Agenzia ItaliaMeteo

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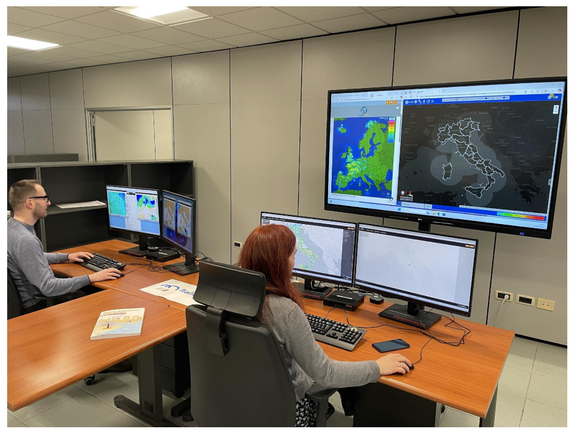
Agenzia ItaliaMeteo

Agenzia ItaliaMeteo (AIM) is the designated **National Meteorological and Climate Agency for Italy**, established by national law L. n. 205/2017.

AIM is a **public entity** with organizational, accounting, and budgetary autonomy, responsible at the national level for **informative, technical-scientific, and operational activities** in the fields of meteorology and climatology.

The agency is headquartered in Bologna.



Agenzia ItaliaMeteo

Coordination of Meteorological and Climatological Activities

Excerpt from the Agency Regulation

- **AIM coordinates activities in the fields of meteorology and climatology**, supporting national and regional authorities responsible for civil protection, public health, environmental protection, and agricultural policies within their respective areas of competence.

- **AIM establishes specific agreements with Italian meteorological institutions** operating in meteorology and climatology, as well as with non-profit private entities providing operational services or meteorological and climatological products of public interest.

The role of Agenzia ItaliaMeteo

Excerpt from the Agency Regulation

- carries out the tasks outlined in the aforementioned law, fulfilling the functions of the **National Meteorological Service** as defined by the World Meteorological Organization (WMO)
- **defines optimal uniform standards** for observational networks, setting technological criteria for quality, frequency, temporal acquisition, and spatial resolution
- **collects and stores observational data**, forecasts, and simulations acquired from Italian meteorological institutions, as well as data received directly from ECMWF, EUMETSAT, ESA, and Copernicus
- **redistributes data, products, analyses, and forecasts** on meteorological, climatological, and marine conditions to the same entities

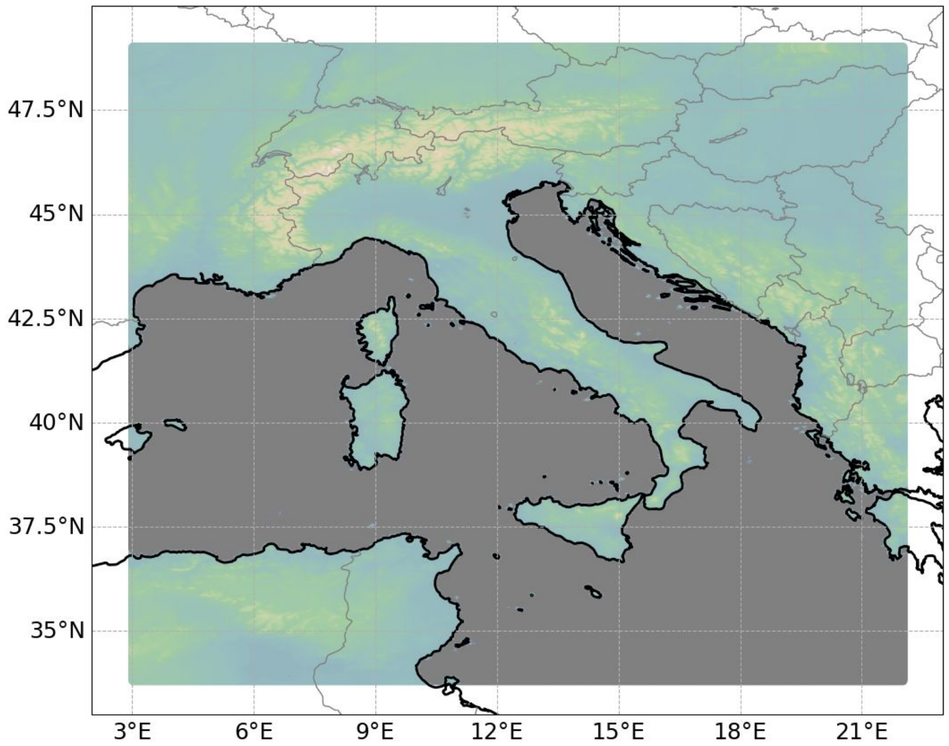
The role of the Agenzia ItaliaMeteo Agency in the meteorological modeling

