LMDZ-régional, jusqu'où iras-tu?

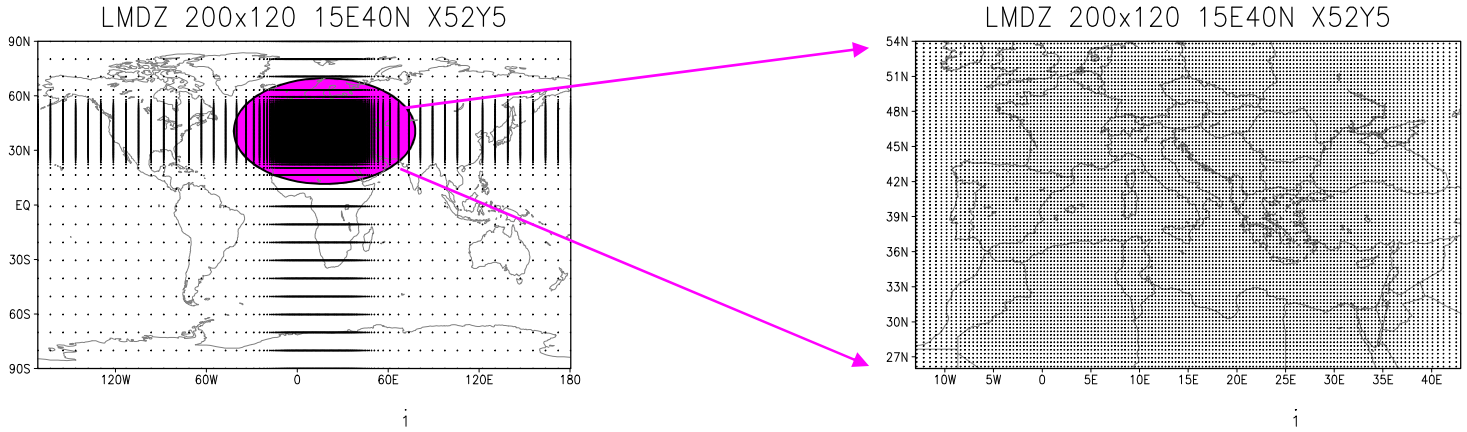
(quelques exemples d'utilisation du LMDZ pour étudier le climat régional)

Laurent Li

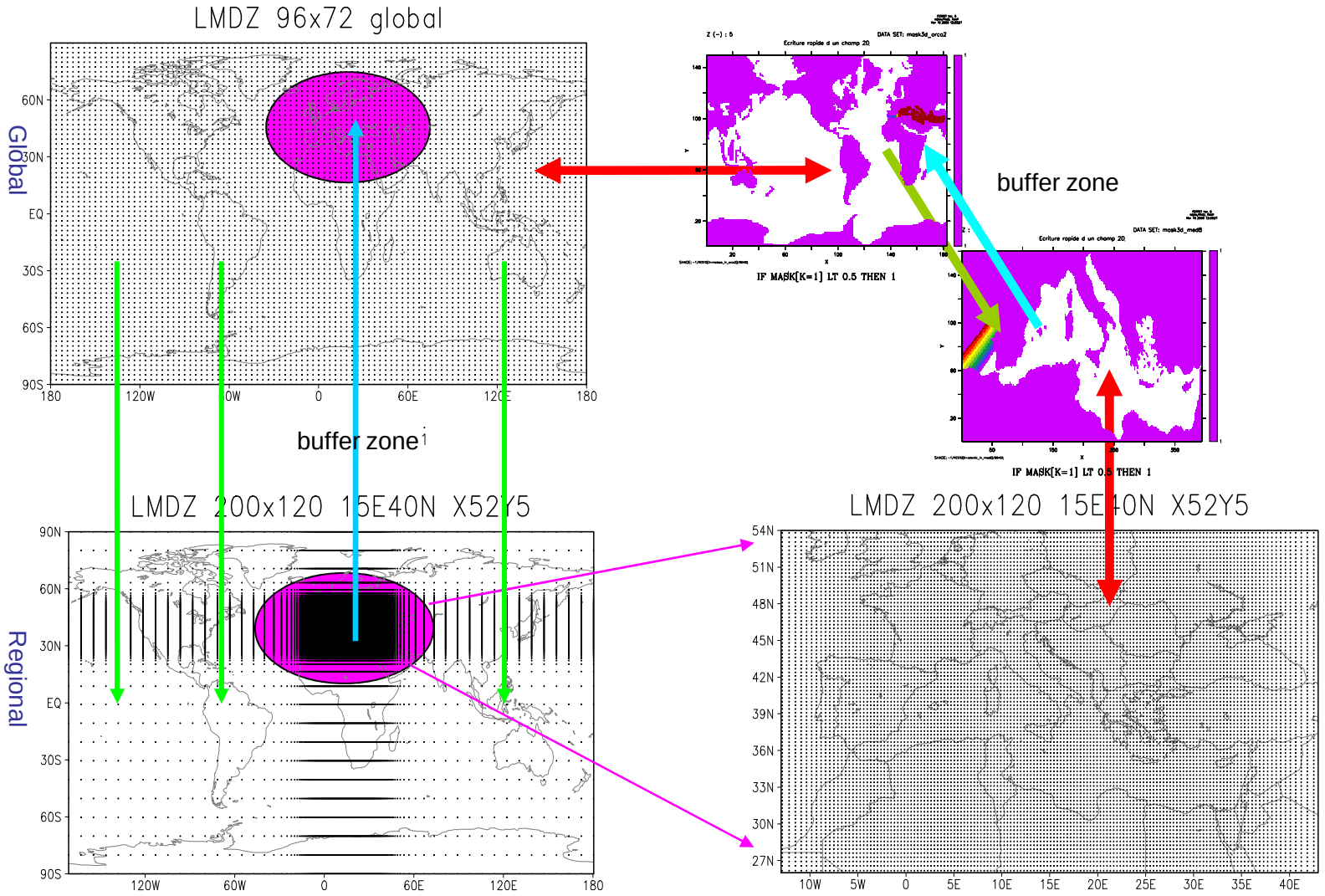
Laboratoire de Météorologie Dynamique,
IPSL/CNRS, Paris

- LMDZ utilisé comme un modèle régional
- Two-way nesting, un outil innovant
- Perspectives: CORDEX, LMDZ/WRF

LMDZ-regional: Med version



- LMDZ-Med is a global atmospheric GCM with variable grid and a zoom over the Mediterranean basin. Local resolution: 30 km.
- It is run as a regional climate model, with nudging conditions (every 6 hours) from a global model (LMDZ-g, ERA40, IPCC, etc.) at low resolution outside the zoom. The model is free to have its own behaviours inside the zoom.



