



Diffusion downscaling for regional weather prediction

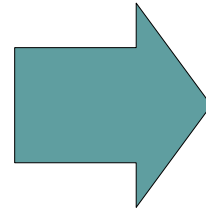
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Météo-France modeling strategy

ANITI

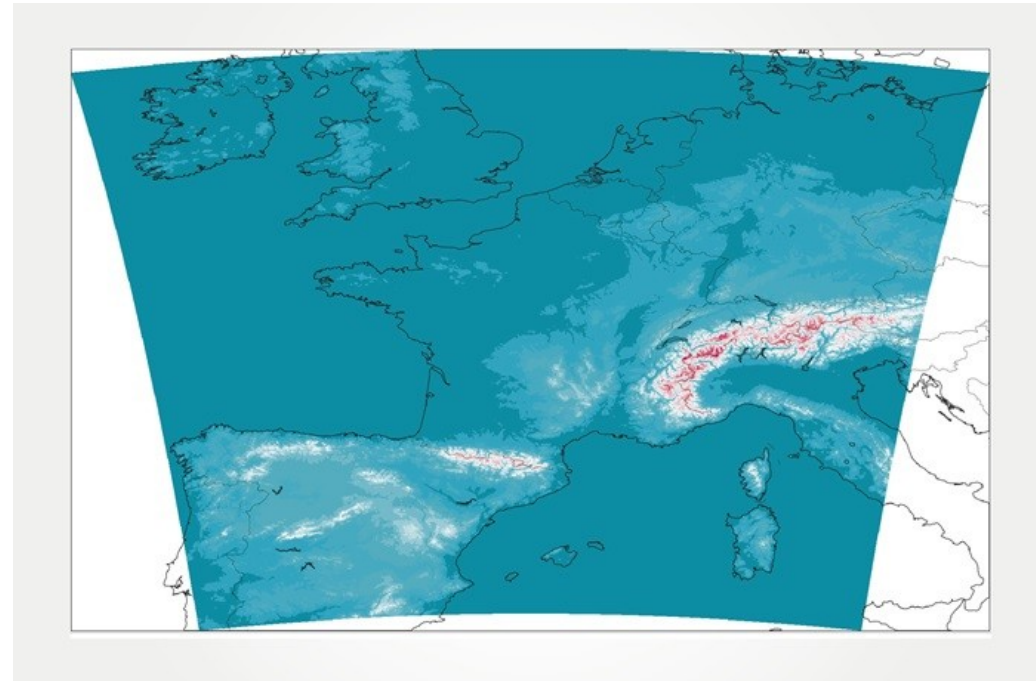
Arpege

Global, 25-10km resolution



Arome

Regional, 2.5-1.3km resolution



METEO
FRANCE

Postdoc objectives

- Develop a statistical downscaling for regional weather prediction
- Leverage diffusion modeling to avoid fine-scale blurring

Approach

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Data: - 5 years of hourly Arome and Arpege analysis

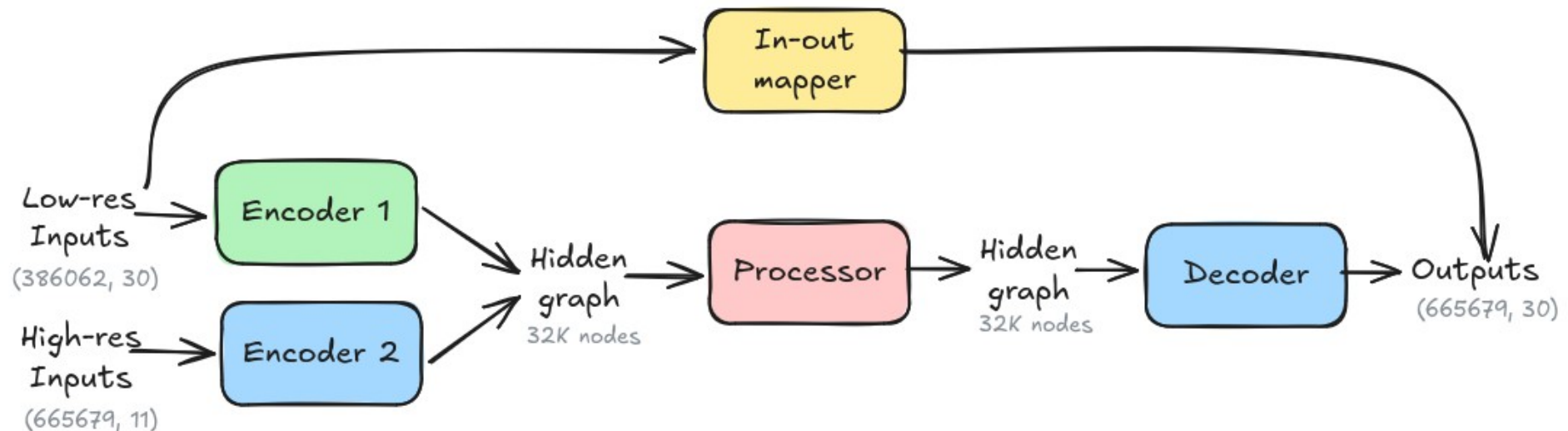
- 30 variables ($2t, 2r, 10u, 10v, prmsl, + r, t, u, v, z$ at 5 levels)



