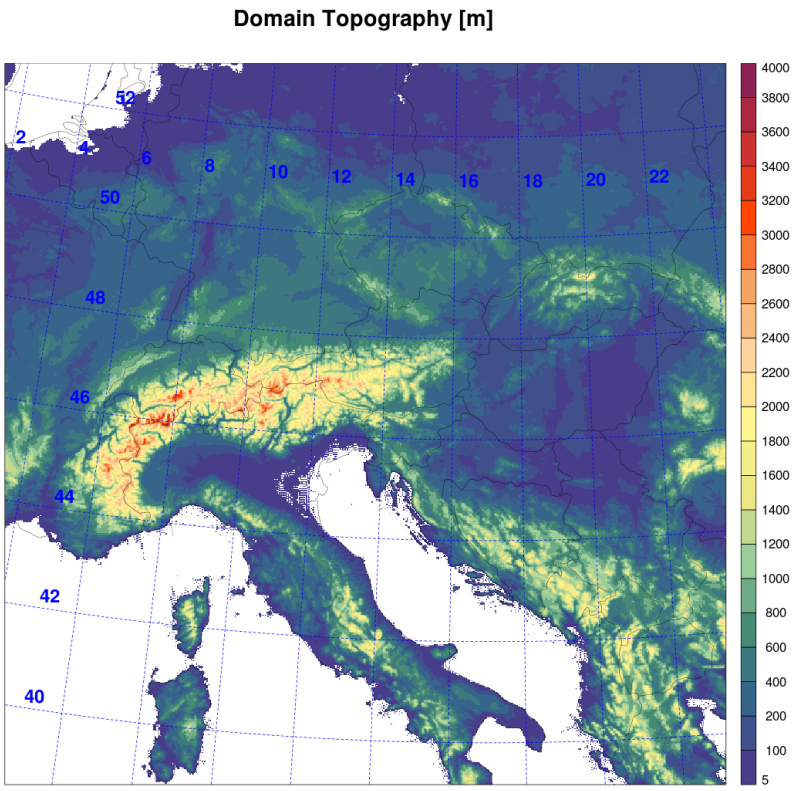
Mesoscale ensemble

AROME with 2.5 km resolution, domain size of 637x637 points, 87 levels in the vertical