- **Global O-A coupled model: LMDZ-global / ORCA2**
- **Regional O-A coupled model: LMDZ-regional / MED8**
- **Two atmospheric models are coupled through buffer zones**
- **Two oceanic models are also coupled through buffer zones**

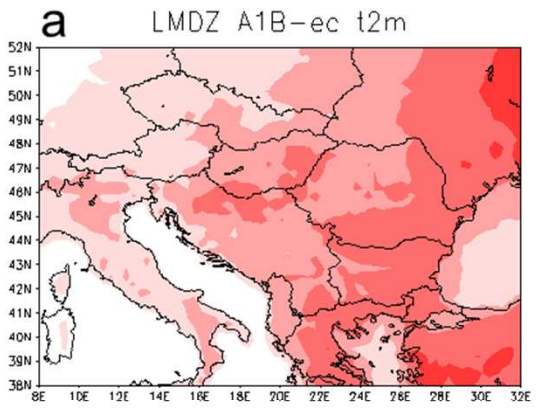
Schematic of the quardruple coupling in IPSL: M4

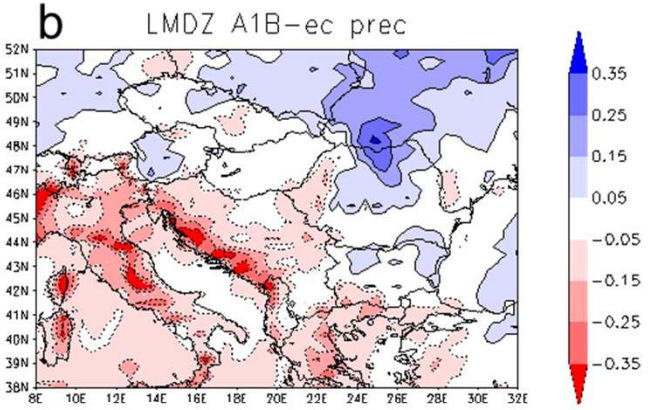
LMDZ-regional and REMO for climate change downscaling (ECHAM A1B) in Eastern Europe

