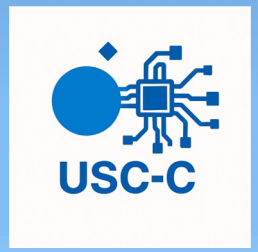
Final Meeting RSN5

The USC-C

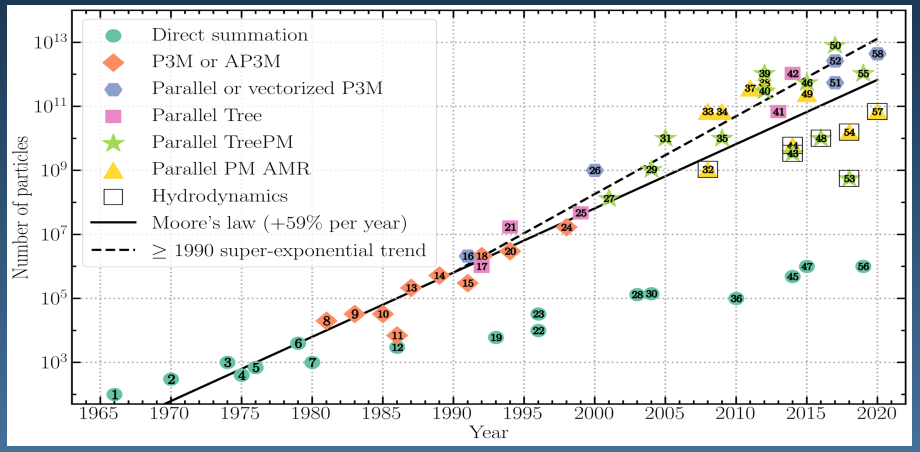


Andrea Possenti

INAF - Monte Mario - 29 Apr 2026

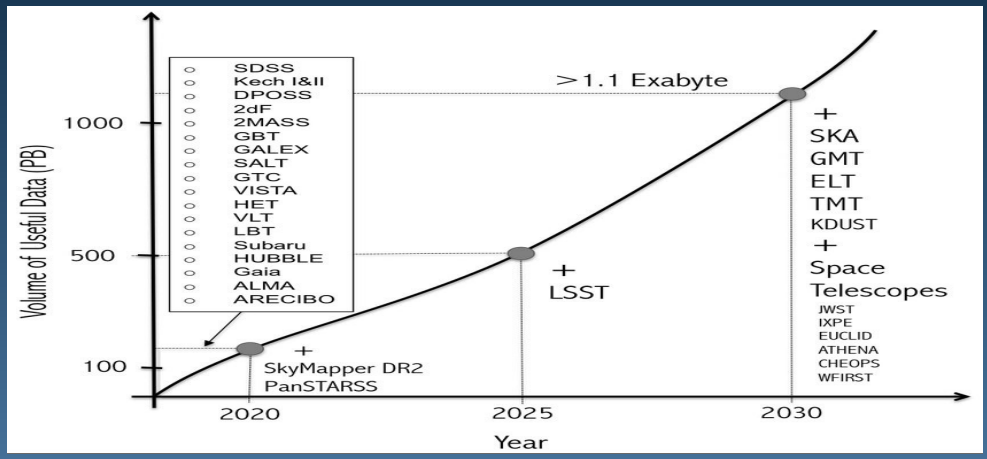
… the Challenges

[F. Leclercq 2023]



