

# The INGV Centre for Computational Geosciences

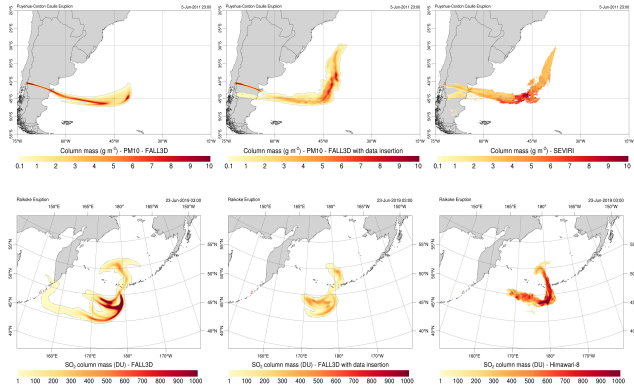
Bridging the gap between excellent research in Solid Earth Sciences and HPC services for the mitigation of natural catastrophes

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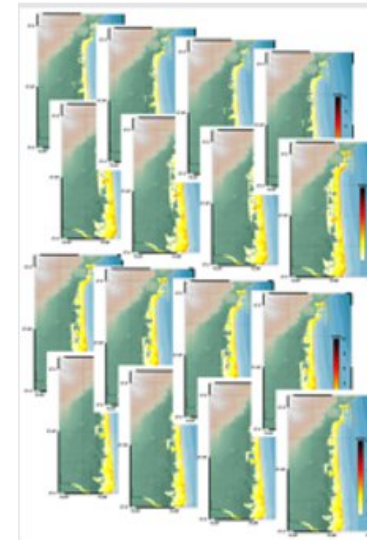
# The HPC challenge in Solid Earth sciences



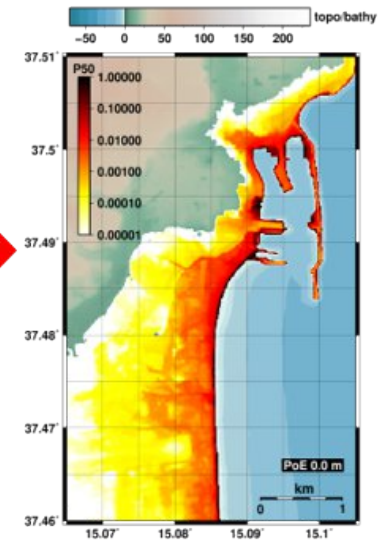
More data  
(assimilation)

Larger  
Ensemble size  
(reduce  
uncertainty)