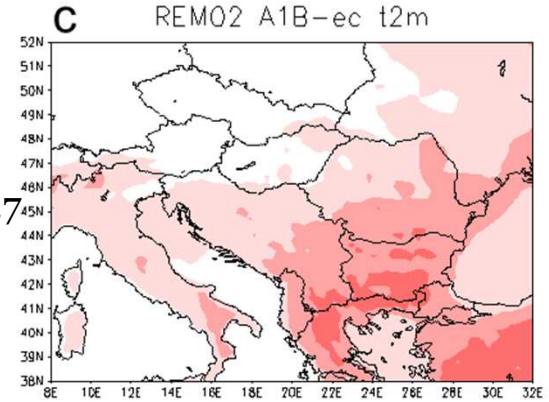
LMDZ

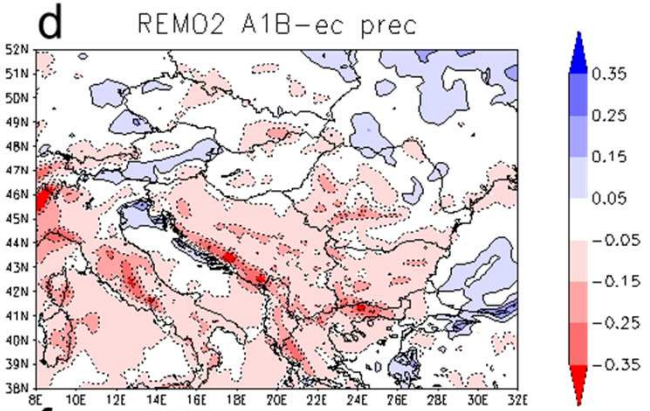
REMO5.7

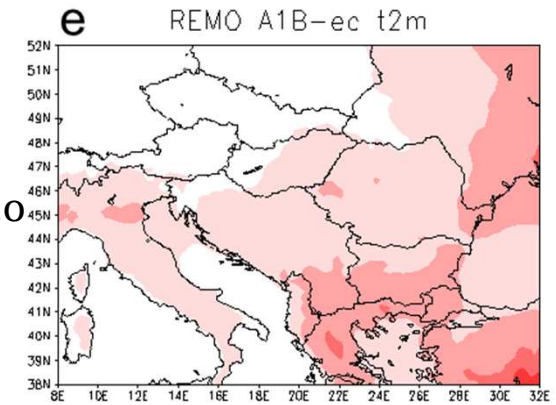
REMO5.0

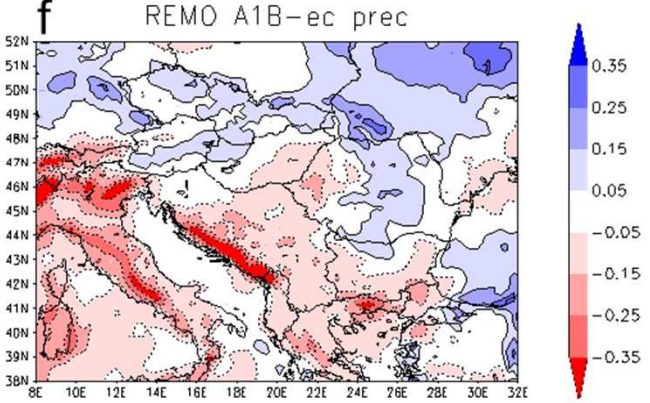












Surface air temperature

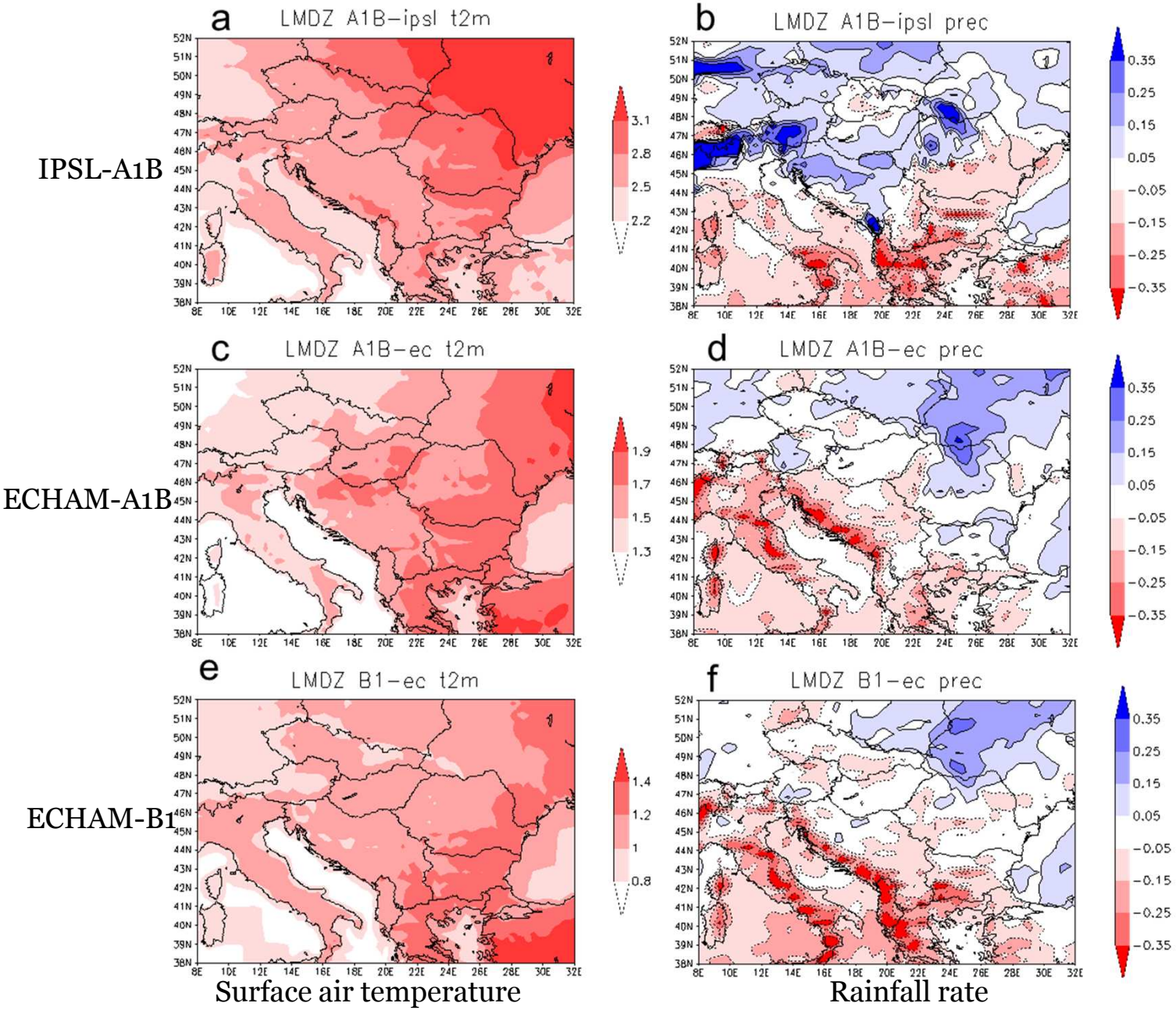
Rainfall rate

LMDZ-regional climate change downscaling (3 different scenarios) in Eastern Europe

IPSL-A1B

ECHAM-A1B

ECHAM-B1



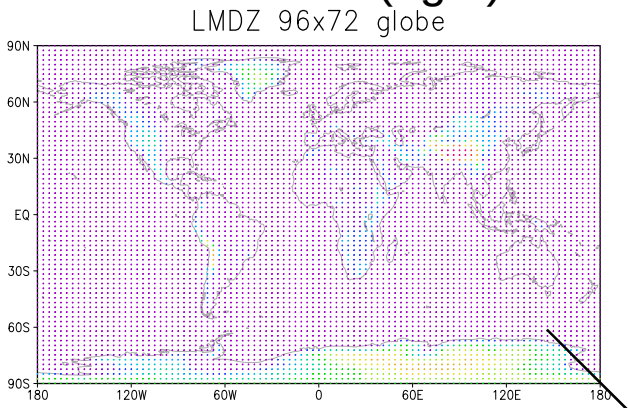
Surface air temperature

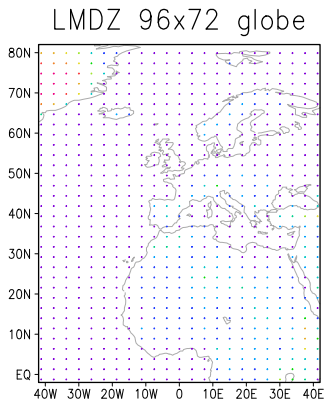
Rainfall rate

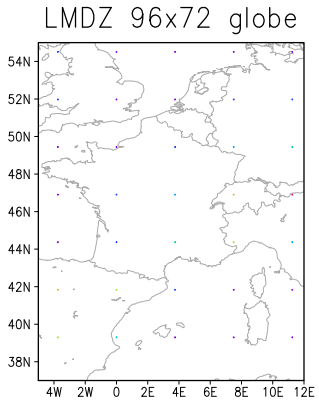
A downscaling study for France:

- Three versions: Global / Europe / France
- Two-way nesting between Global/Europe
- One-way nesting from Europe to France

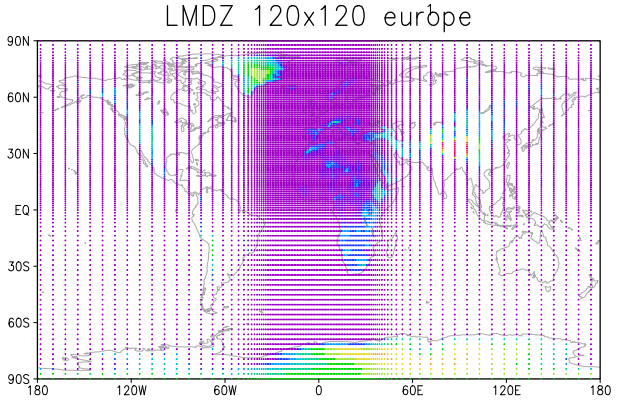
LMDZ grid schemes for the whole earth (left), for Europe (middle) and for France (right) in three versions