Coupled to ECWMF ENS - all 50 members

Runing with HARMONIE scripting system at ECMWF

ENS upper air are not stored in MARS -> had to be saved promptly

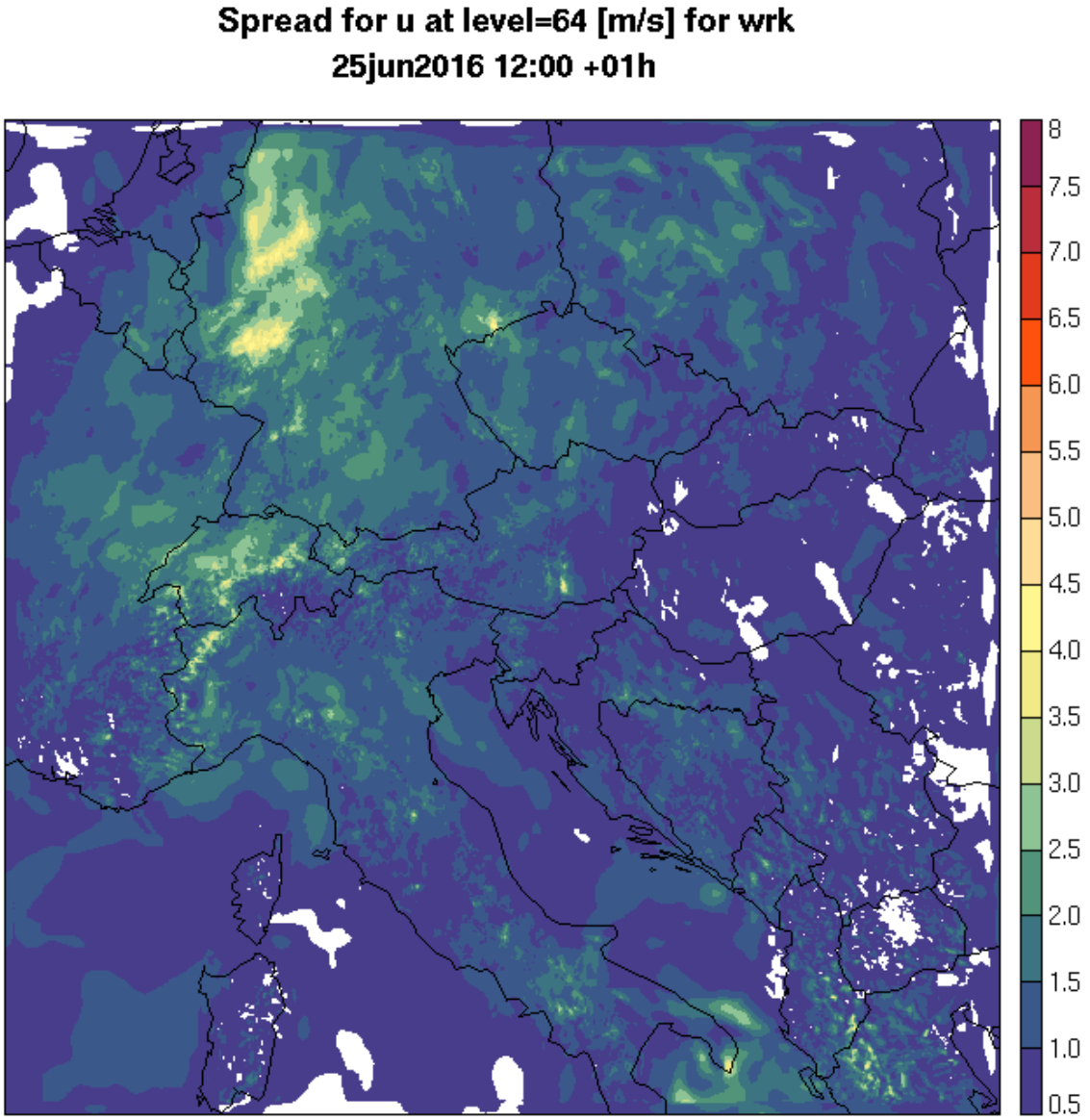


Investigating the spread of an ensemble