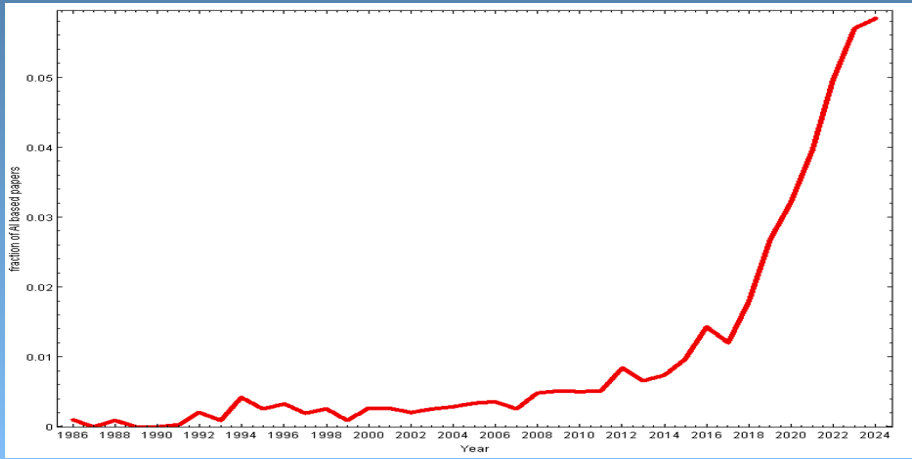
High Performance Computing

[R. Rosa 2021]

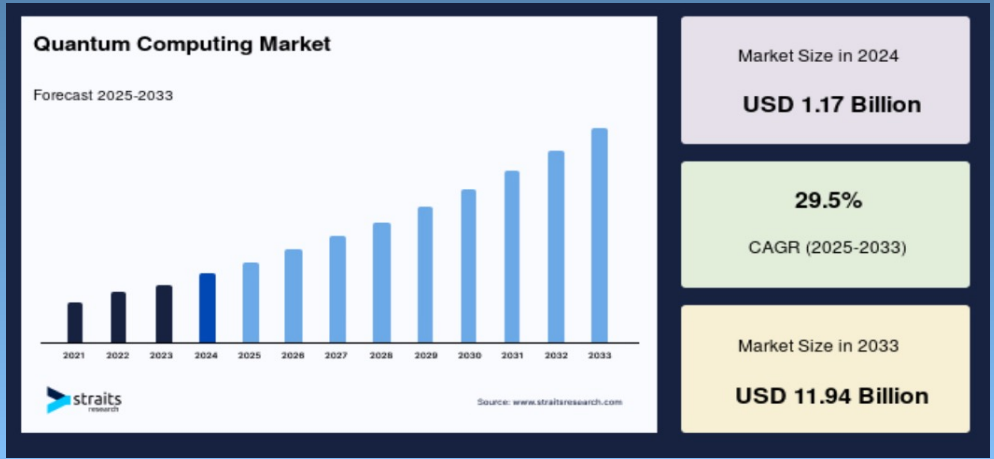


Data handling & Archiving

[S. Cavuoti 2025]



Machine Learning & AI



Quantum Computing

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Main Aims of the INAF USC-C *Computing*

The main medium-long term objective of USC- C is **the creation of a computing ecosystem for INAF**, capable of supporting, for the next few decades, the current very high competitiveness of the members of INAF in the international arena

The case of RSN5: not only HPC …

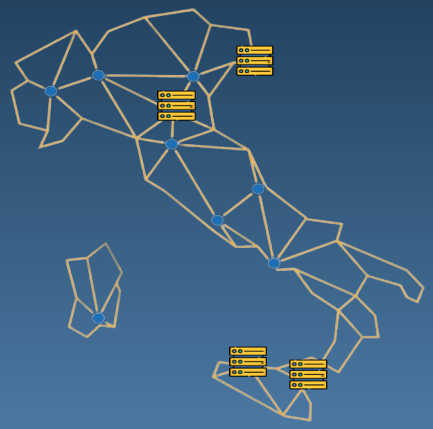
≈ 15% of all approved requests at the regular "Pleiadi" call #7 (Apr 26-Oct 26)

The success of so many experiments depends on the ability to have **good Twin software**, to have **adequate control software systems** and **monitoring software** for the instrumentation and the surrounding environment

The available INAF facilities: Pleiadi, Leonardo, IA2

PLEIADI is **distributed across four INAF sites**:

- IRA Bologna (CPU nodes)
- OA Catania (CPU & GPU nodes)
- OA Trieste (CPU & GPU nodes)
- OA Palermo (GPU nodes)



Leonardo is the Italian national Tier-0 high-performance computing system hosted at CINECA and **one of the most powerful supercomputers in Europe**.