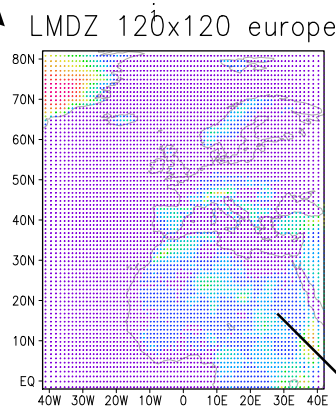


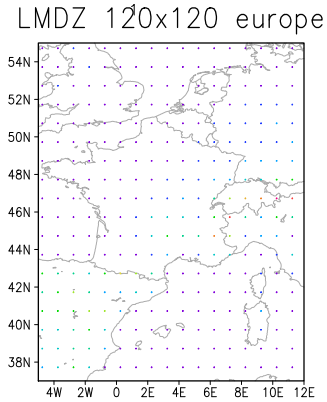




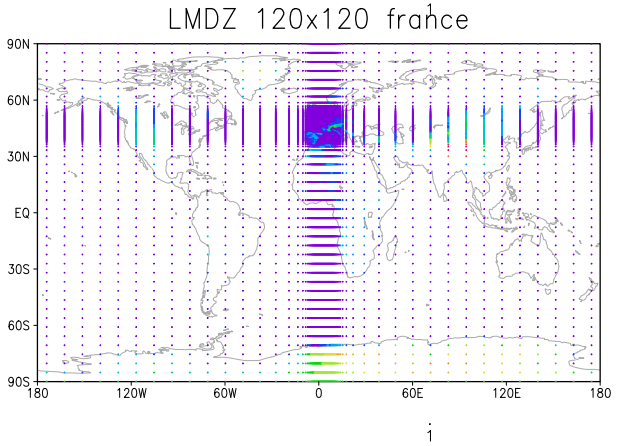
LMDZ Globe
(300 km)

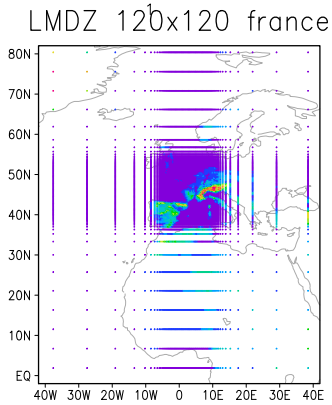


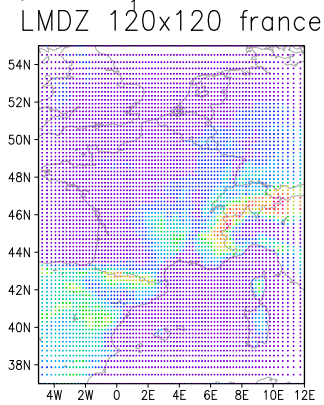




LMDZ Europe
(100 km)

