



CMCC SYMPOSIUM

The Acceleration of Scientific Revolutions. The case of Climate Sciences

October 1-2, LECCE, Italy

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CONCEPT

Science is undergoing a phase of profound disruption. Across disciplines, long-established, incremental models of knowledge production are being replaced by nonlinear, accelerated modes of discovery, driven by rapid advances in artificial intelligence, machine learning, and data-intensive technologies. Scientific progress no longer follows a steady evolutionary path but unfolds through leaps and bounds, enabled by new ways of processing, analysing, and exploiting vast, heterogeneous datasets.

Climate science exemplifies this moment of “shock”. Faced with the urgency and complexity of global environmental change, the field has become a laboratory for new research paradigms integrating Earth observation systems, advanced numerical models, digital infrastructures, and AI-based methods. Knowledge increasingly emerges from continuous feedback between data, models, and decision-making processes, reshaping how scientific evidence is produced, validated, and applied.

This rapid technological transformation represents a break with the past. The pervasive diffusion of AI and ML across scientific practice—and society more broadly—calls on researchers to adapt swiftly by rethinking methodologies, epistemological assumptions, and institutional cultures. Navigating these technological revolutions requires openness to interdisciplinarity, new forms of collaboration, and adaptive research approaches that can keep pace with accelerating change.

The CMCC is celebrating the first 20 years of its pioneering research at the interface between science and policy with a symposium that offers an opportunity to analyze and reflect on some cutting-edge issues that will define the main challenges facing the scientific community in the coming decades.

Bringing together international scientists, policymakers, and experts, the conference “The Acceleration of the Scientific Revolutions. The case of Climate Sciences” provides a high-level forum for reflecting on how science is responding to this disruptive moment. The symposium positions climate science as both a driver and a testbed for accelerated knowledge production, while examining the implications for governance, policy, and society in the Anthropocene.



TOPICS AND SESSIONS

The event is structured around thematic sessions on frontier aspects of climate research, featuring contributions from keynote speakers, presentations on specific aspects of the current state of scientific knowledge, perspectives on the near future in light of methodological and technological advancements available to the global scientific community, and innovations in policy and in interactions between the climate system and socio-economic systems.

The thematic sessions are designed to provide an in-depth examination of the challenges that will characterize the coming decades of climate research, with particular attention to a multidisciplinary, integrated approach that highlights emerging data, technological innovations, advances in understanding the climate system, policy options, and climate solutions.

The identified themes are:

Session 1

When Science meets Policy and Business

Organised by Massimo Tavoni and Carlo Carraro

Session 2

The Climate–Biodiversity Nexus: Governing Within Planetary Boundaries

Organised by Monia Santini and Donatella Spano

Session 3

Climate Science for a Changing World

Carlo Carraro (chair)

Session 4

From Data to Predictions: Machine Learning Across the Earth System

Organised by Simona Masina and Nadia Pinardi

Session 5

Digital Twins for Climate Resilience: Integrated Solutions from Terrestrial to Ocean Systems

Organised by Giovanni Coppini and Andrea Rinaldo

Session 6

Carbon Neutrality: Integrating Monitoring, Modeling, and Management

Organised by Soheil Shayegh and Riccardo Valentini



AGENDA

DAY 1 - Thursday, October 1st

11.00

Institutional opening

- **Costas Kadis**, EU Commissioner Fisheries and Oceans,
- **Anna Maria Bernini***, Italian Minister of University and Research
- **Antonio Decaro***, President Apulia Region, Italy
- **Antonio Navarra**, CMCC President

12.30

LUNCH

14.00

Session 1

When Science meets policy and business

- Chairs - **Massimo Tavoni** and **Carlo Carraro**

This session will explore the latest developments in climate economics and finance and how this field has evolved in recent years. The session will discuss how climate science, together with economics and modeling, is used to inform decisions for international climate policy cooperation, climate finance, financial stability, investment planning, and business operations. The panelists' expertise -ranging from European institutions to academics and business - will show how climate change research has helped improve societal decisions and will highlight what it needs to do to stay on top of shifting priorities.