Spread for zonal wind, at level 64 (~850 hPa)

Only downscaling and no other perturbations but those from ENS

Joint impact of IC and LB



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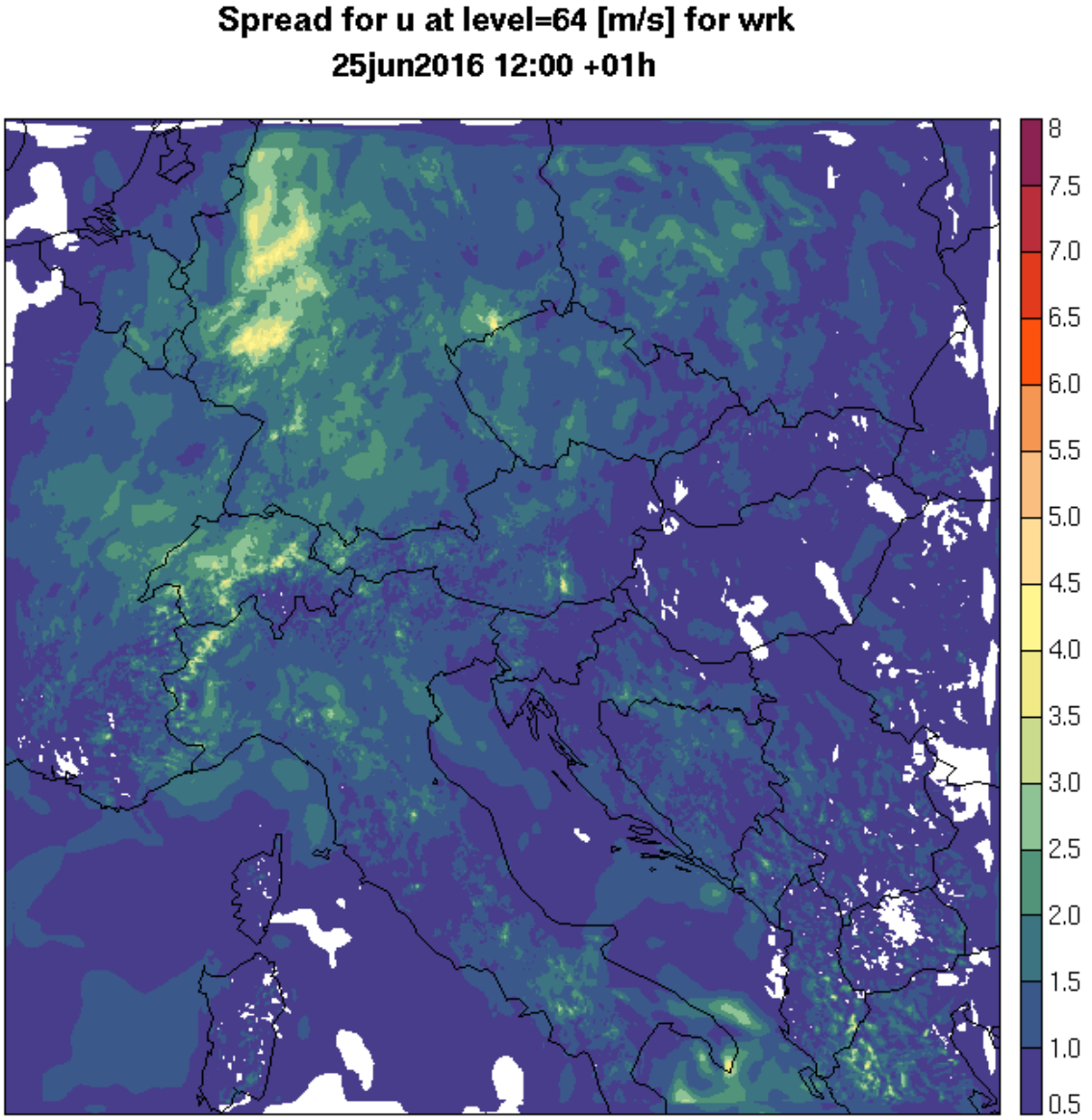