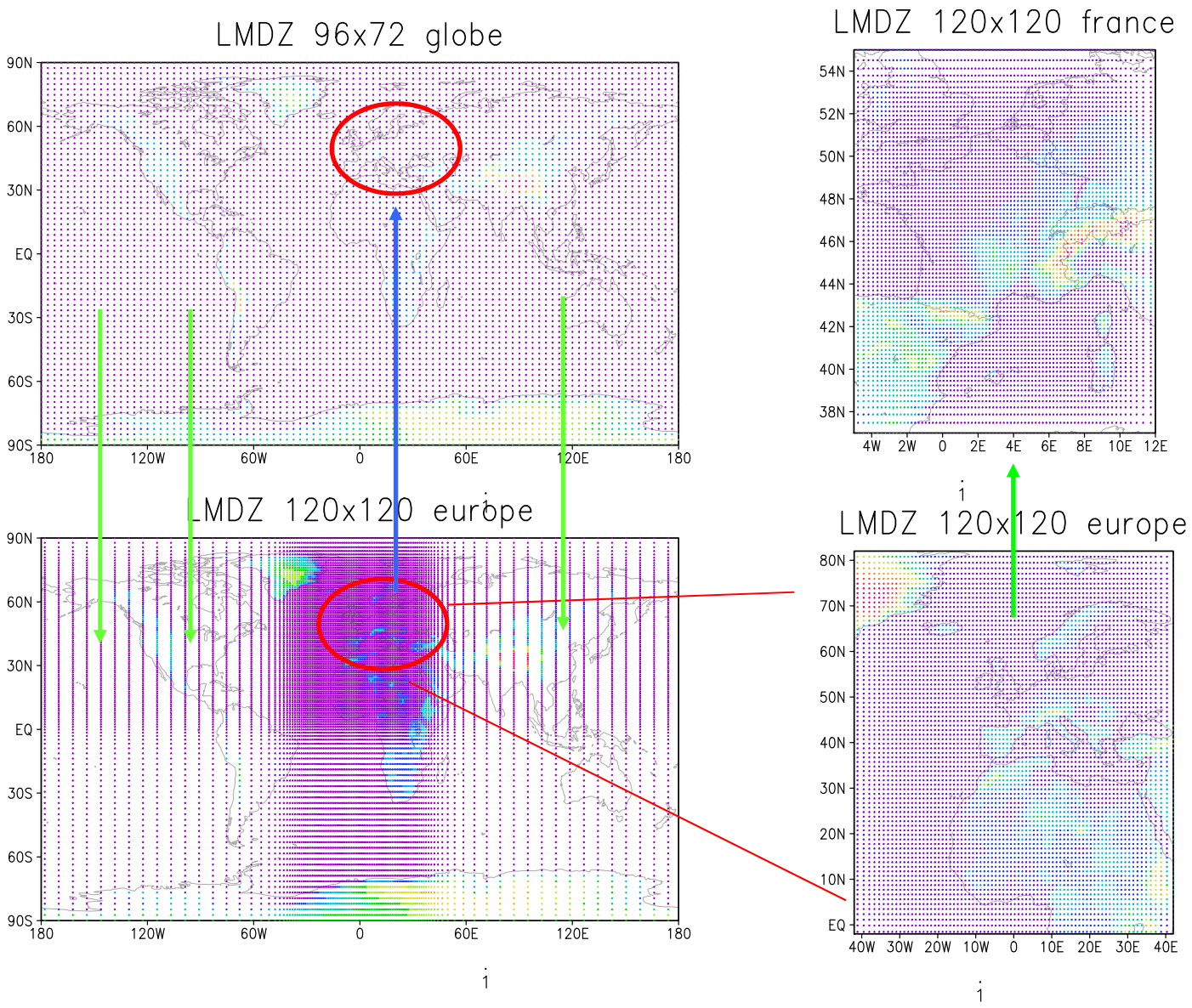




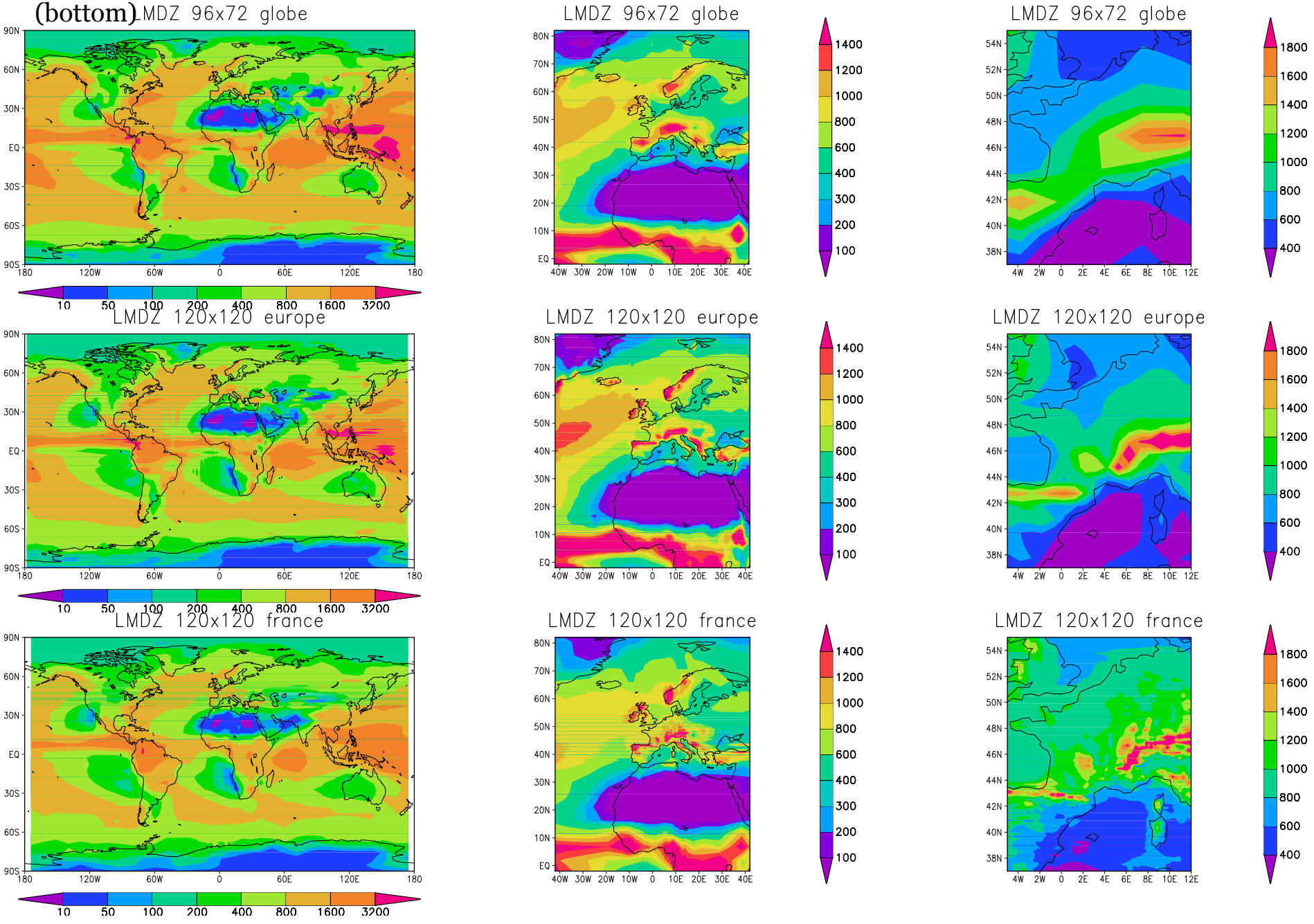


LMDZ France
(20 km)

Two-way nesting between LMDZ-regional and LMDZ-global



Annual-mean precipitation (mm) in three LMDZ models: Globe (top), Europe (middle) and France (bottom)



Pr (mm/jour), Tx(° C) et Tn (° C) pour un niveau de retour à 50 ans, à Marseille, observation et trois résolutions du LMDZ

Pr	Obs	300km	100km	20km
1961/1990	**145**	**43**	**42**	**62**
2021/2050	**?**	**38**	**56**	**93**

Tx	Obs	300km	100km	20km
1961/1990	**38.9**	**32.2**	**34.7**	**35.6**
2021/2050	**?**	**36.0**	**36.9**	**37.5**

Tn	Obs	300km	100km	20km
1961/1990	**26.2**	**21.7**	**24.8**	**25.6**
2021/2050	**?**	**24.0**	**27.0**	**27.8**

