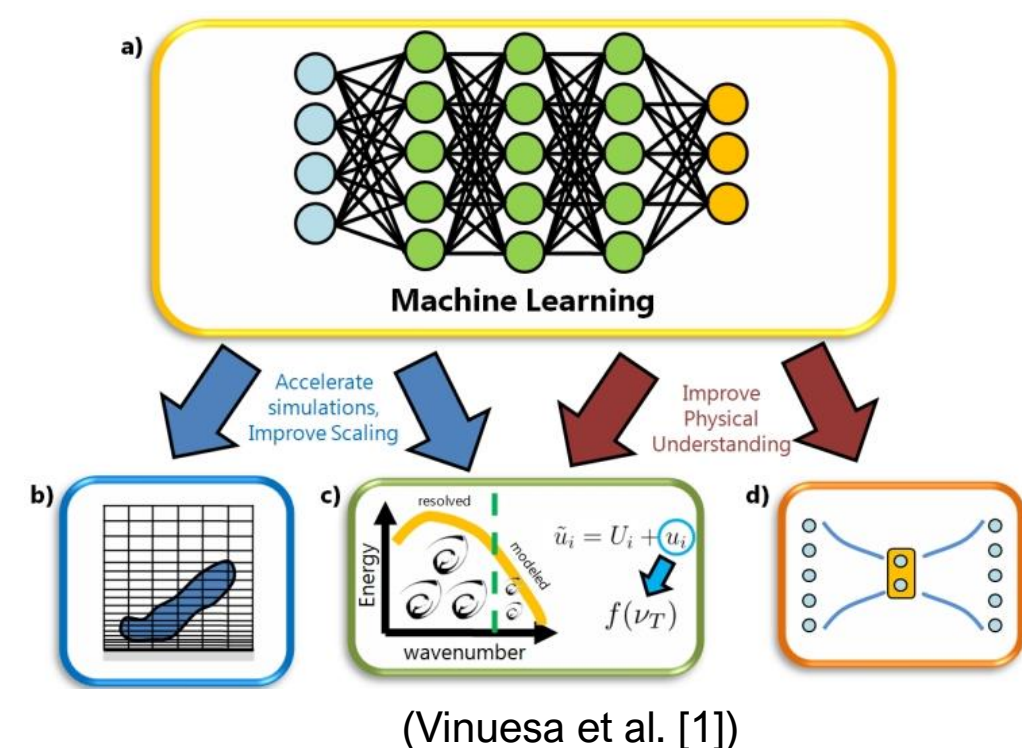


(Luca Marradi, luca.marradi@eviden.com)

Where could AI help in numerical simulation ?



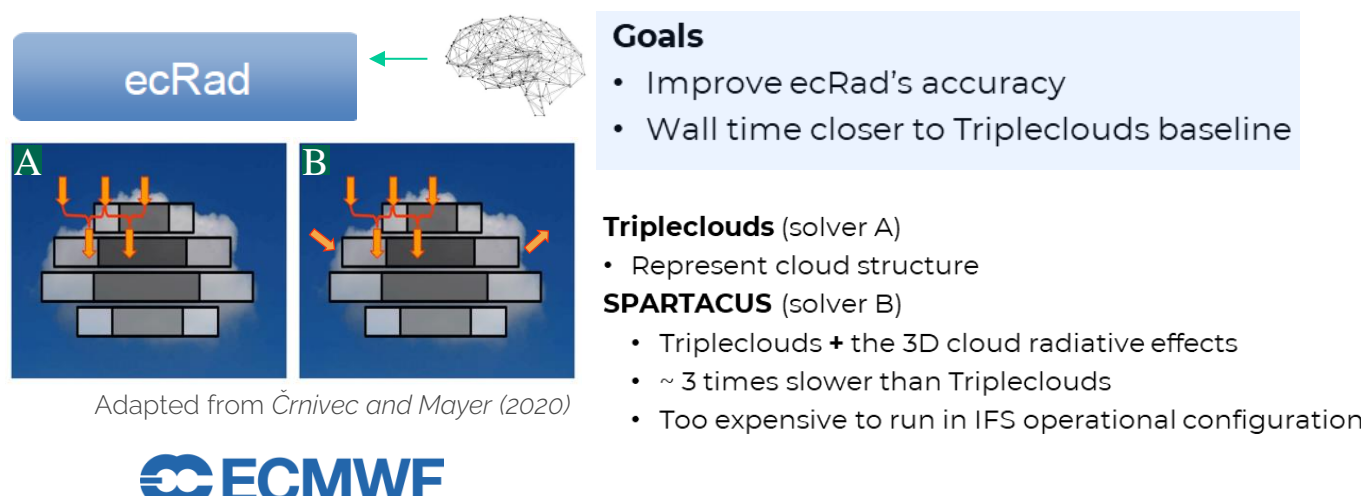
- **Modelling** sub-grid effect
- **Speed-up** solver time computing
- **Surrogate** model
- **Explainability**

