Extreme rainfall in South East France : added value of a convection-resolving regional model

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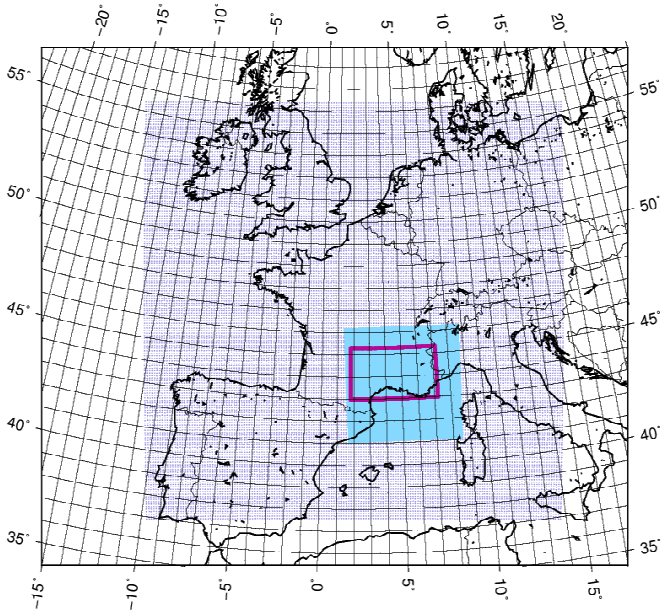
Motivation

- Mediterranean heavy precipitation events in Autumn are among the strongest in Europe causing very damaging flash-flood events

- Despite a proven added-value of the 12km regional climate models (RCMs) vs 50km-RCMs (*Ruti et al. 2015, Prein et al. 2015*), high precipitation events (HPEs) are still underestimated by convection-parameterized models

- Using convection-resolving RCM may improve the HPE representation in present climate

How did we proceed?



Model experiments

The ALADIN-Climat RCM : 12.5 km

o Era-Int simulation driven

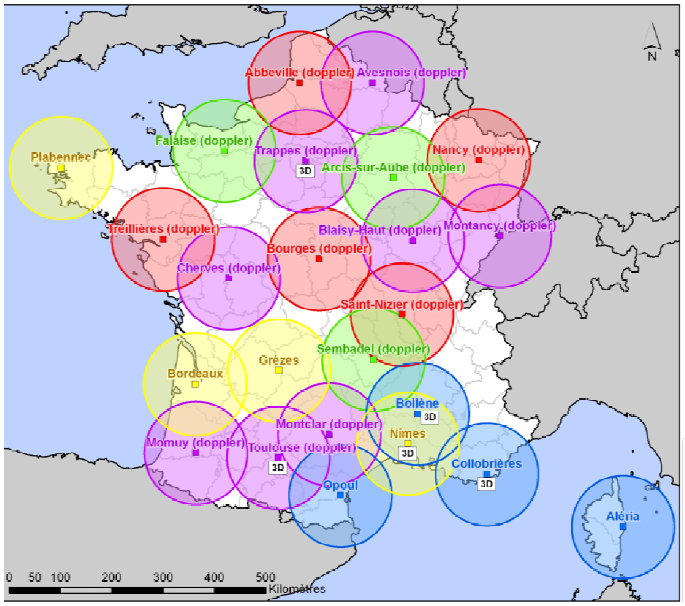
o Monthly mean Era-Int SST

o Same Physics as used for CORDEX experiments

The AROME convection-resolving RCM : 2.5 km

o Forecasting model run in a climate environment

o Driven by the 12.5km ALADIN-Climat RCM



The Data

COMEPHORE : 1km over France, hourly data

1997-2006 reanalysis of precipitation estimation using :

o the radar network (5' reflectivity radar images)