- AIM has set up meteorological modelling **coordination groups** to coordinate meteorological modelling efforts at a national level
- AIM is **responsible for maintaining and developing the NWP system based on ICON** to support Italian stakeholders, particularly the National Department of Civil Protection
- AIM **promotes the use of the ICON** model in universities and other Italian operational and research institutions

Current status of NWP at ItaliaMeteo

- For many years, **Arpae Emilia-Romagna** was responsible for national NWP on behalf of the Italian Civil Protection Department
- Since this year, the **responsibility has moved to ItaliaMeteo**, which now closely **collaborates with Arpae in the joint maintenance and development** of the national NWP system under a new agreement. This ensures the operational continuity of the forecasting system in support of the National Civil Protection.
- AIM can now rely on an integrated modeling system that benefits from:
  - **model development** within the COSMO Consortium and ICON collaboration
  - a **data assimilation** system already operational at kilometer scale, including the assimilation of radar volumes over the Italian territory
  - operational **verification** activities, including fuzzy and diagnostic methods

Current status of NWP at ItaliaMeteo



Model version: 2025-04

Horizontal resolution: 2.2 km

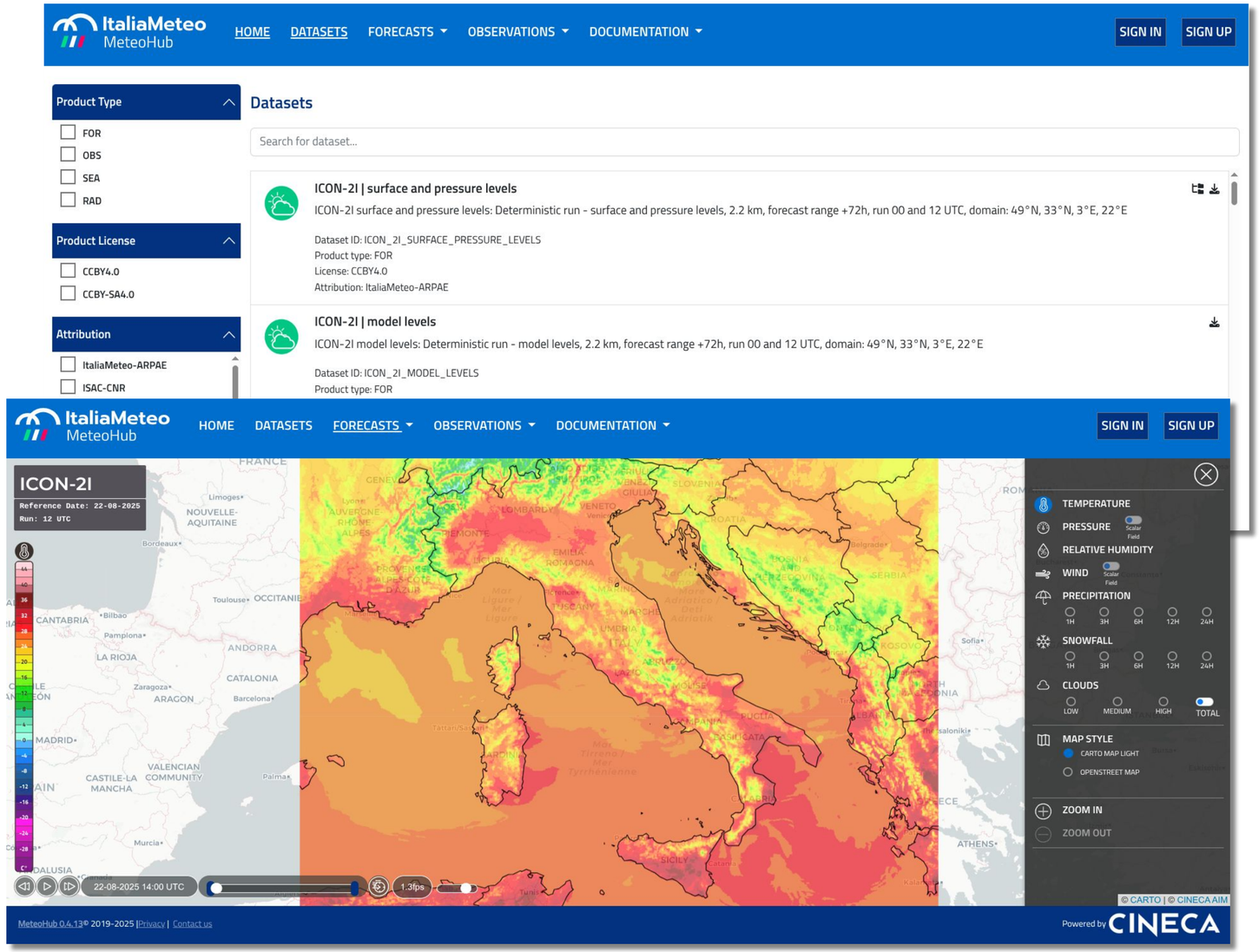
Vertical levels: 65

Boundary conditions: IFS

Initial conditions: KENDA analyses (hourly cycles), assimilating conventional observations, Italian radar volumes and radar-estimated precipitation (via LHN)