Coupling RAPS20 - AI:

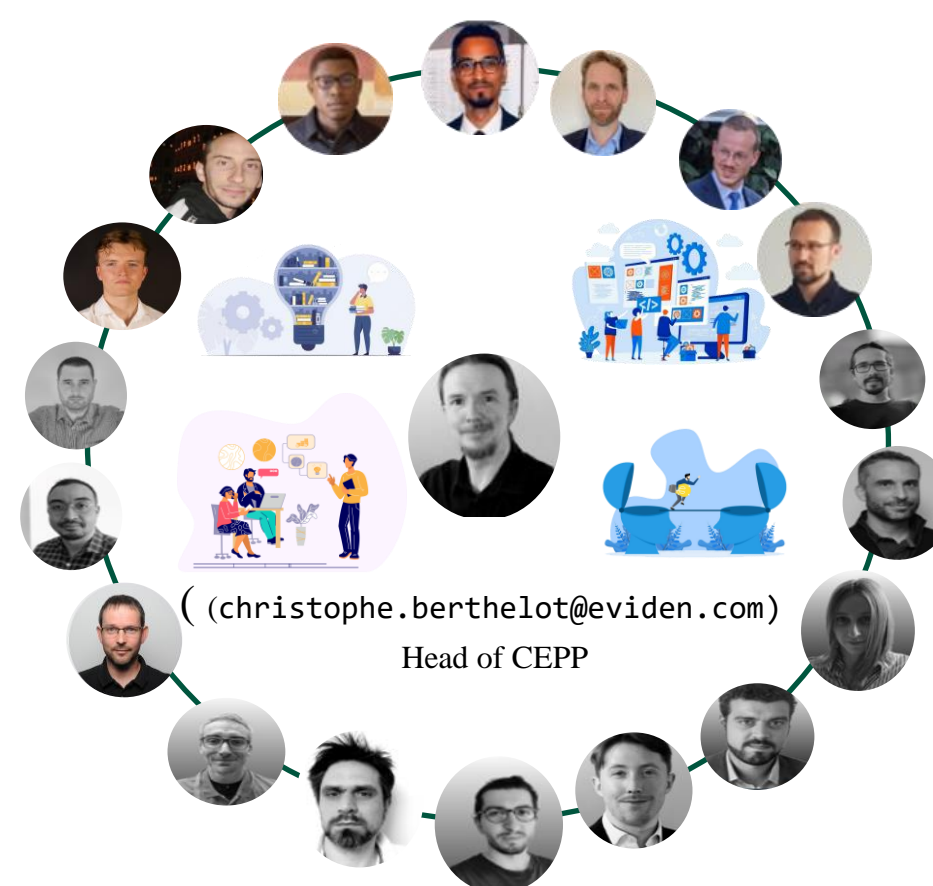
1 - Benefits of AI in HPC

- Tackle **sub-grid modelling** by data-driven approach
- Extends framework capability: **automatic differentiation** (Kochkov et al [2])
- Exploit **hybrid architecture** (GPU-CPU)