Experiment construction: 3 sets of downscaled ens

To isolate the impact of LB we replace the initial condition with the one from member ooo

```
for MBR in $MEMBERS; do
  ln -s mbr000/ICMSHINIT mbr$MBR/ICMSHINIT
```

=experiment with the same IC

And, similarly for impact of IC we only keep perturbed IC, all coupling files point to member ooo

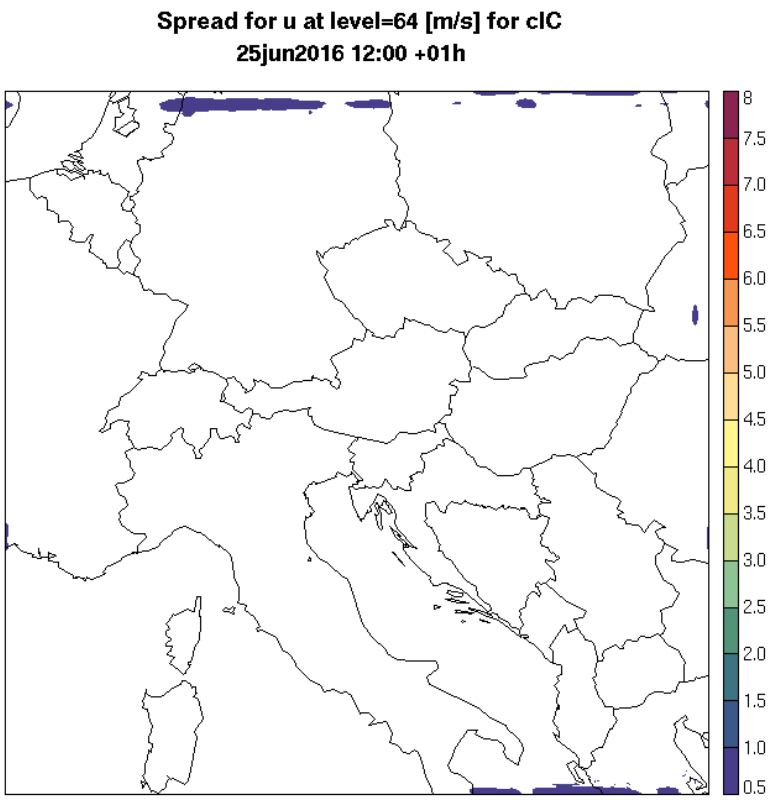
```
for MBR in $MEMBERS; do
  ln -s mbr000/ELSCF* mbr$MBR/.
```