Model	Forecast type	Forecast range	Initial time (UTC)
ICON-2I	deterministic	+72h	00, 12
ICON-2I-RUC	deterministic	+24h	00, 03, 06, 09, 12, 15, 18, 21
ICON-2I-EPS	ensemble, 20 members	+51h	21

MeteoHub: the national platform for meteorological data



AIM agrees with Italian meteorological institutions on **methods for data transmission and exchange**, as well as on the use of computing infrastructures and data archives.

Open data dissemination:

- forecasts
- observations

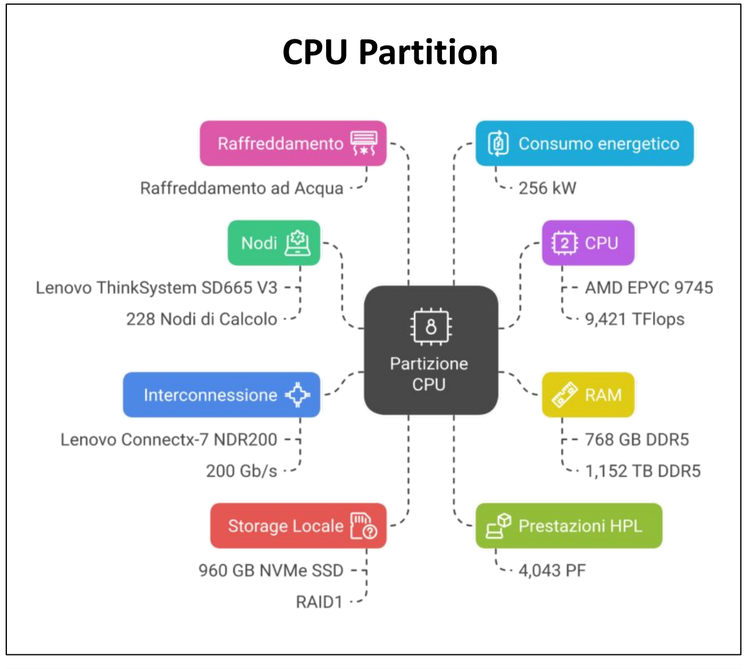
All data are distributed under the **CCBY-4.0 license** and feed into the National and EU Open Data Portals.

https://meteohub.mistralportal.it/app/datasets

Marco Polo HPC system

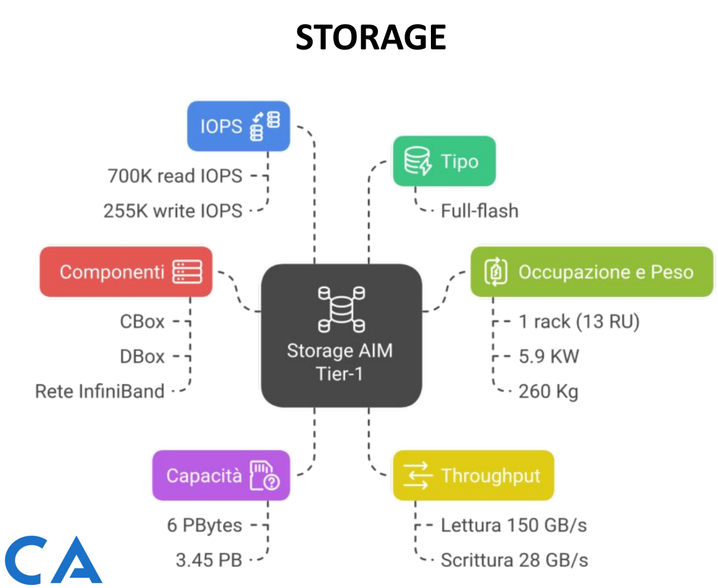
AIM made a significant investment in a **dedicated HPC system**, in collaboration with CINECA.