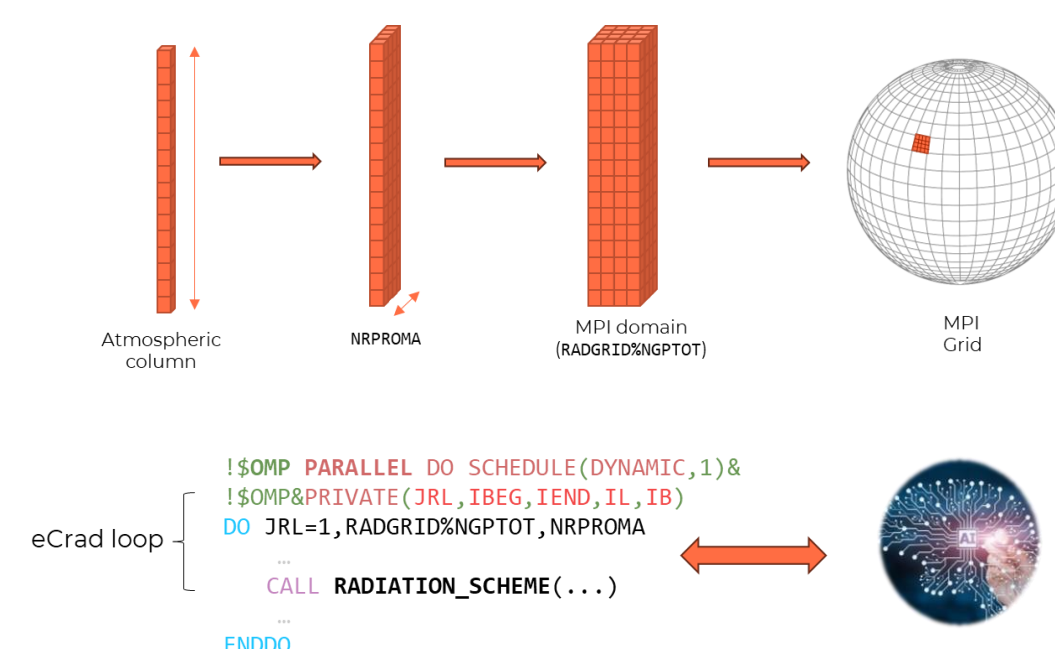
2 - General Context



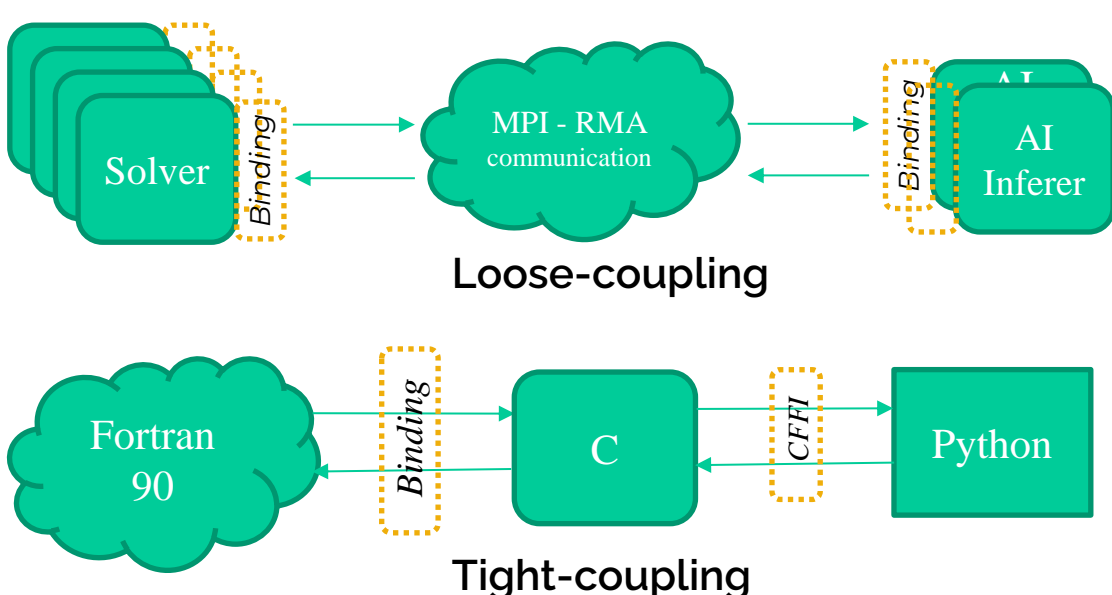
CEPP team



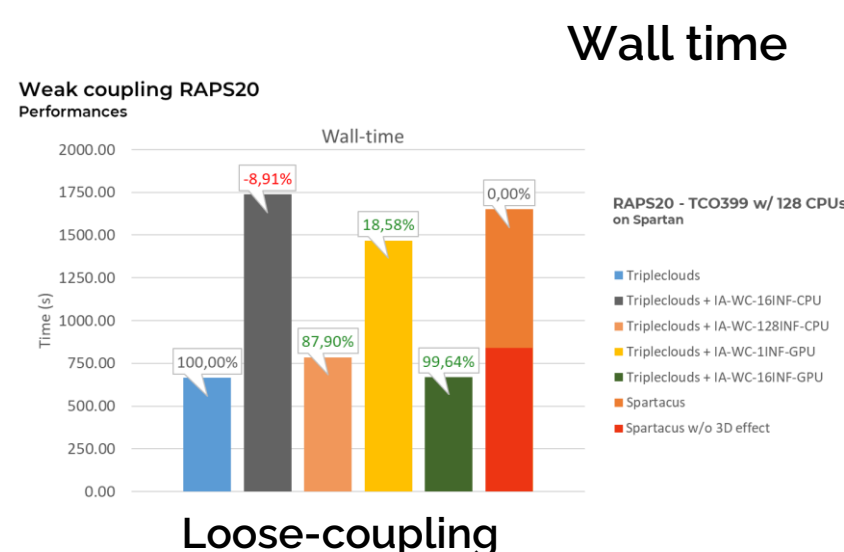