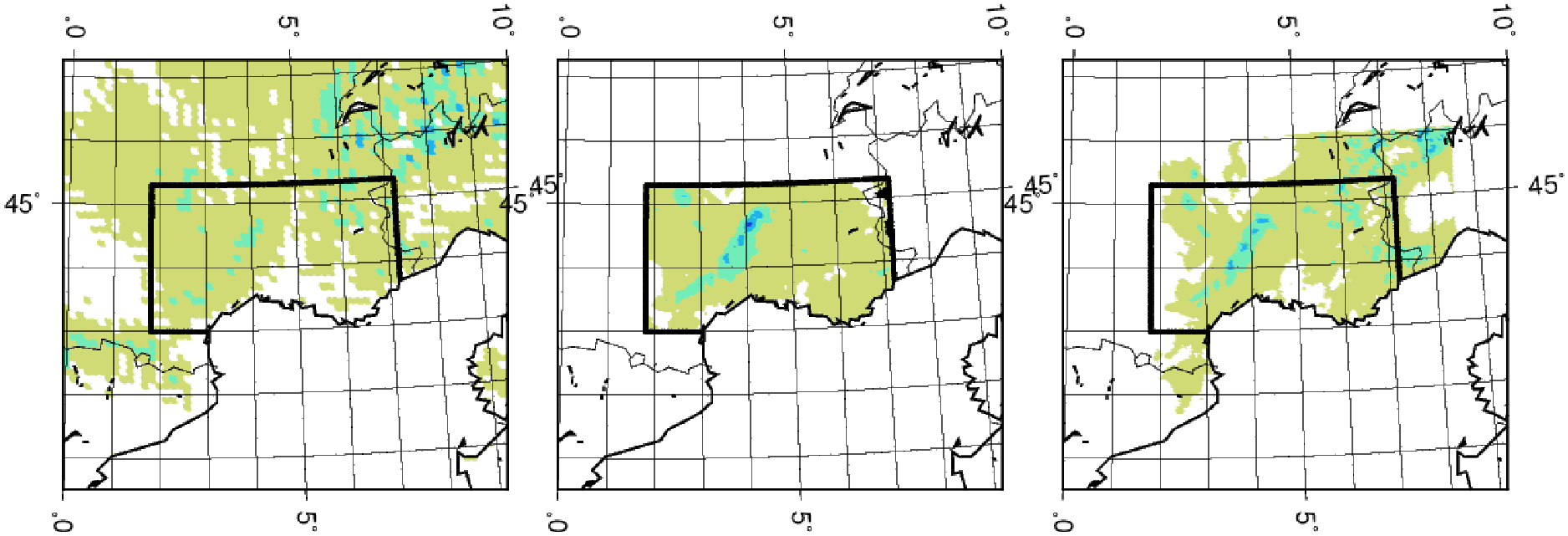
o the hourly and daily raingauge network

(*Tabary et al.* 2012, IAHS)

Hourly precipitation mean, Evaluation (1/2)