Training: - EDM Diffusion on residuals (*Karras et al., Mardani et al.*)

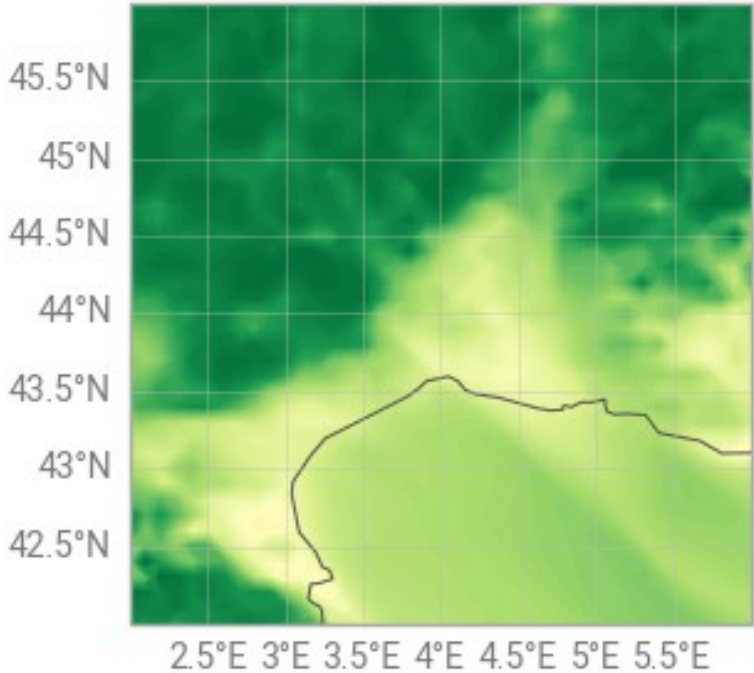
- 140k steps ($545 h_{GPU}$ on 8 A100)

Architecture: GraphTransformers (512 channels, $60M$ parameters)