3 - Set up



4 - Coupling Designs

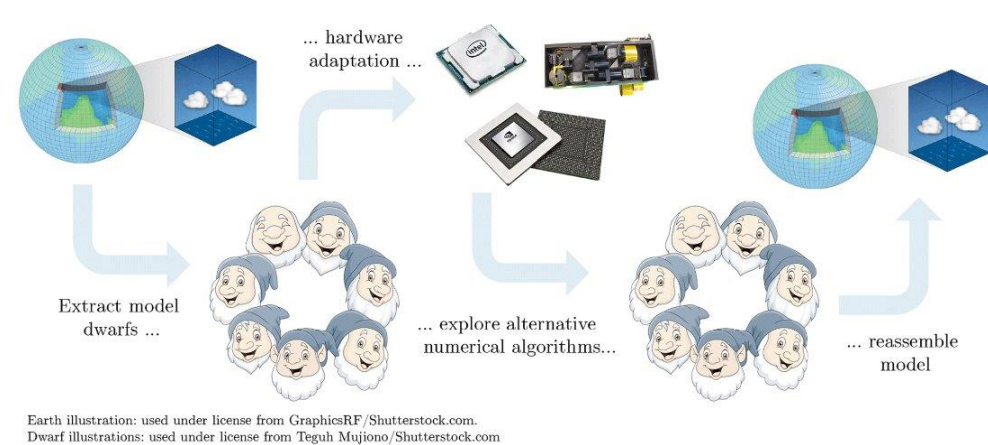


5 - Results



Heterogenous Computing:

1 - Workflow

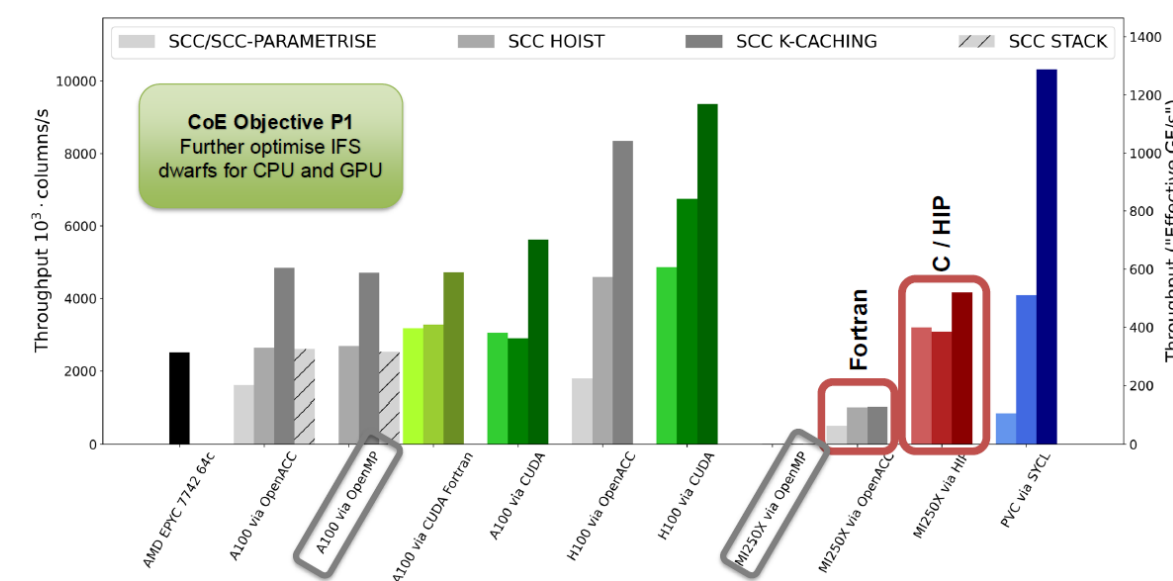


2 - Optimization



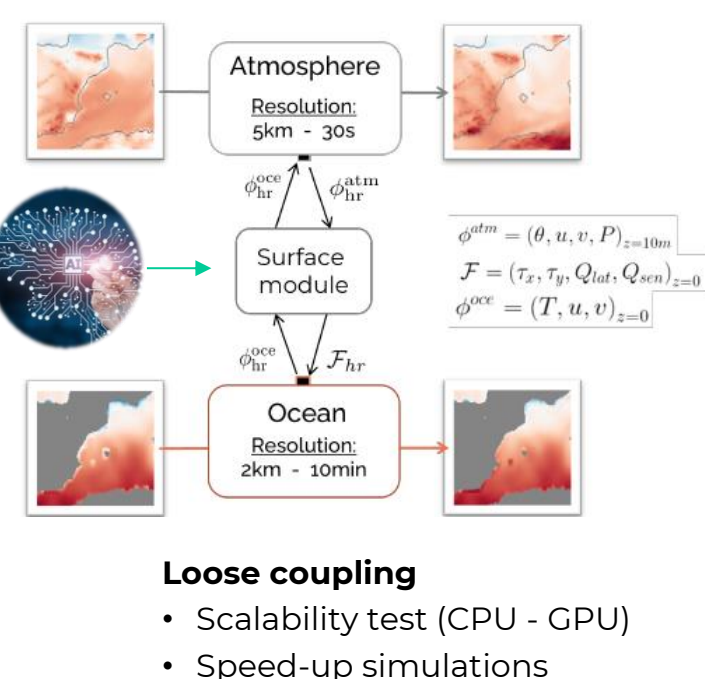
3 - Porting: from openACC to openMP

CLOUDSC cross-platform performance study^[4]

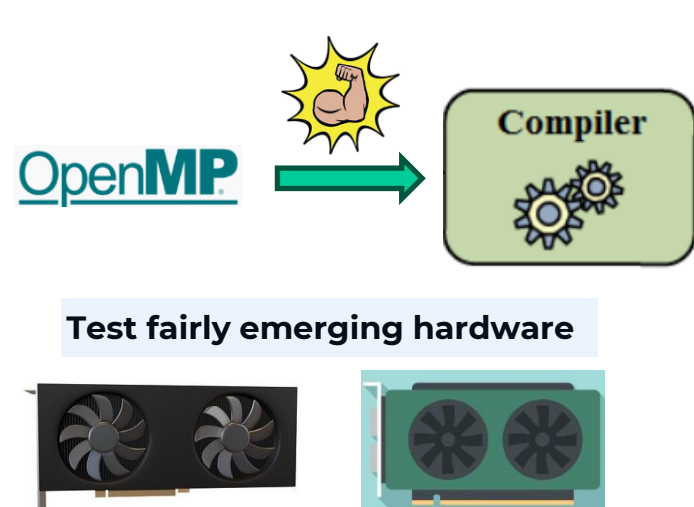


What next:

Coupling



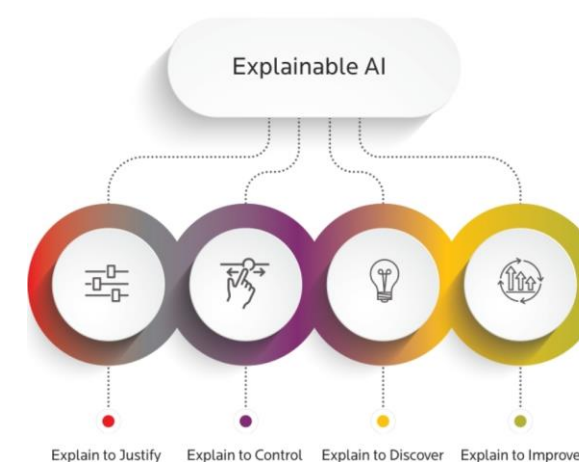
Porting



EVIDEN

- **Inference**: apply a pretrained model on Arame data
- **Finetuning** on Arame data
- **Evaluation** of sterched vs limited area model (lam) strategy

AI



CEPP activities



EVIDEN
an atos business

References

- [1] Vinuesa, et al. (2022), "Enhancing computational fluid dynamics with machine learning", *Nat Comput Sci* **2**, 358–366
- [2] Kochkov1, et al. (2024), "Neural General Circulation Models for Weather and Climate", *Nat* **632**, 1060-1066