Average of hourly precipitation over SOND for 1997-2006

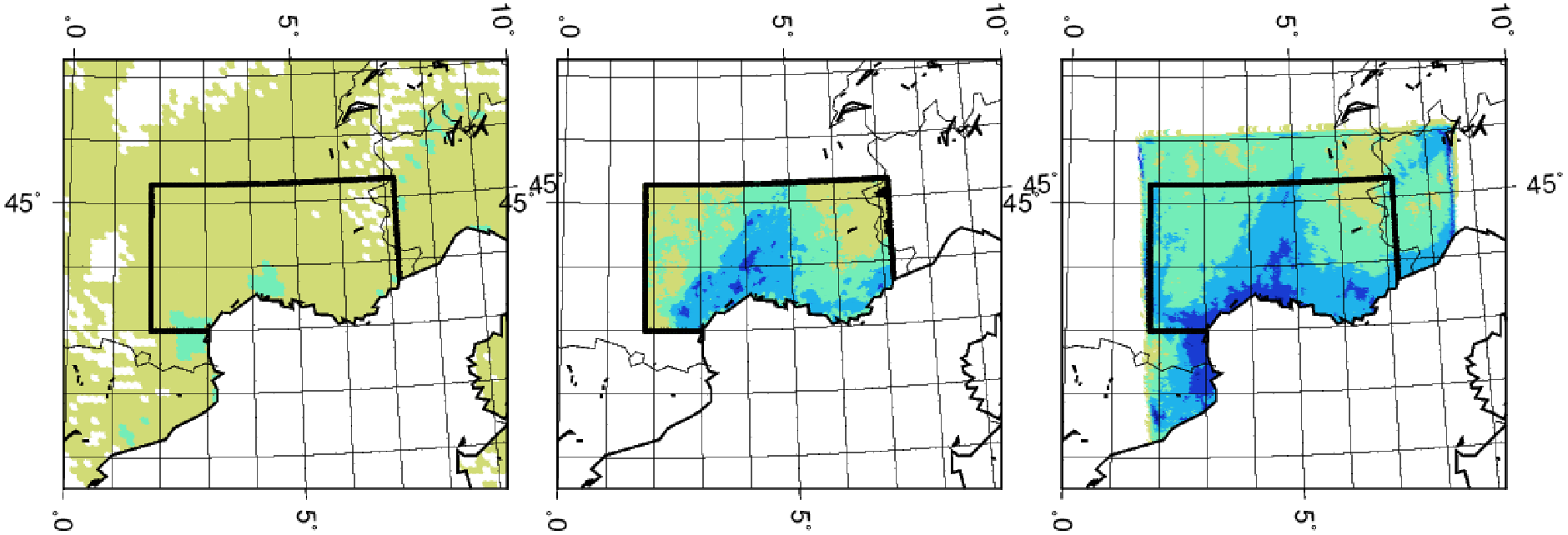
- High values well spotted
- Values closer to observations for the convection-resolving model (AROME)



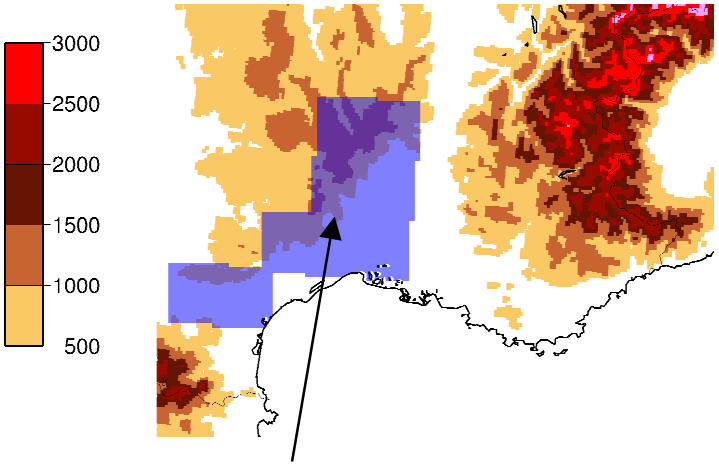
ALADIN **COMEPHORE** **AROME**

Hourly precipitation mean, Evaluation (2/2)