Integration with PLEIADI

- Access provided through the **INAF-CINECA agreement**
- Resources allocated within the same call framework as PLEIADI

IA2: The data curation

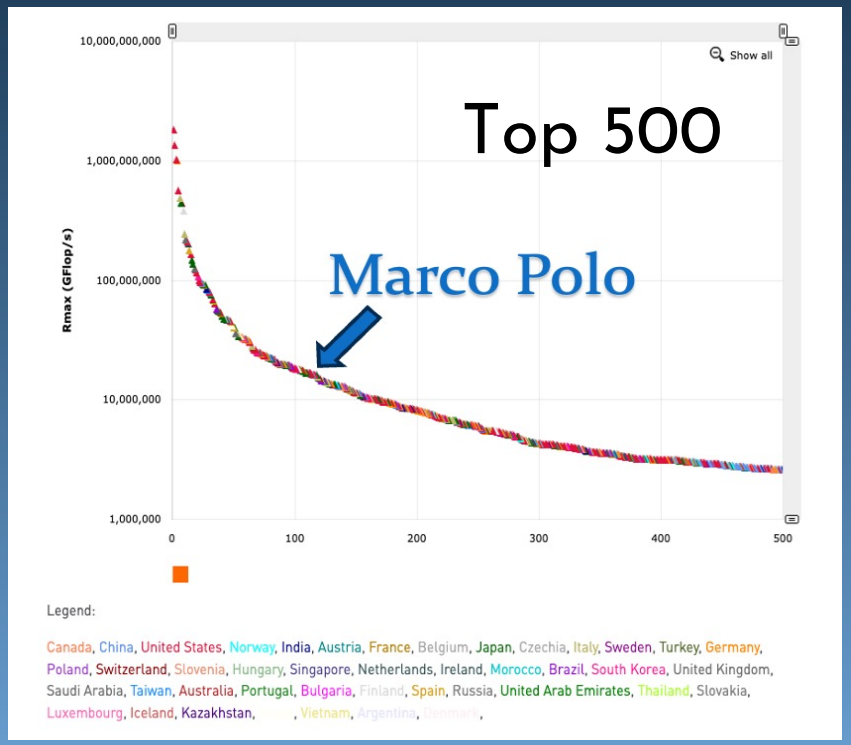
- Italian Astronomical Archives (IA2) and services
- **Open Access (Data) and FAIR**
- Virtual Observatory http://www.vobs.it/en/
- Training

Incoming (2026+) INAF Resources

- **Computing power**
  - 55 nodes of the Marco Polo CPU partition
  - 33% of the Marco Polo GPU partition
  - 100% of Tier3 (still to be renamed)
- **Storage**
  - 5 PB of on-line storage
  - ~17 PB of long-term storage
  - Access to 10 PB Scratch NVME Storage (Marco Polo scratch area)
- **Network**

  ≥200 Gb/s high-speed internal network interconnecting compute and storage systems +

  100 Gb/s external connectivity to the Internet



Timeline

- December 2025 – May 2026: system software set-up by Cineca
- June 2026: system in production (computing + on-line scratch)
- **Computing available for next Pleiadi call#8**
- **End 2026: long-term storage also available**

Incoming (2026+) INAF Resources

Marco Polo and Tier-3 systems @ Technopolo

INAF Human Resources

At the moment under the scientific direction of the USC-C …
≈ 7 FTE are supported by the USC-C **with fixed term contracts**
1 FTE acquired with a permanent contract
1 FTE about to be acquired with a permanent contract

All perspectives for improvement and development of the capabilities of the USC-C to serve the needs of the INAF community are tightly linked with the availability of additional well motivated and skilled personnel

Given the context, we are looking into preparing for:

- ✓ **maintaining the consistency of the current human crew**
- ✓ **creating dedicated paths for the career of people shifting from pure science to software/computing/data_curation/ in astrophysics**
- ✓ **exploiting the opportunities of the confirmed ICSC (national centre for computing)**
- ✓ **repeating the positive experience of the National calls for permanent positions**