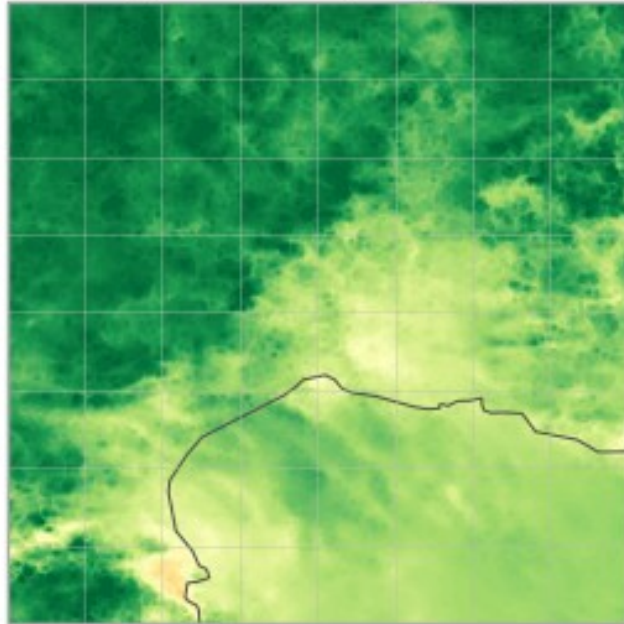
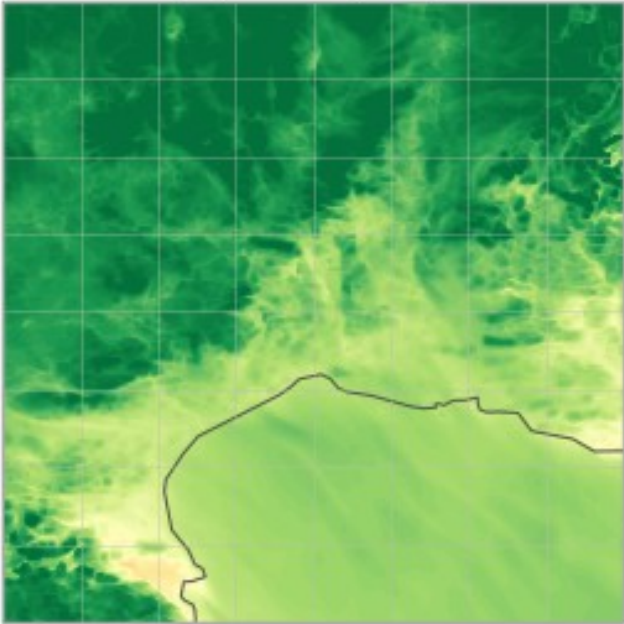
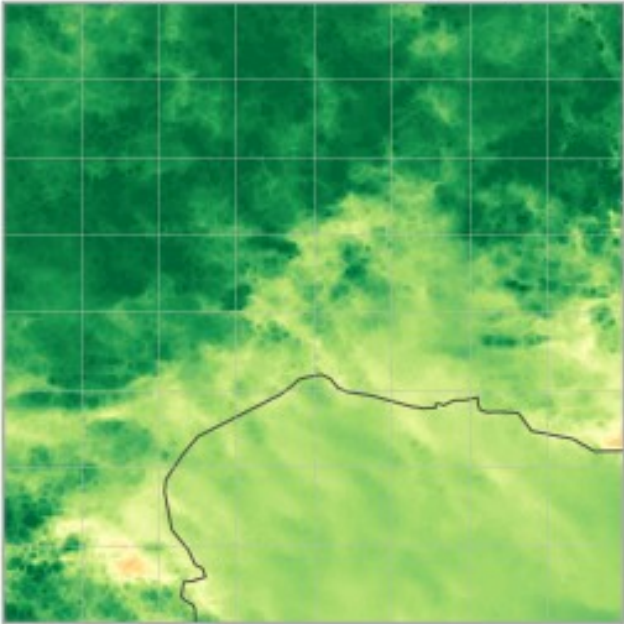


Input:

Arpege low-resolution

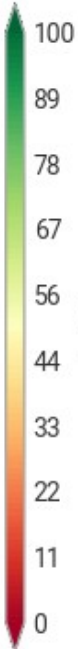
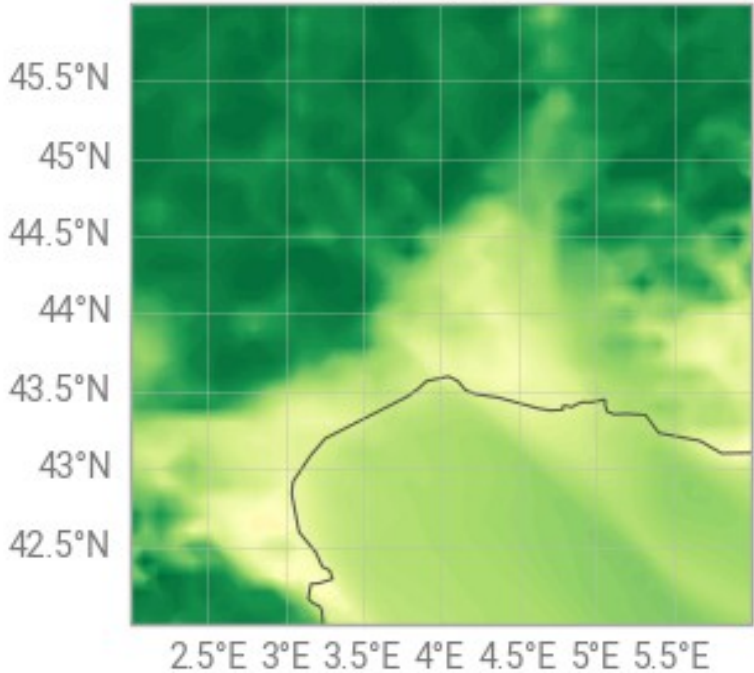