Average of hourly precipitation >=2mm **over SOND for 1997-2006**

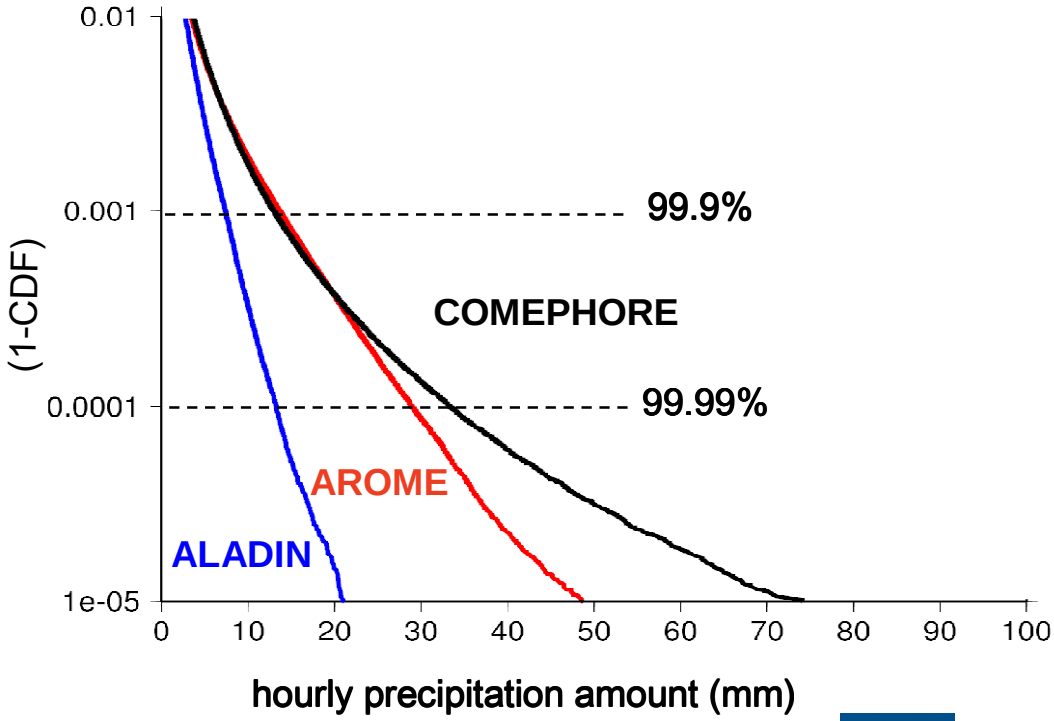


Hourly cumulated precipitation



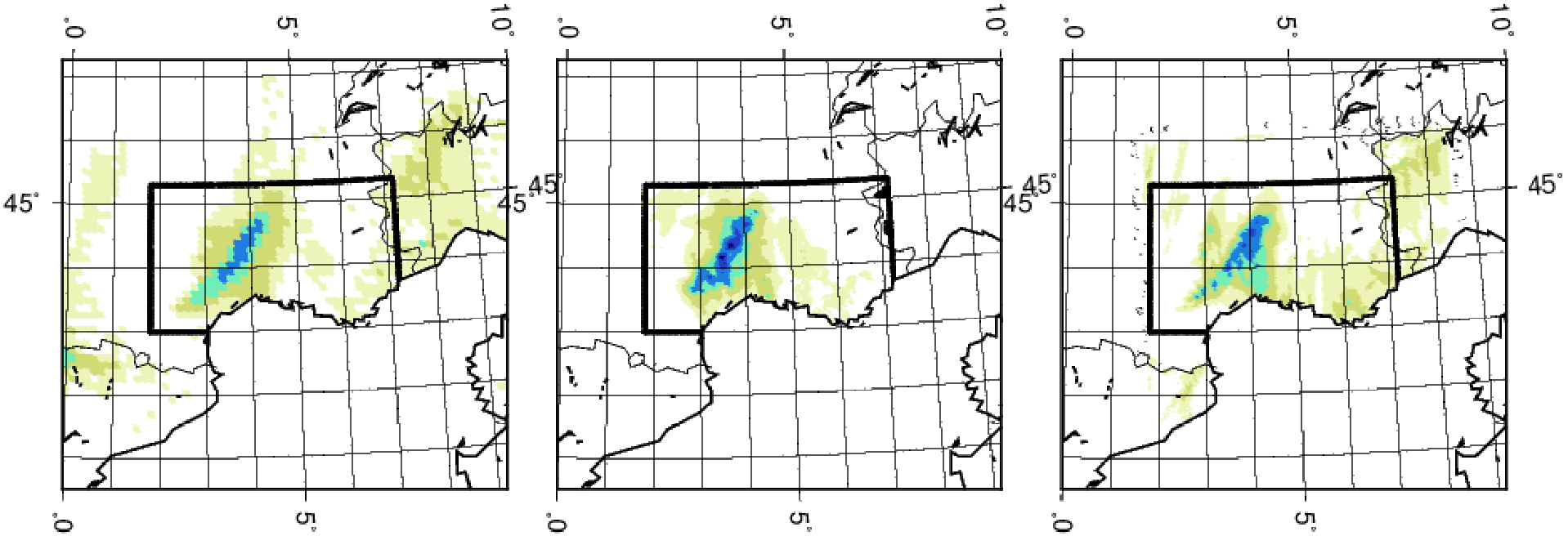
Boxes (0.5°x0.5°) with maximum precipitation rate > 300mm/day