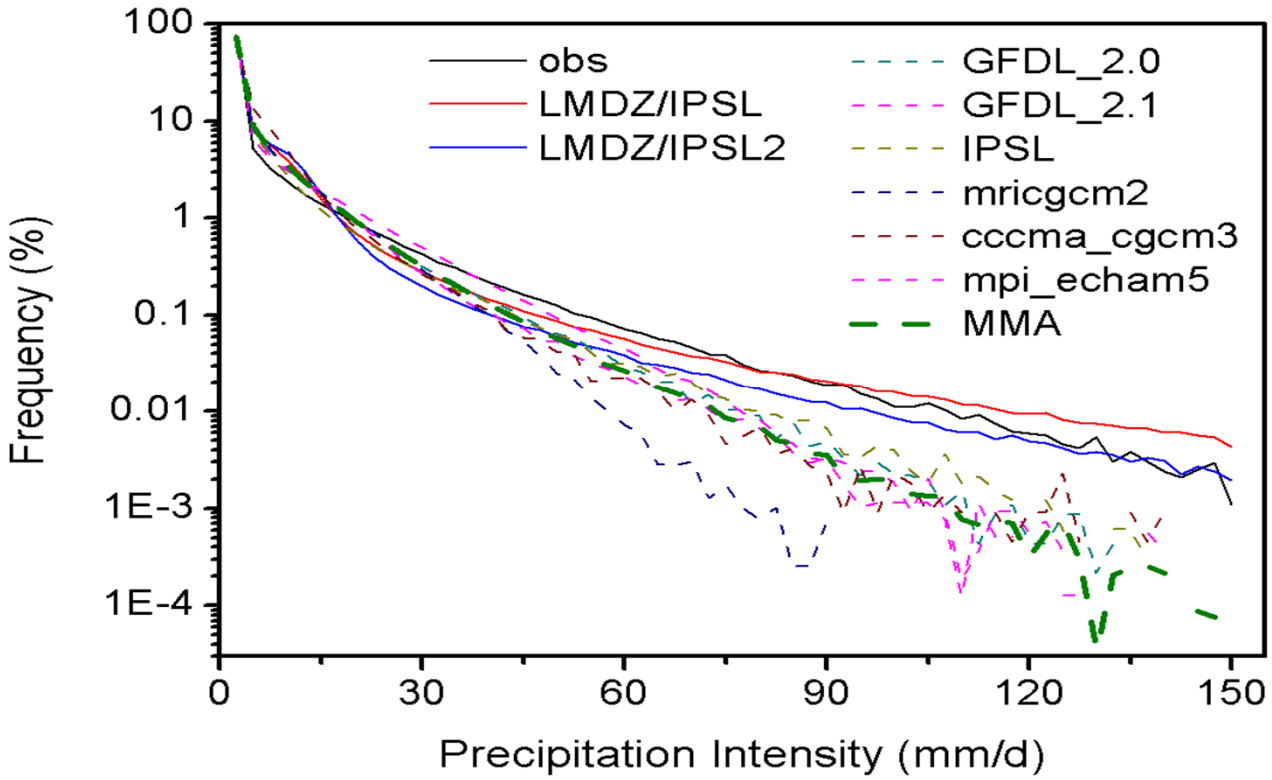
Pr: précipitations intenses

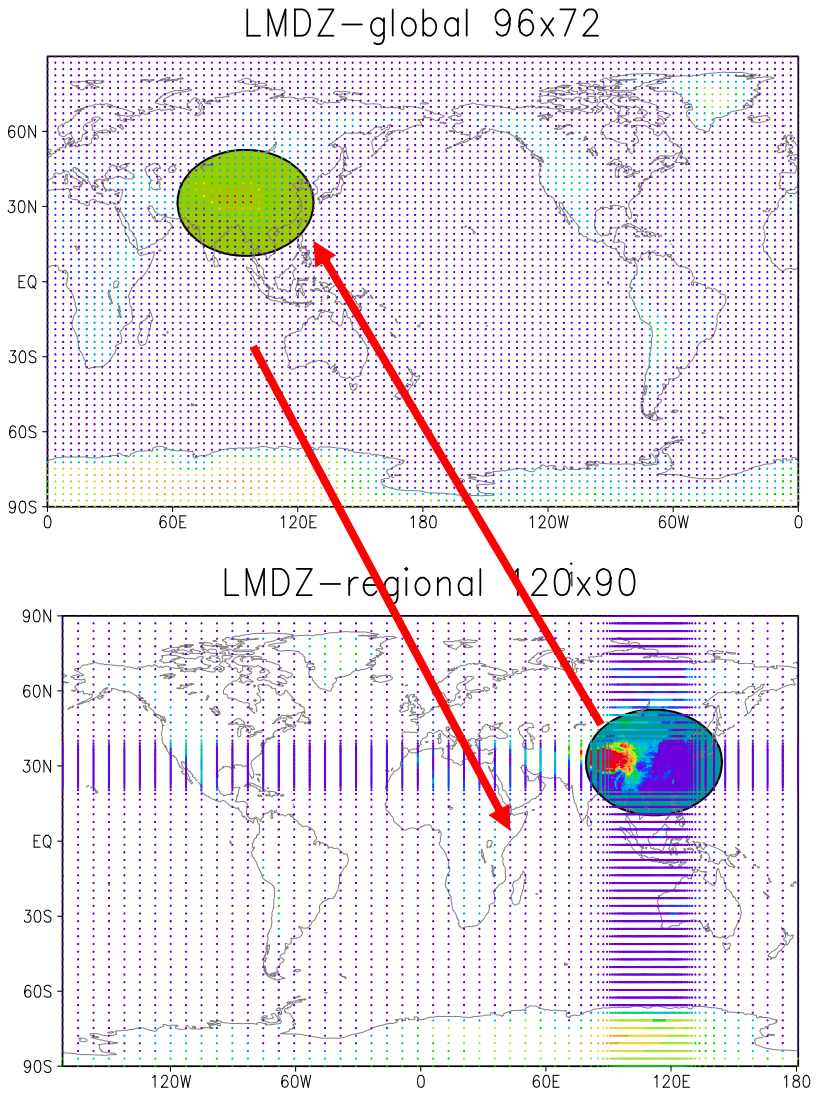
Tx: température maxi de jour

Tn: température de nuit chaude

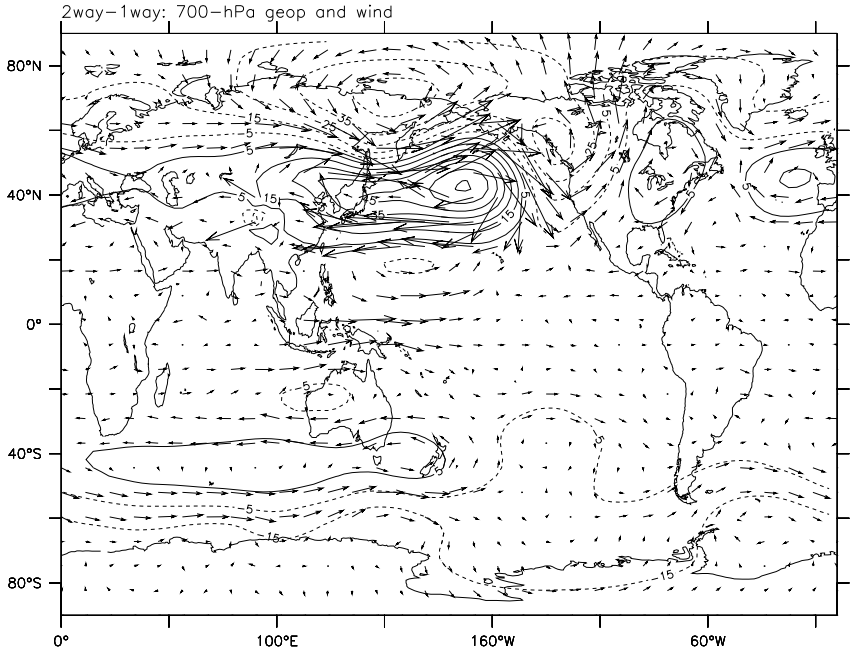
Added values of LMDZ-regional: extremes

Spectral distribution of rainfall in southeast China, comparison between the observation, LMDZ/CTRL, LMDZ/CTRL2, and a few other corse-resolution global models. Added values of high-resolution models can be clearly identified.





Feedbacks from LMDZ-regional to LMDZ-global: vers une super-paramétrisation?