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New opportunities

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Bando di finanziamento Astrofisica di Frontiera 2025

Allegato al Decreto del Presidente No. 57 del 30 dicembre 2025

ICSC Grants

PROGRAMMA "ICSC GRANTS"
PER IL FINANZIAMENTO DI PROGETTI DI RICERCA E INNOVAZIONE A VALERE SUI CONTRIBUTI ORDINARI ex Art. 3, comma 5 DELLO STATUTO DELLA FONDAZIONE

"Centro Nazionale di Ricerca in High Performance Computing, Big Data and Quantum Computing"

MIUR PRIN-Hybrid

Ministero dell'Università e della Ricerca

Segretariato Generale

Direzione generale della ricerca per la programmazione dei finanziamenti e per l'innovazione tecnologica

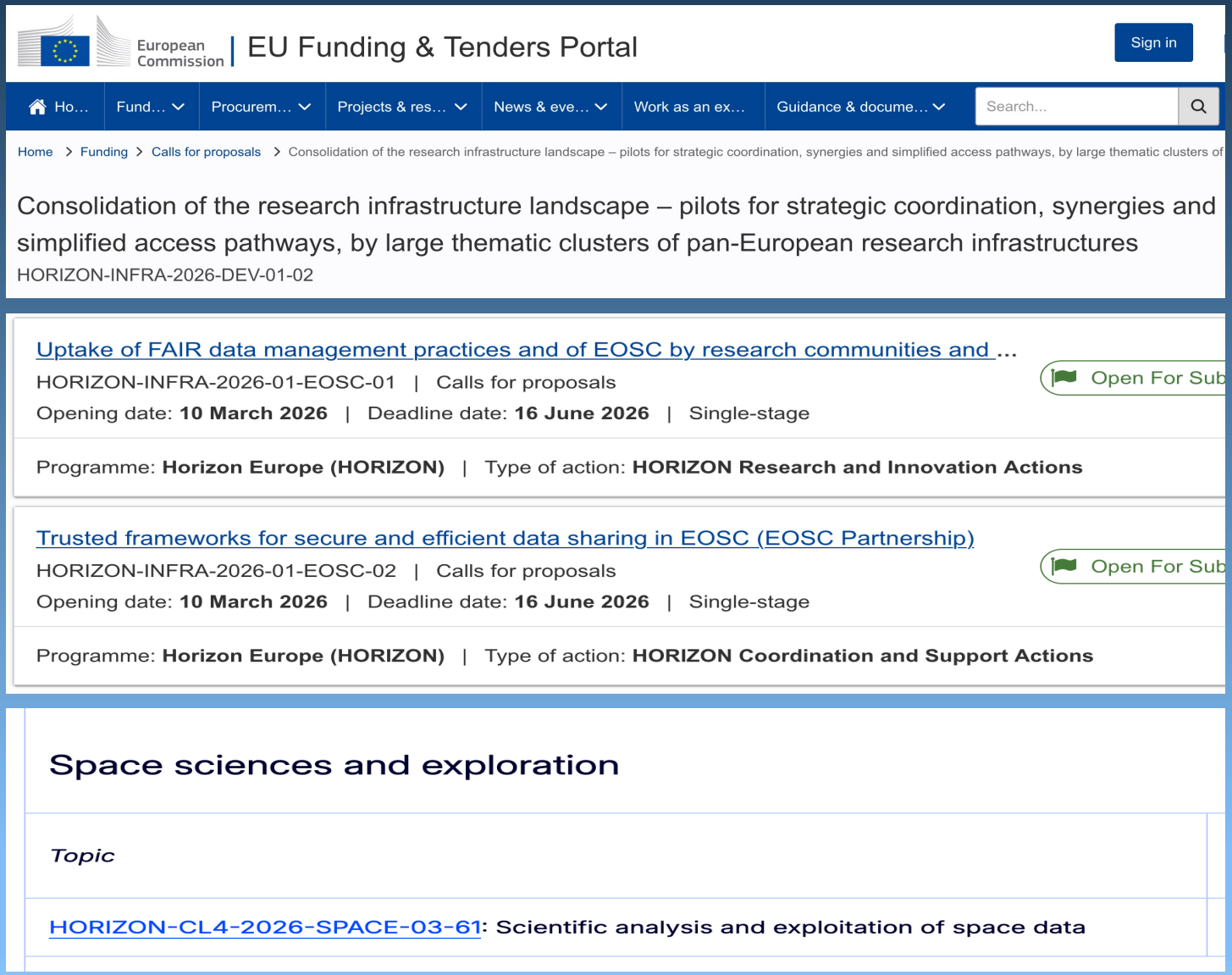
PROGRAMMA PRIN 2026 HYBRID

AVVISO PER IL FINANZIAMENTO DI PROGETTI DI RICERCA DI RILEVANTE INTERESSE NAZIONALE (PRIN) AL FINE DI PROMUOVERE IL SISTEMA NAZIONALE DELLA RICERCA E RAFFORZARE LE INTERAZIONI TRA UNIVERSITÀ, ENTI PUBBLICI DI RICERCA E ISTITUZIONI AFAM ANCHE ATTRAVERSO L'INTEGRAZIONE TRA SAPERI UMANISTICI E L'APPLICAZIONE DELLE NUOVE TECNOLOGIE IN UNA LOGICA DI IBRIDAZIONE DELLE COMPETENZE.

(BANDO PRIN 2026 HYBRID)

New opportunities

EU calls



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Thank you all !!

Marco Polo Tier 1 system

The Marco Polo system is composed by two partitions:

- **CPU Partition**
- **GPU Partition**

CPU Partition:

- LENOVO ThinkSystem SD665 V3
- 221 nodes AMD EPYC 9745 (Turin-Zen5c)
- **Core per node: 128**
- Frequency: 2.3 GHz
- Node Power: 400 W
- Node **RAM Memory: 768 GB** DDR5