Inundation scenarios

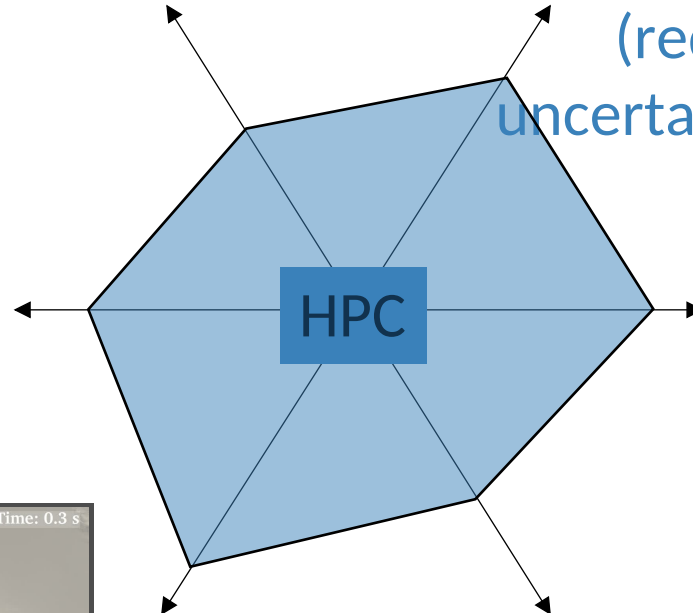


Local hazard map



Larger spatial/temporal  
domains

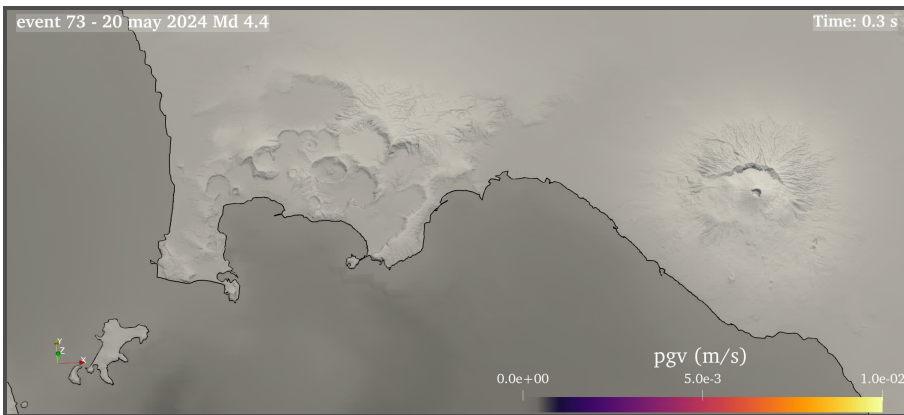
Higher spatial/temporal resolution



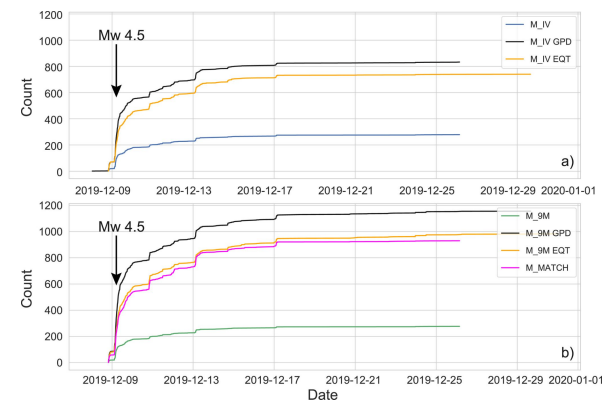
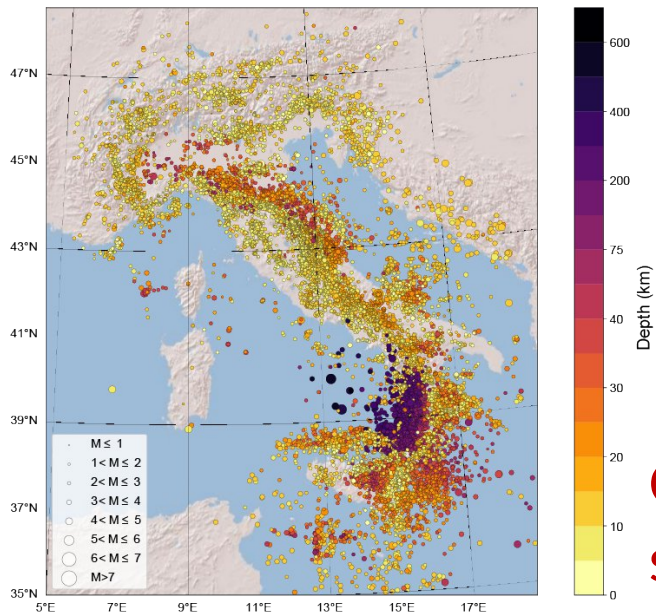
More  
physics  
(complexity)

More output  
(analysis)

Campi Flegrei seismic and volcanic risks

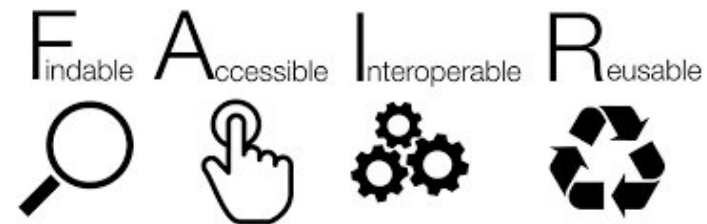


# The HPC - Big Data - AI convergence



Increased Data volumes

Increased Data sources (Distributed Networks, Edge Computing)