=experiment with the same LB

June 25, 2016 at 12 UTC

NE moving upper level through & a cold front associated to it

same initial conditions, different lateral boundaries



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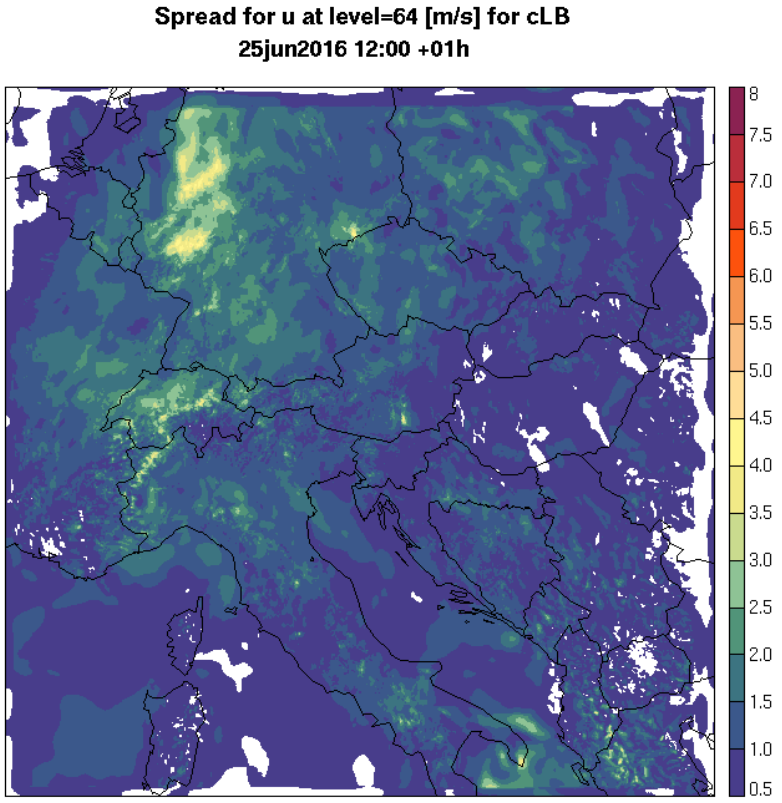

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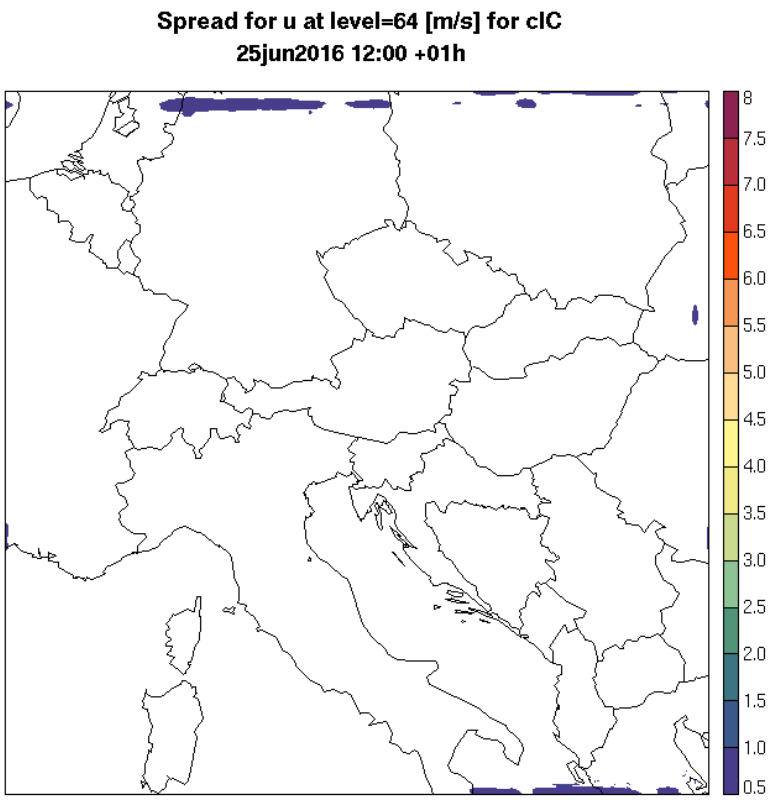

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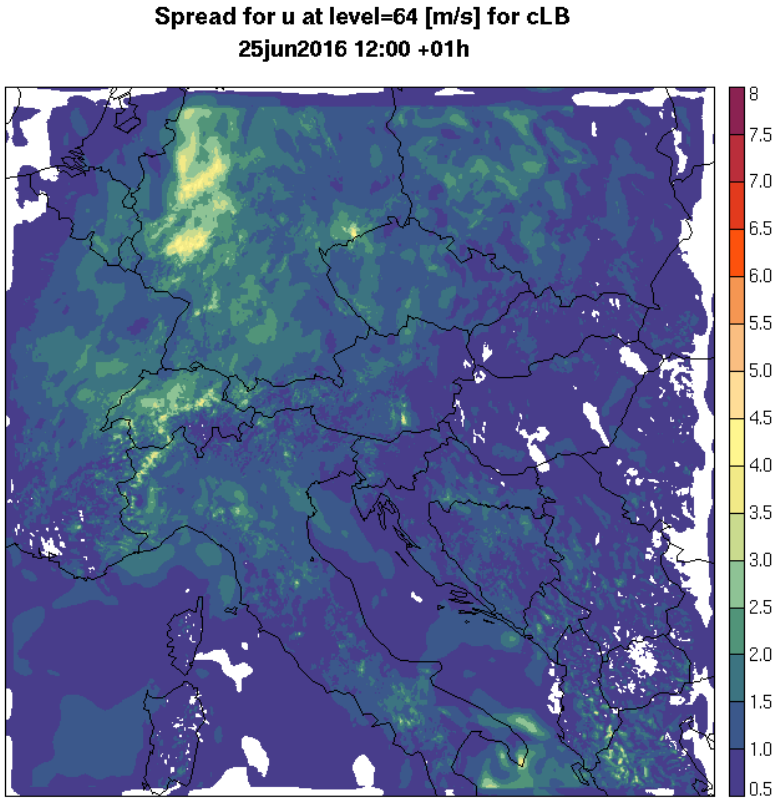