- Network:
  - 2 × ConnectX-7 NDR200 dual-port × node (Infiniband for computing)
  - 2 × 100 Gb Ethernet per node (I/O)
- HPL ~ 3.9 PFlops

GPU Partition:

- LENOVO ThinkSystem SD650-N V3
- 90 nodes Intel Emerald Rapids 8592+
- **Core per node:** 64 × 2 sockets (**128 tot**)
- Frequency: 1.9 GHz
- Node RAM Memory: 512 GB DDR5
- **4 GPUs per node Nvidia H100** SXM5
  - **Memory HBM3 per GPU: 80 GB**
  - Interconnect: NVLink 4.0
- Network:
  - 4 × NDR200, each directly linked to GPU (Infiniband for computing)
  - 2 × 100 Gb Ethernet per node (I/O)
- Node Power: 3317 W (700 W per GPU)
- HPL ~ 15.24 PFlops

INAF Tier 3 system

The INAF dedicated Tier-3 system is composed by:

- **21 FAT CPU nodes**
- **4 GPU accelerated nodes**
- **5 PBytes on-line fast storage**
- **~ 17 PBytes long-term storage**

CPU Nodes:

- 21 AMD EPYC 9745 (Turin-Zen5c)
- **Core per node: 128**
- Frequency: 2.3 GHz
- Node Power: 400 W
- Node **RAM Memory: 1.152 TB** DDR5
- HPL ~ 0.1 PFlops

GPU Nodes:

- 4 Intel Emerald Rapids 8592+
- **Core per node**: 64 × 2 sockets (**128 tot**)
- Frequency: 1.9 GHz
- Node RAM Memory: 512 GB DDR5
- **4 GPUs per node Nvidia H100** SXM5
  - **Memory HBM3 per GPU: 80 GB**
  - Interconnect: NVLink 4.0
- Node Power: 3317 W (700 W per GPU)
- **HPL ~ 1 PFlop**

Storage:

- On-line storage
  - Huawei OceanStor Pacific
  - HDD 5 PB capacity
- Long-term data storage
  - Huawei OceanStor Arctic
  - ~ 17 PB capacity
  - Magneto-electric tape techonlogy

Multi-tired fully integrated system

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