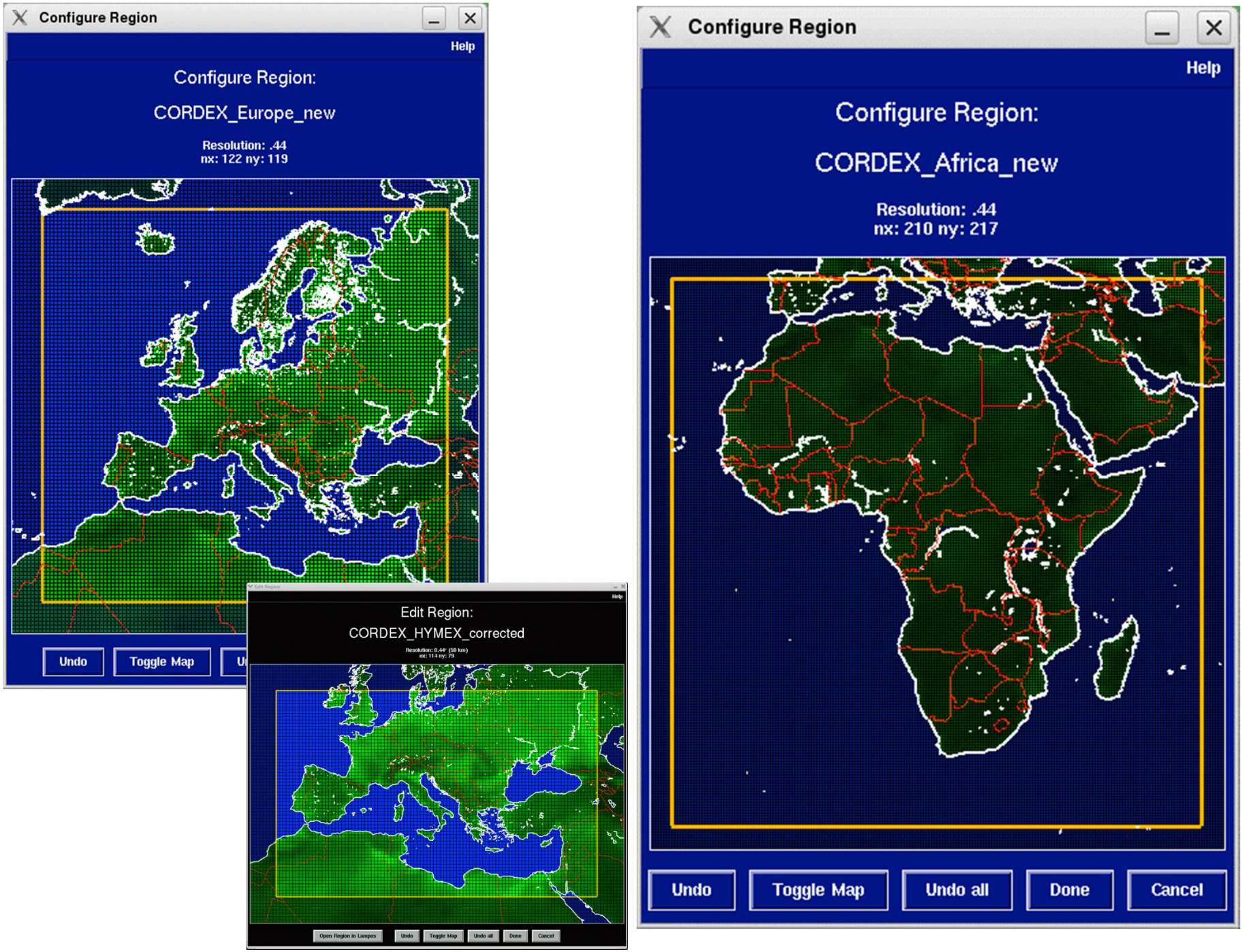


2way – 1way in LMDZ-global:
700-hPa height and wind

[Two-way nesting between LMDZ-regional and LMDZ-global]