Cumulated Distribution Function of precipitation in the 9 boxes selected of the SOND hourly values for 1997-2006



Case study : 22-24 novembre 2003 (1/2)

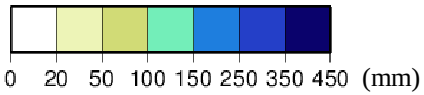
- Cumulated rain amount over the period



ALADIN
Max. : 249.44mm

COMEPHORE
Max. : 435.8mm

AROME
Max. : 329.94mm



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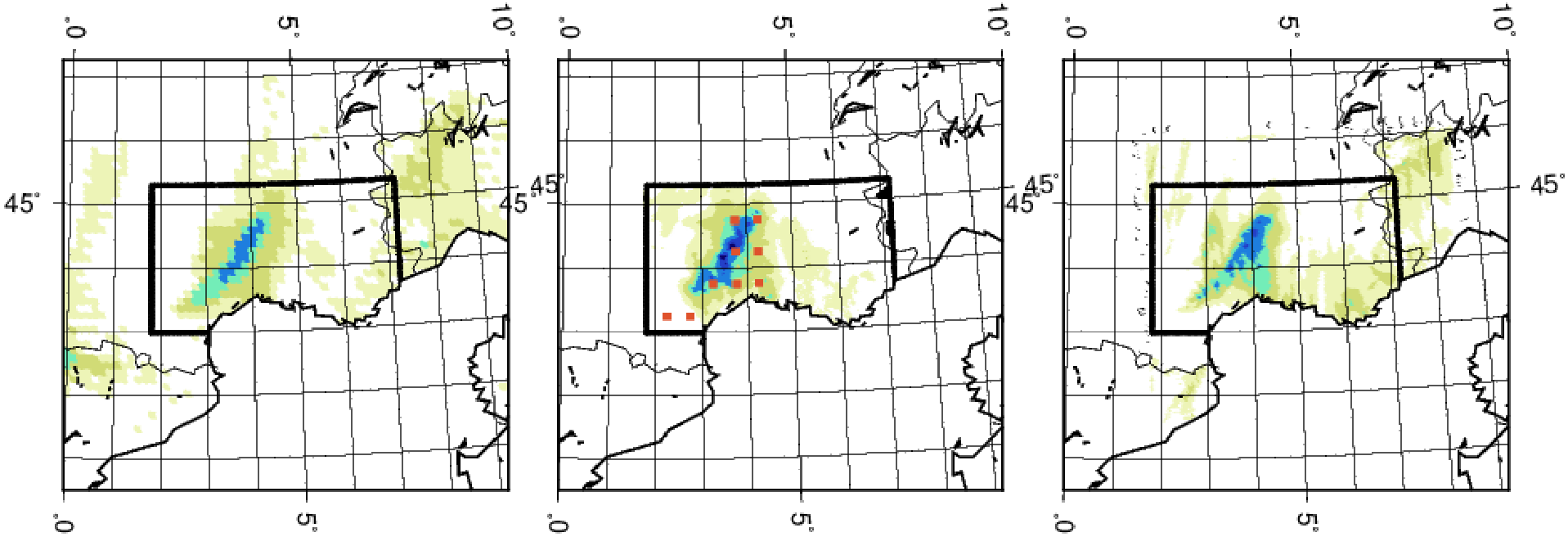