Quality standards

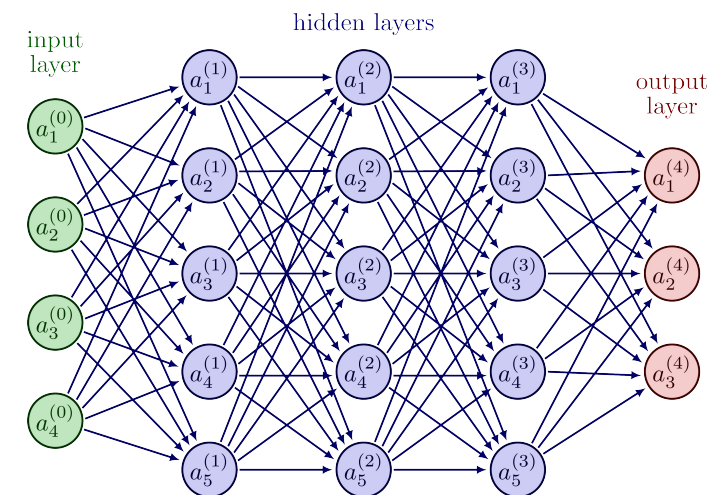
Enhanced interoperability

Improved Network capabilities

Evolved ML / AI techniques



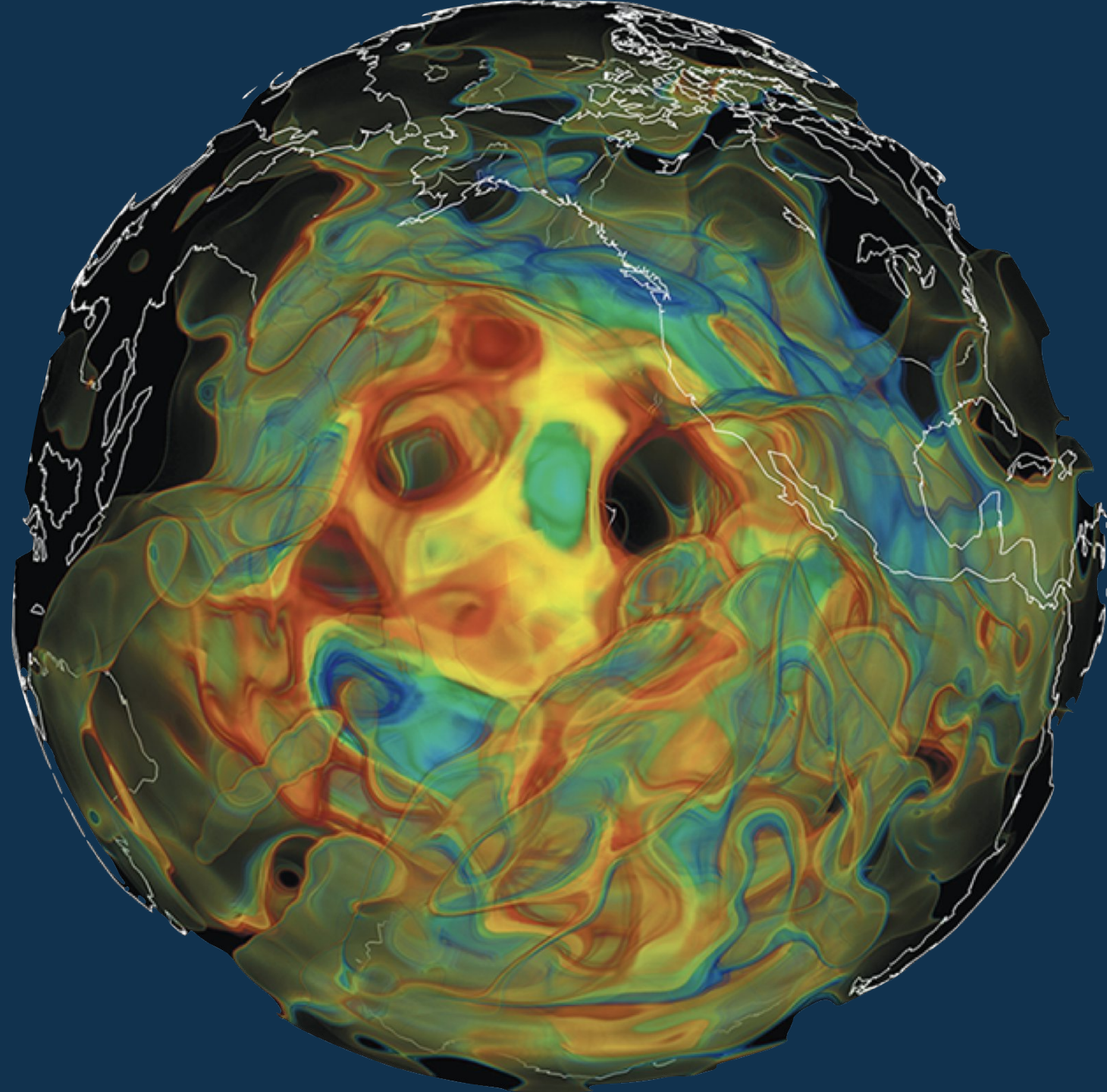
Big Data



# The INGV “Centre for Computational Geosciences” challenges

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- Improve accessibility to HPC – AI resources (hard and soft)
- Capacity building and knowledge transfer
- Integration within the National and European HPC ecosystem