Sample for statistics

8 cases, all 50 members downscaled in 3 ways

~5 days apart, equally distributed between 00 and 12 runs

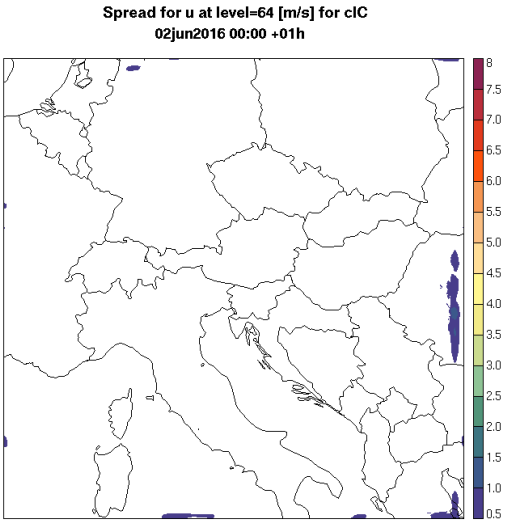
June 2016	02 00z
	06 12z
	11 00z
	15 12z
	21 00z
	25 12z
	30 00z
July 16	04 12z

assumed to be synoptically independent

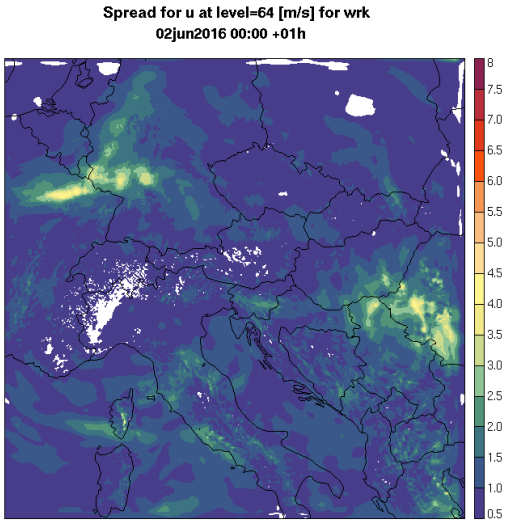
June 02, 2016 at 00 UTC

upper level cut-off low

same initial conditions,
different lateral boundaries



different initial conditions,
different lateral boundaries



different initial conditions,
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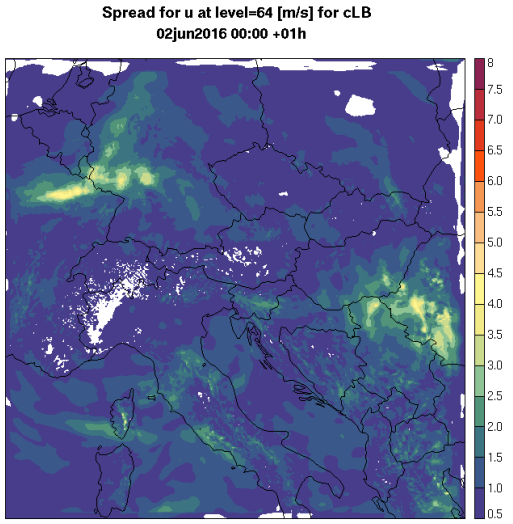
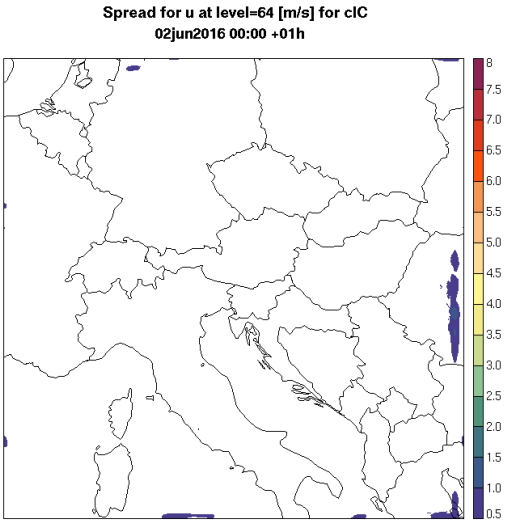