Outputs:



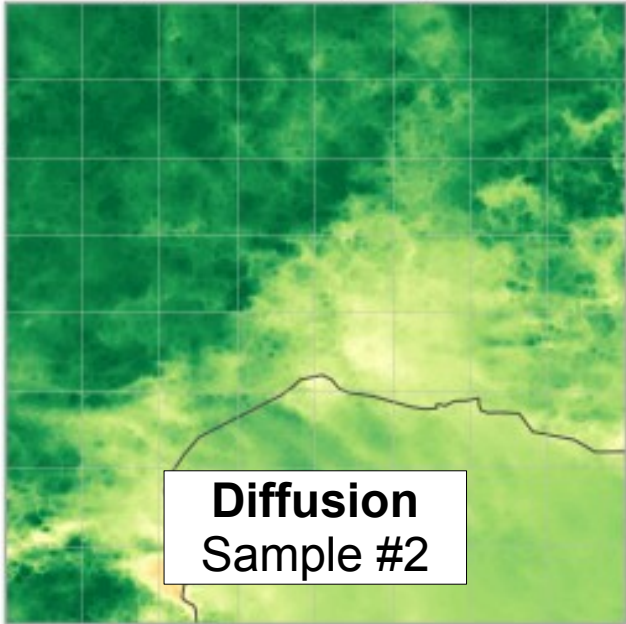
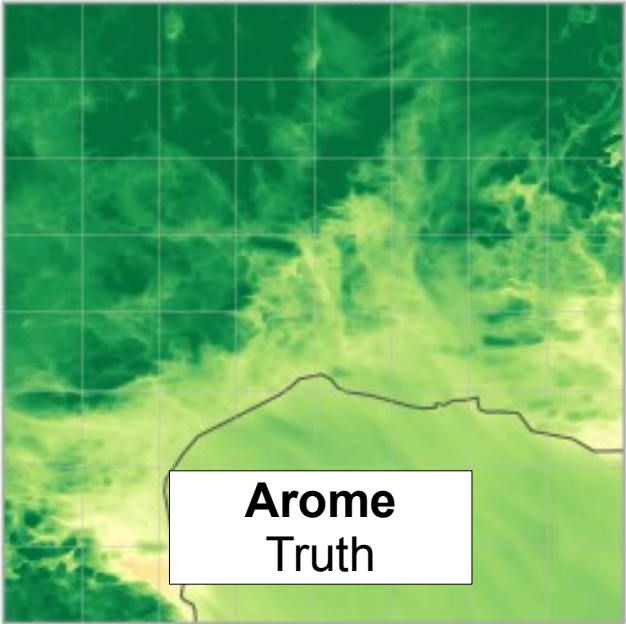
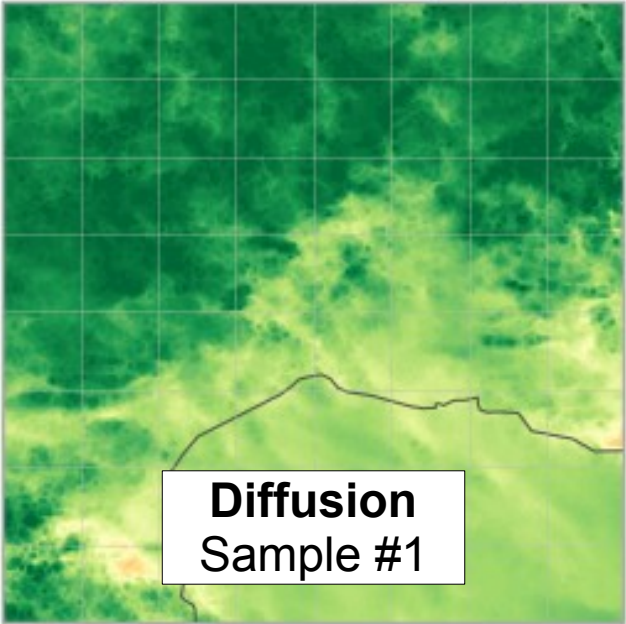
Input:

Arpege low-resolution



2-m relative humidity (%)

Outputs:



Perspectives

- Evaluation (*versus truth and obs., ensemble quality*)
- Comparison between downscaling and auto-regressive emulation
- Work on noise (*different noise power, colored noise, etc*)

Outputs: 2-m temperature