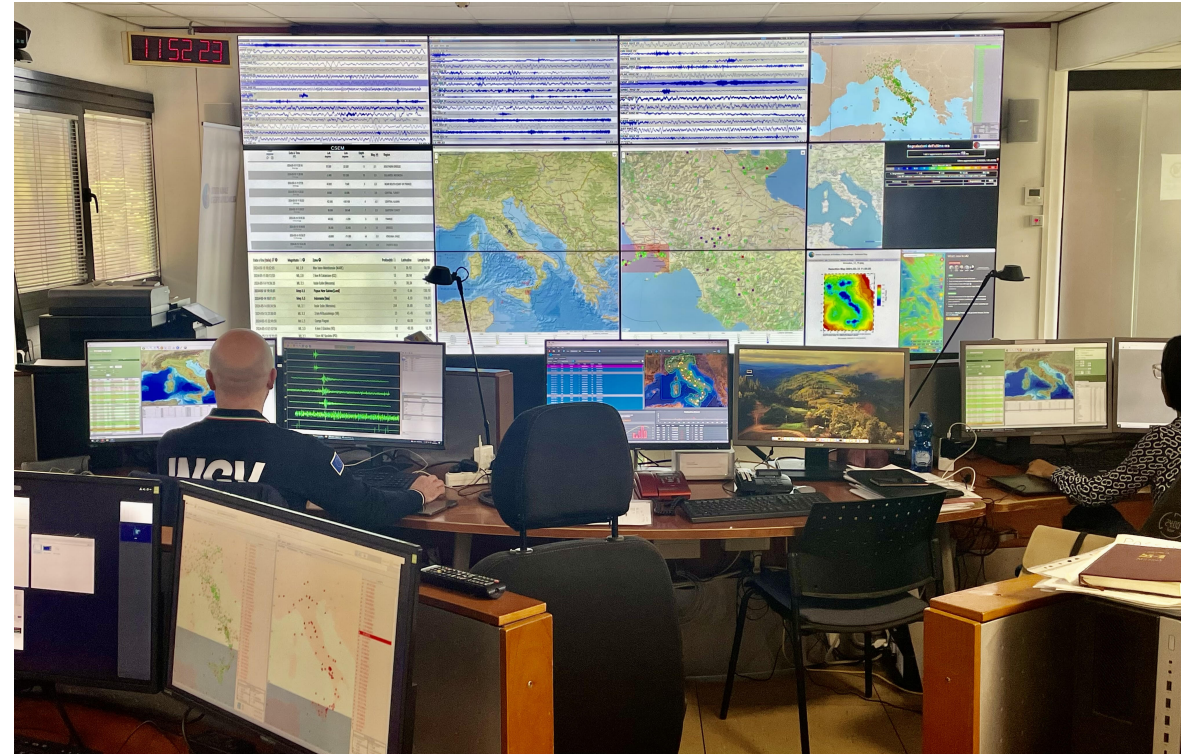
# 1) Access and harmonisation

1. Increase **computing capability**.  
New HPC cluster (~2 PFLOPS) (PNRR)
2. Increase access to HPC/AI **software**
3. Guarantee **Virtual and TransNational Access** of the EU scientific community.
4. Harmonise **INGV distributed resources**.
5. Coordinate the development and enforce (environmental and economic) **sustainability**.



## 2) Capacity Building and knowledge transfer

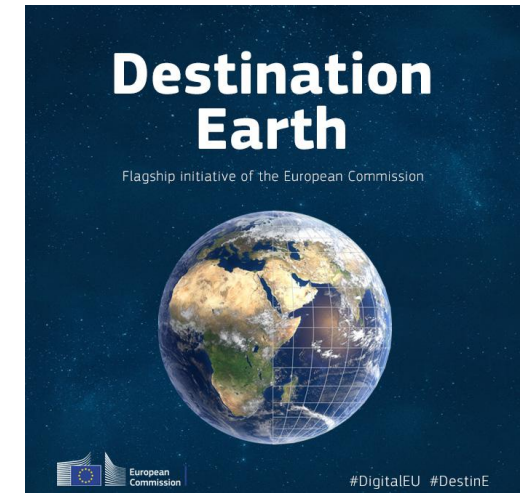
1. **Traning and education** in HPC-AI.
2. **Knowledge sharing.**
3. **Porting and enabling** of new scientific applications.
4. Implement **operational HPC/AI services** for the mitigation of natural disasters.
  - Urgent Computing procedures
  - Early warning systems
  - Probablistic hazard assessment
  - Automatic detection algorithms



*Sala di Sorveglianza Sismica e Allerta Tsunami presso la sede INGV-Roma*

# 3) Integrate with the National and European HPC ecosystem

1. Integrate within the **National Centre** for HPC, Big Data, QC (ICSC)
2. Integrate with the **AI factories**.
3. Integrate with the **EuroHPC** and **EOSC** initiatives.
4. Integrate with European **Research Infrastructures** (EPOS, EMSO).
5. Support the **Destination Earth** flagship programme.



# Conclusions and perspectives

- The INGV Centre for Computational Geosciences is part of a broad **community and institutional effort** made to exploit HPC power and to bring AI revolution in Solid Earth Sciences, at a National and European level
- **Urgent Computing** and **Probabilistic Hazard Assessment** demonstrate the clear advantage from a **convergence of HPC and AI**.
- A variety of **public and private stakeholders** can be involved in the co-design of HPC-AI application services.
- The clear bottleneck is the **education and training** of the new generation of Earth Scientists in the field of HPC.

**Grazie per  
l'attenzione!**

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