- **Valentina Bosetti**, Università Bocconi and CMCC
- **Avram Miller** - Intel Capital and Elevo, IIT Fellow
- **Alessandra Sgobbi** - EU Commission, DG CLIMA
- **Livio Stracca** - European Central Bank

15.30 -
16.00

COFFEE BREAK



16.00

Session 2

The Climate–Biodiversity Nexus: Governing Within Planetary Boundaries

- Chairs - **Monia Santini** and **Donatella Spano**

The session will explore the climate–biodiversity nexus from science to policy, examining how biodiversity loss and climate change interact across ecosystems and societies. It will highlight scientific evidence, integrated scenarios and governance approaches needed to operate within planetary boundaries. Bringing together leading international exSSperts, the session will discuss how science can support resilient, nature-positive and evidence-based decision-making.

Keynotes

- **Regan Early** – University of Exeter
- **Paula Harrison** – UK Center for Ecology & Hydrology (UKCEH)
- **Maisa Rojas*** – University of Chile

Presentations

- **Daniele Peano** - CMCC, **Simone Mereu** - CMCC & **Gabriella Scipione** - CINECA
- **Hellas Cena**, University of Pavia

17.30

End of the day



DAY 2 - OCT. 2

9.00

Session 3

Climate Science for a Changing World

Chair: **Carlo Carraro**

This session explores how rigorous and ambitious science, directed towards society, became instrumental in understanding and managing a changing climate. It also honors the scientist who made much of this possible in Italy and Europe. Trained in physics at Bologna University and at Princeton's Geophysical Fluid Dynamics Laboratory, Prof. Antonio Navarra founded the Euro-Mediterranean Center on Climate Change and has led it for more than twenty years, building a multidisciplinary institution where climate physics, economics and resilience meet.

Keynotes

- **Laurence Tubiana** - President and CEO of the European Climate Foundation
- **Hans Von Storch** - University of Hamburg
- **Joe Tribbia** - National Center for Atmospheric Research - NCAR
- **Antonio Navarra**, CMCC

10.30

COFFEE BREAK

11.00

Session 4

From Data to Predictions: Machine Learning Across the Earth System

- Chairs - **Simona Masina** and **Nadia Pinardi**

Machine learning and AI are rapidly reshaping how we predict the atmosphere and ocean, from global weather models rivaling operational NWP to ocean and climate emulators. This session brings together recent advances in data-driven forecasting across scales, highlighting hybrid physics-ML approaches and emerging applications.

Keynotes

- **Peter Dueben** - ECMWF
- **Rossella Arcucci** - Imperial College

Presentations

- **Emanuela Clementi & Italo Epicoco** - CMCC
- **Annalisa Bracco** - CMCC
- **Ronan McAdam** - CMCC

12.30

LUNCH



14.00	Session 5 Digital Twins for Climate Resilience: Integrated Solutions from Terrestrial to Ocean Systems - Chair - Giovanni Coppini Digital twins are emerging as cloud-enabled infrastructures for climate resilience, integrating observations, models, AI and high-performance computing across terrestrial, coastal and atmospheric-ocean systems. This session explores how process-based and data-driven approaches, including new satellite and in-situ observing streams, support forecasting, what-if analysis, and multi-hazard early warning to inform adaptation, risk reduction, and the design of resilient, evidence-based socio-environmental systems. Keynotes Joanna Staneva - Helmholtz-Zentrum Hereon Andrea Rinaldo - Università di Padova Presentations Ivan Federico - CMCC Paola Mercogliano - CMCC Silvia Torresan - CMCC
15.30	COFFEE BREAK
16.00	Session 6 Carbon Neutrality: Integrating Monitoring, Modeling, and Management - Chair - Soheil Shayegh and Riccardo Valentini This session explores advances in carbon cycle monitoring and modeling, integrating observations, AI-driven analytics, and Earth system simulations to improve carbon flux estimation and support effective pathways toward carbon neutrality. Keynote Pierre Friedlingstein - University of Exeter Presentations Giulia Mengoli - CMCC Chiara Ciscato - CMCC Marco Gambarini - CMCC Lamin Ann - University of Tuscia
17.30	End of the Symposium



SCIENTIFIC COMMITTEE

Donatella Spano (Chair), Carlo Carraro, Giovanni Coppini, Antonio Marcomini, Simona Masina, Nadia Pinardi, Monia Santini, Soheil Shayegh, Massimo Tavoni, Riccardo Valentini

ORGANIZING COMMITTEE

Laura Panzera (Chair)
Mauro Buonocore, Virginia Corlianò Nahi , Rosella Marasco, Mattia Perizzolo, Manuela Santagata.