CORDEX, a major exercise for IPCC-AR5

Also for LMDZ in the next few years?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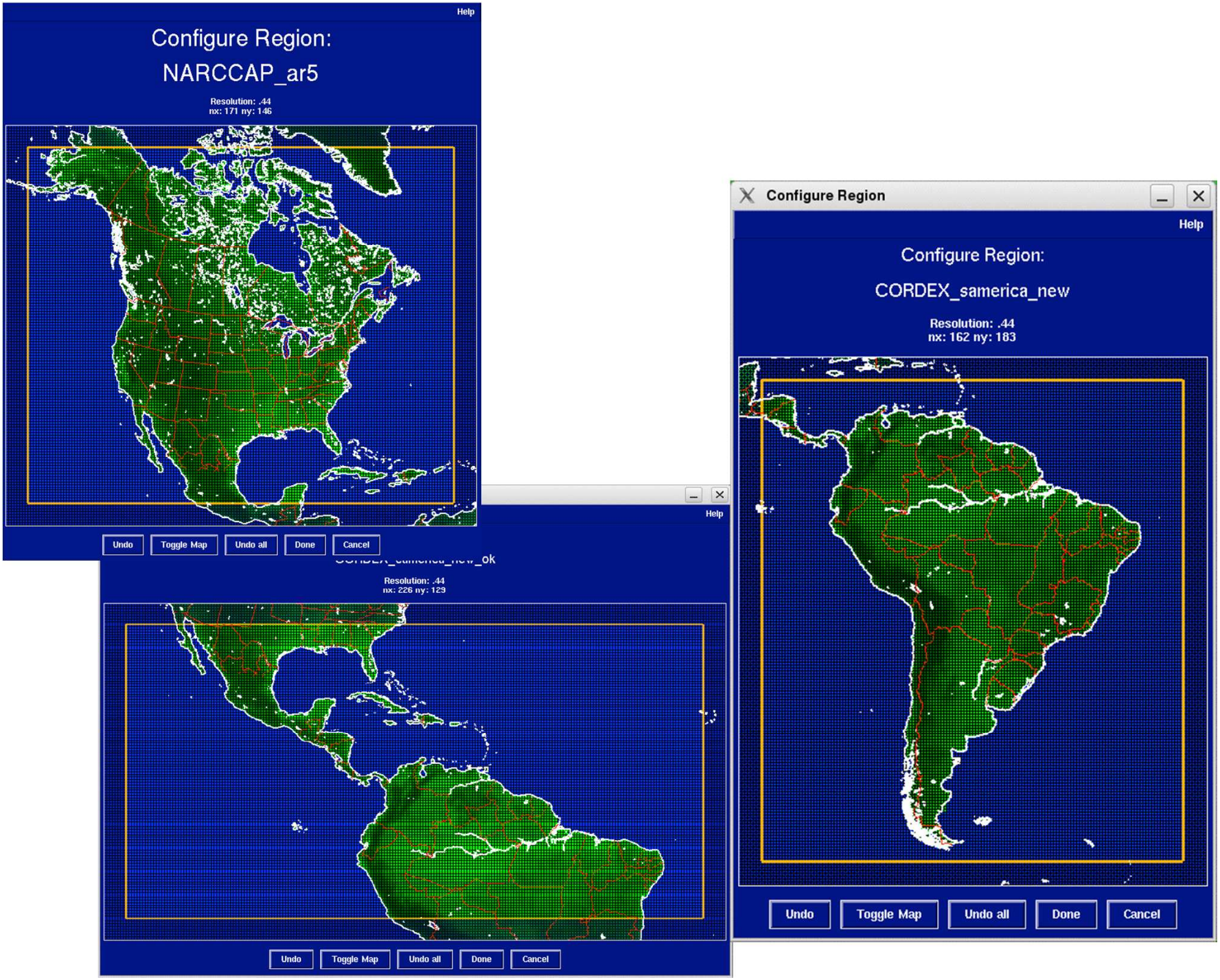
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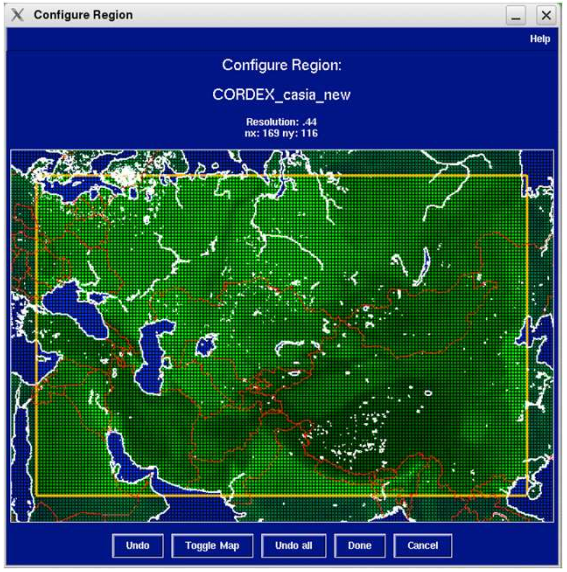
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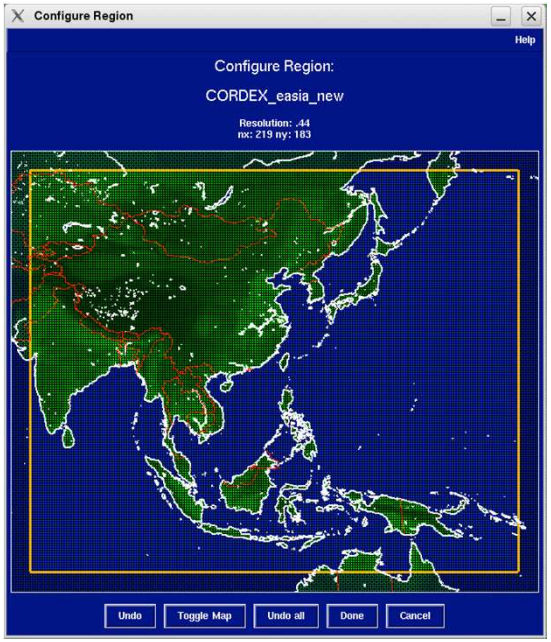
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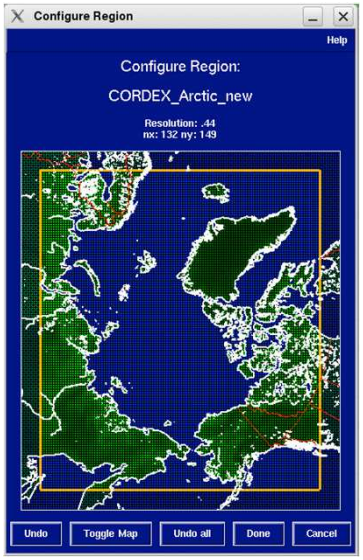
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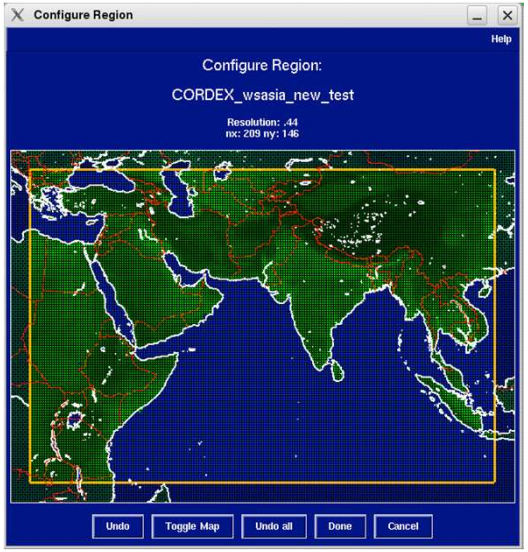
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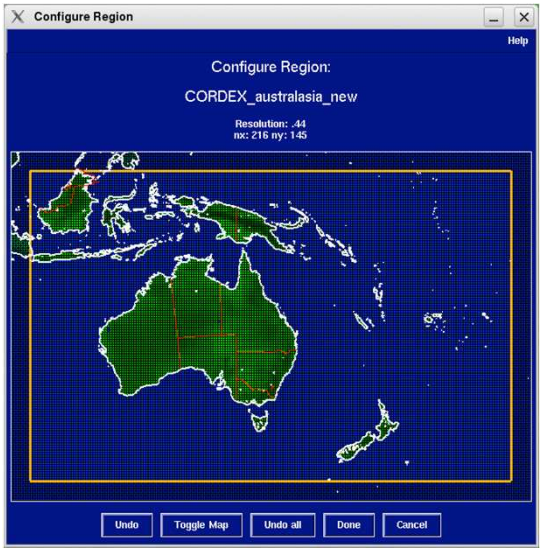
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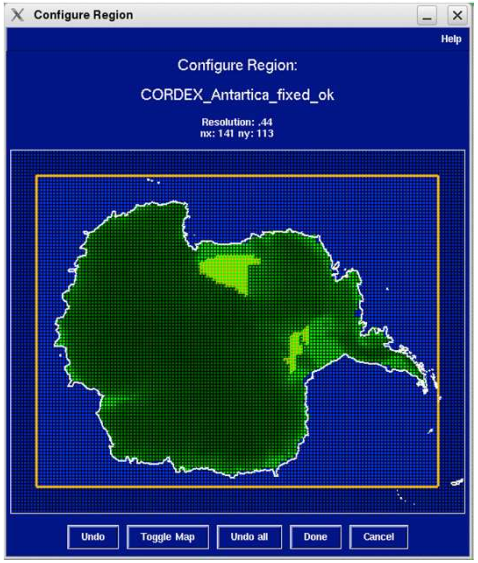
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Physics of LMDZ in WRF, our future ?

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