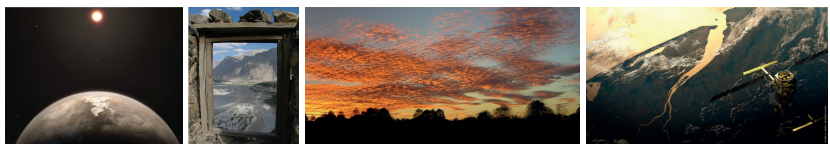
TERRE & UNIVERS

National Program

Computational sciences for Universe sciences (SUN)

Mathematics, numerical methods, HPC/HPDA, and artificial intelligence for Earth and Universe sciences



Pascal Chevrot (DAS Développements instrumentaux innovants)

Florian Lemarié (président du CES)

Context

Main Objectives of the INSU National Programs (PN):

- **Structure the scientific community** around a major theme
- Foster **interdisciplinary** and **inter-institutional** collaborations
- **Support scientific projects** through calls for proposals
- Coordinate **training activities** and **scientific events**
- **Promote and enhance the value of data** produced by observation systems (SNO)

Strategic coherence of the National Programs is ensured by the Inter-Institutional Committee (C2I)

The **Inter-Institutional Committee (C2I)** is composed of representatives from the **CNRS** (INSU) and partner public institutions (**CNES, IRD, Météo-France, BRGM, CEA, Ifremer, Inrae, Ademe**).

Origins of the SUN National Program

Summary of the C2I meeting, end of 2024:

- *The Mathematical and NUmerical Methods (MANU) action of the LEFE program [. . .] would need to be even more visible to attract more expertise. [. . .]*
- *Extending this transversally to all INSU domains appears desirable.*

The INSU leadership proposes to the C2I the creation of a cross-cutting national program

⇒ April–May 2025: establishment of the cross-cutting, multi-institutional National Program “Universe and Digital Sciences” (SUN)

Origins of the SUN National Program

Compte-rendu du C2I fin 2024 :

- *L'action Méthodes Mathématiques et NUmériques (MANU) du programme LEFE [. . .] nécessiterait d'être encore plus visible pour attirer plus d'expertise. [. . .]*
- *La transversalisation à l'ensemble des domaines de l'INSU semble souhaitable*

INSU domains: ocean and atmosphere sciences (OA); astronomy and astrophysics (AA); solid Earth and geosciences (TS); continental surfaces and interfaces (SIC).

La direction de l'INSU propose au C2I la création d'un programme national transverse

⇒ **Avril - mai 2025: montage du PN transverse et multi-organismes "Sciences de l'Univers et du Numérique" (SUN)**

Main Objectives and Eligibility Criteria

- **Strengthen collaborations** between INSU-affiliated laboratories and key actors in the computational sciences (mathematics, data science, computer science, software engineering, etc.)

- **Develop mathematical and computational skills within the INSU community**, in order to:
  - better understand and master existing numerical tools and their limitations,
  - contribute to the emergence of innovative methods adapted to the specific challenges of Earth and Universe sciences

- **The scientific scope of the expected projects** may be characterized by their content:
  - methodological (with a solid mathematical foundation),
  - numerical (involving computational methods),
  - and generic (not strictly tied to a specific application or model),
  - while not excluding the presence of an applied component within the projects.

Program Overview

AAP 2026

Appel blanc

Petits projets à caractère méthodologique fort

Actions ciblées

Projets de plus grande envergure pour lesquels **la participation active** des membres du C2I est attendue

Animation scientifique

Formations

Open Call

- **Duration:** 1 to 3 years
- **Budget:** 5k€min./year (possibility to fund a Master's internship)
- **Overall budget:** 200 k€/ year (CNRS) + contributions from C2I member institutions

→ Modelling
→ Data assimilation
→ Uncertainty quantification
→ Data and analysis
→ Artificial Intelligence

☐ AI Technologies
☐ HPC/HPDA
☐ Energy footprint

Open Call

- **Duration:** 1 to 3 years
- **Budget:** 5k€min./year (possibility to fund a Master's internship)
- **Overall budget:** 200 k€/ year (CNRS) + contributions from C2I member institutions

Particular attention will be given to projects led by

- Early-career researchers
- Mixed teams with expertise in Earth & Universe sciences and computational sciences
- Support for PhD projects with a strong multidisciplinary component

+ **projects with a catalytic role**

Scientific Activities and Training

- **Dedicated call for thematic workshops**
  - Coordination effort with GdR/RT/Mesocenters
  - Specialized workshops to contribute to foresight exercises
- **Training for PhD students (recognized by graduate schools)**
  - Under MANU: Numerical modeling of OA, Data assimilation, Data science
  - Inventory of similar initiatives in other fields
- **Training for researchers/engineers**
  - Need for a core set of skills in computational sciences
- **Training will remain specific to the application domain**

Targeted Actions

- **Duration:** 2 to 3 years
- **Budget:** potentially including human resources
- **Overall budget:** to be determined, depending on C2I commitment

Four priority themes identified

- Optimization of observation systems (OSSEs) – application-oriented action
- Interoperability of heterogeneous data – specification and development action
- Design of innovative codes for exascale and hybrid physical/AI modeling – technological development action
- Methodologies for integrating AI emulators into modeling chains – methodological action

- **Targeted actions:** projects must be structuring for the community

  - **Collective scope:** addresses a need shared by a large number of community members; strengthens collective skills

  - **Leverage effect:** opens new perspectives, provides tools, or establishes standards that will serve as a basis for future developments

  - **Ability to unite:** mobilizes multiple key actors in the community; fosters interdisciplinary and inter-institutional cooperation

Targeted Actions

2026 Call: timeline of the open call and targeted actions synchronized

Proposed organization for upcoming calls:

1. Collection of letters of intent (end of March)
2. Evaluation by the Scientific Evaluation Committee (CES) (April)
3. Review by C2I members (May)
4. Feedback to proposers: go/no-go decision and estimation of feasible human resources (end of May)
5. Submission of detailed proposals (early September)

→ optimizes researchers' time by simplifying procedures

→ avoids confusion between "targeted actions" and "open call"

In Summary

- **Evolution of the MANU activity from the LEFE national program**
- **Extension of MANU across all INSU scientific domains**
  - New National Program “Universe and Digital Sciences” (SUN)
  - `https://programmes.insu.cnrs.fr/sun/`
  - 1st SUN call for proposals closed on September 5, 2025

Scientific Evaluation Committee (CES)

- Benoît Commerçon (CRAL, ENS Lyon) [AA]
- Thomas Dubos (IPSL, Paris) [OA]
- Ronan Fablet (IMT Atlantique, Brest) - référent IA
- Pierre-André Garambois (INRAe, Marseille) [SIC]
- Sophie Giffard-Roisin (IsTerre, Grenoble) [TS]
- Flavien Gouillon (CNES, Toulouse) - référent données
- Clément Hibert (ITES/EOST, Strasbourg) [TS]
- Sophie Lanco (Marbec, Sète) [SIC]
- Florian Lemarié (Inria, Grenoble) - référent Maths Applis
- Jean-Philippe Mallet (ITES/EOST, Strasbourg) - représentant Data Terra
- Guillaume Roullet (LOPS, Brest) [OA]
- Jenny Sorce (CRIStAL, Lille) [AA]