June 02, 2016 at 00 UTC upper level cut-off low

same initial conditions,
different lateral boundaries



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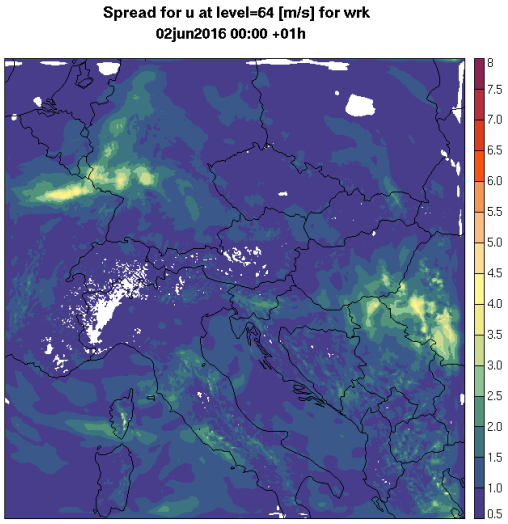

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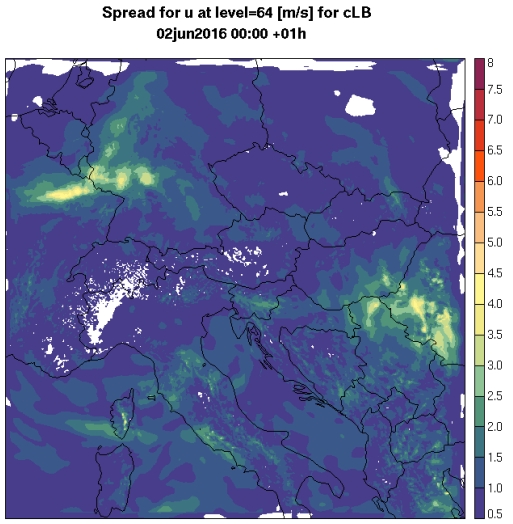
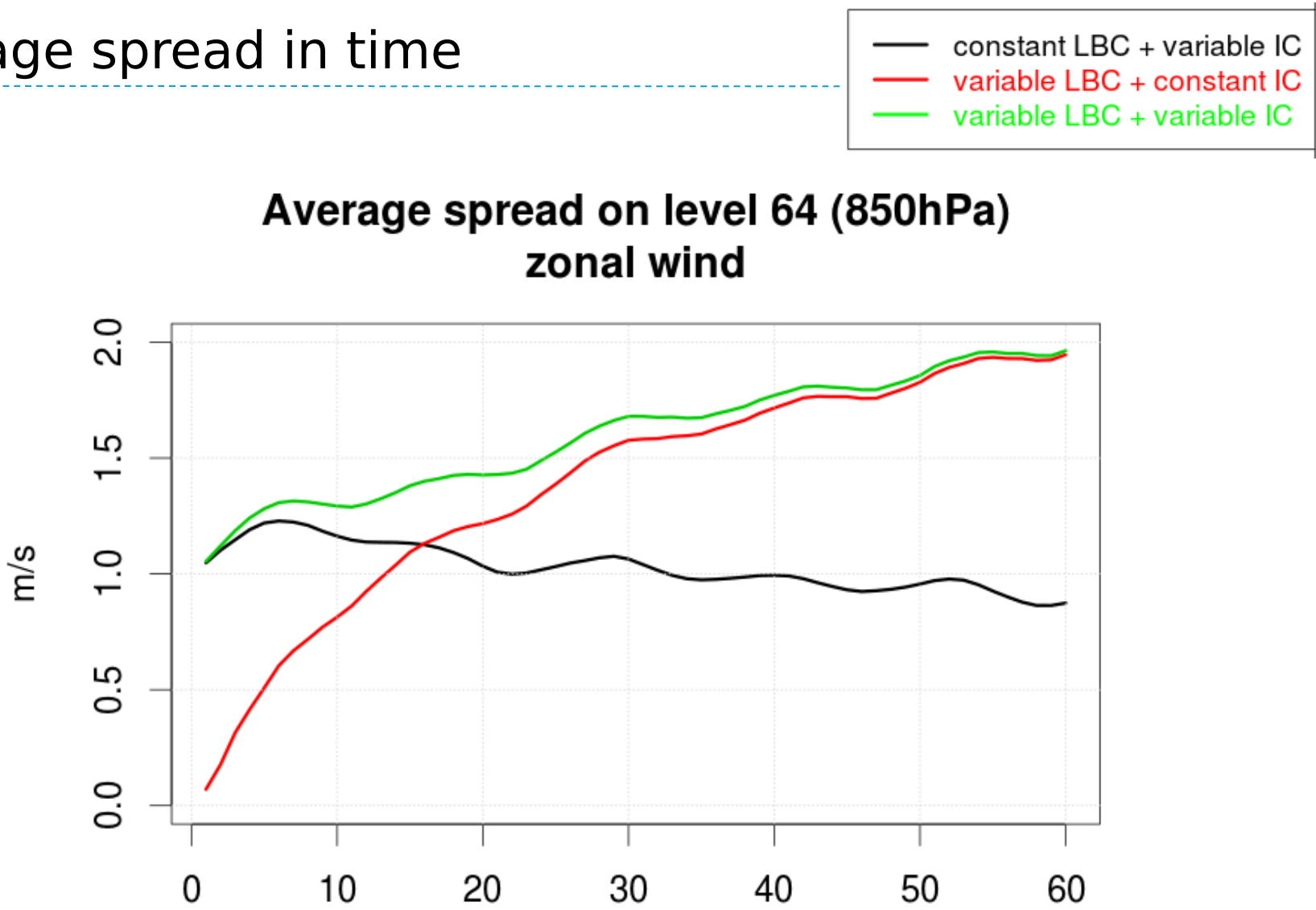