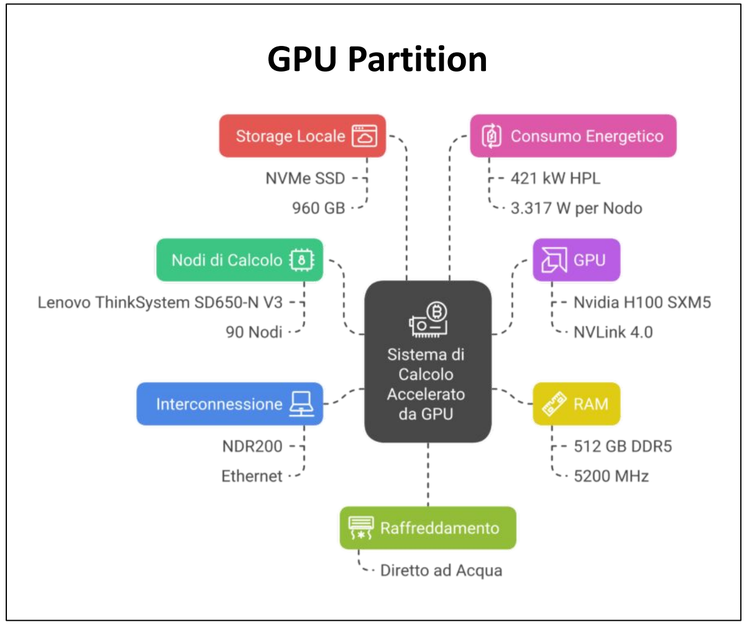
The computing system is designed to integrate the latest technologies from AMD, Nvidia and Intel, optimised with Lenovo HPC solutions for performance and energy efficiency.



CPU partition (Conventional):

- Nodes: Based on Lenovo ThinkSystem SD665 V3.
- CPU: 2x AMD EPYC 9745 'Turin-Zen5c' 128C 400W 2.3GHz. This CPU offers a theoretical rPeak of 9.421 TFlops and significant improvements over the previous generation, including 12-channel DDR5 (up to 6400 MT/s) and AVX-512.
- RAM: 768 GB of DDR5 at 6400 MHz per node (24 DIMMs of 32 GB), providing 3 GB per core. 26 compute nodes will have 1.152 TB of DDR5 memory.





GPU partition (Accelerated):

- Nodes: Based on the upcoming Lenovo ThinkSystem SD650-N V3.
- CPU: 2x Intel Emerald Rapids 8592+ 64C 1.9Ghz. Offers a theoretical rPeak of 3.891 TFlops.
- GPU: 4x Nvidia H100 SXM5 80GB HBM3 per node, interconnected via NVLink 4.0. The GPUs are expected to operate at 600W under normal conditions and 700W for HPL benchmarks. The theoretical peak performance (FP64) is at least 60 TFlops.

CINECA

Collaboration and projects in NWP activities

- the **coordination of various institutions**, some of which are already part of the COSMO Consortium, by defining common development topics for collaboration (i.e LaMMA, CNR, CNR-IBE, ENEA, Arpa Friuli-Venezia Giulia, Arpa Liguria, CIMA)

- **collaborations with Universities and research institutions** (University of Bologna, Polytechnic University of Turin, CETEMPS) which provides AIM with key expertise to maintain a state-of-the-art modeling system for the National Meteorological Service.

- **collaboration in the GLORI Digital Twin and IDEA-S4S** projects

- **FLOOD SIGNALS**: using DestinE Extremes into CIMA hydrological model and improving results using high-resolution simulations with ICON and SynCast data

- **IT4LIA AI Factory**: establishment of a strategic AI platform in Italy for the European Commission, developing optimized infrastructure, applications, and services, including in meteorology and climate.

Planned developments and contributions

- **Ensemble component enhancement**: perturbation, more ensemble runs, probabilistic products for forecasters (with Arpae Emilia-Romagna)
- **Model improvement:**
  - Resolution increase (with University of Bologna and Arpae Emilia-Romagna PhD Matteo Siena)
  - Study of Medicanes and coupled ocean-atmosphere modelling (with CETEMPS)
  - Urban parametrization (with CIMA, Arpa Piemonte e Arpa Emilia-Romagna)
- **Data assimilation improvement**: assimilation of additional observations:
  - Satellite data:
    - MHS (with University of Bologna and Arpae Emilia-Romagna, PhD Marcello Grenzi)
    - IASI and IASI-NG (with CNR-IBE)
    - MTG-FCI and MTG-IRS
  - Radar data: refinement of the assimilation of radar data and inclusion of OPERA (with ArpaeEmilia-Romagna)
  - Near-surface data: SYNOP (T2m, RH2m) and non-SYNOP
  - MODE-S

Planned developments and contributions

- **Verification and monitoring:**
  - Refinement of verification (with LaMMA, CIMA, Arpae Emilia-Romagna and Arpa Piemonte)
  - Monitoring improvements for ICON and KENDA
- **Reanalysis**: implementation of I-DREAM-IT, a high-resolution reanalysis based on ICON-2I
- **Computational aspects**:
  - use of hybrid CPU-GPU architectures (with Arpae Emilia-Romagna)
  - use of AI

With these activities, we intend to support and strengthen the joint work carried out within the COSMO consortium

Thank you!

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