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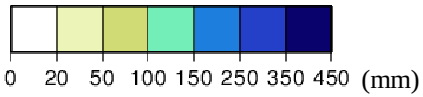
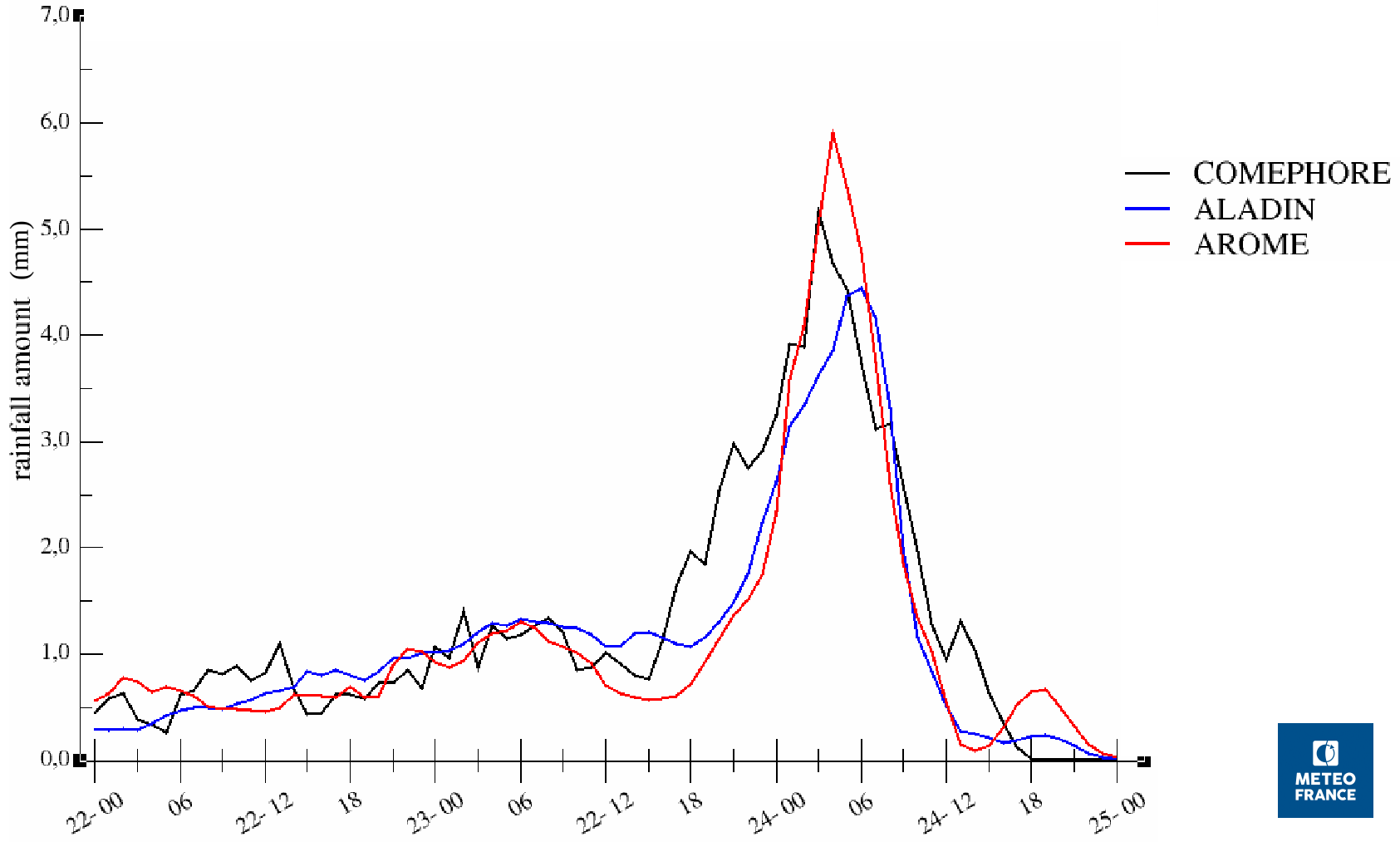


Case study : 22-24 novembre 2003 (2/2)

- Time series of the 9 box spatial average rainfall



Conclusions

- When large areas are concerned the AROME and ALADIN-Climat RCMs are equally able to simulate HPEs .

- However, the AROME convection-resolving RCM is better than the ALADIN-Climat RCM to estimate the hourly precipitation for percentiles above 99.9%, but underestimates percentiles above 99.99% .

Thank you for your attention.

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