Average spread in time



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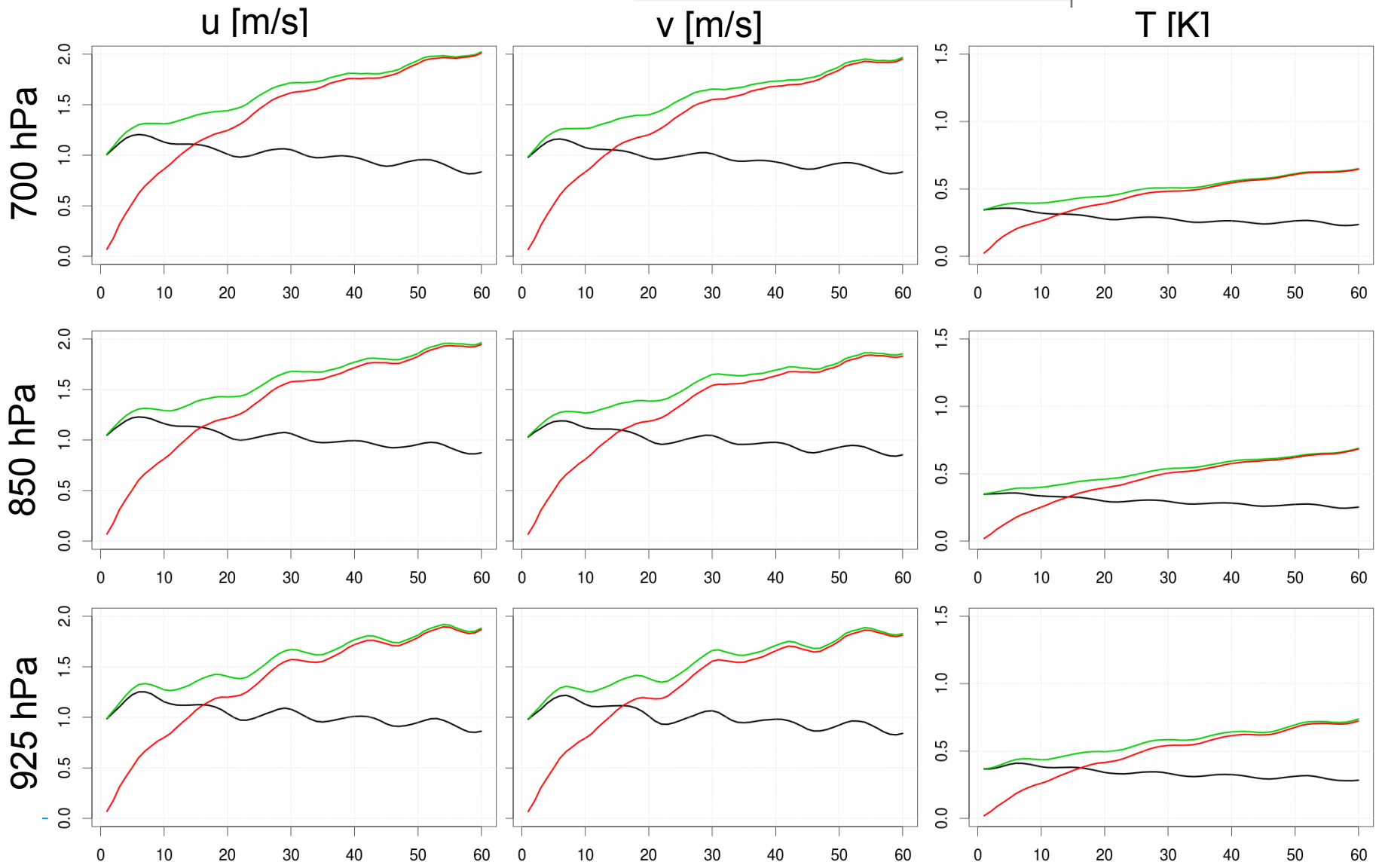
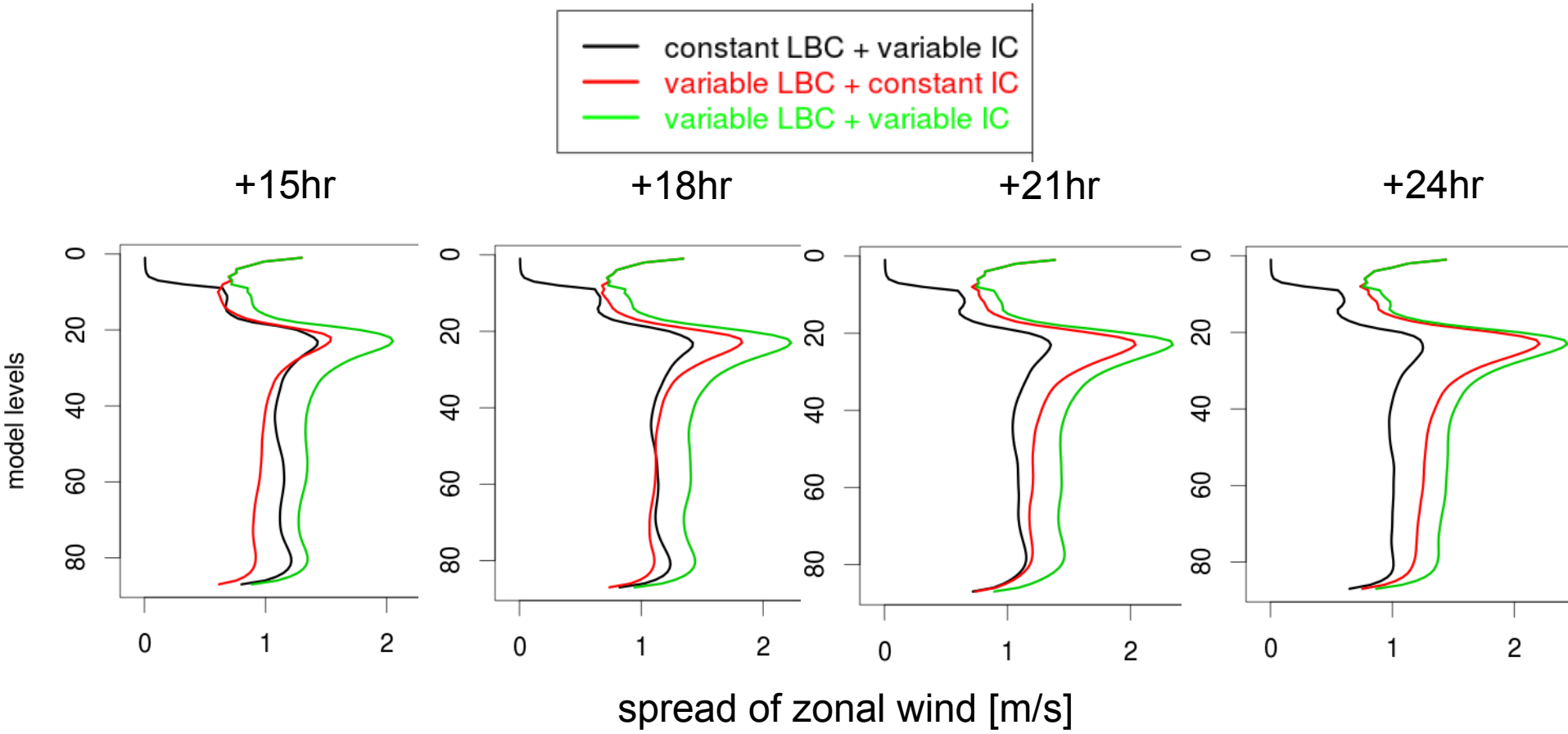


Average vertical profiles of average spread



Conslusions

Propagation of uncertainties from the boundaries

Small domain, but not that small (637x637 points)
Location of »the zone of interest« matters too

The spread resulting from boundary conditions rises to the same magnitude as the internally grown spread after ~15 hours

Forecasts longer than ~24 hours are dominated by downscaling of lateral boundary conditions