



INSTITUT  
POLYTECHNIQUE  
DE PARIS

RESEARCH  DAY

# NUMERICAL MODELING — *and* — ECOLOGICAL TRANSITION

*December 1st, 2025  
at Télécom Paris*



INSTITUT  
POLYTECHNIQUE  
DE PARIS



ENST2



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## *Address from the Scientific Committee*

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The ecological transition raises formidable challenges for engineers across many fields: energy, transportation, infrastructure, urban planning, and more. The IPCC bases its assessments on models of climate evolution. Numerical modeling therefore plays a fundamental role in this context, but it also raises important questions—for example, regarding the validity of models under new climatic conditions, and the energy cost of these models, especially when they rely on the use of very large datasets.

For the fourth year, the scientific community of the Institut Polytechnique de Paris will gather around the theme “**Numerical Modeling and Ecological Transition**”, with a program featuring plenaries lectures, mini-symposia, and a poster session.

This annual event aims to:

- Explore interdisciplinary research topics related to the chosen theme,
- Showcase scientific results and their impact,
- Foster exchanges and promote collaboration among researchers.

### ***Tony Lelièvre***

Chair of the Committee,  
Professor at CERMICS,  
a laboratory of ENPC,  
Affiliated to E4C center

### ***Gauthier Vermandel***

Researcher at CMAP,  
a laboratory of École Polytechnique

### ***Nathanaelle Schneider***

CNRS Senior Researcher at IPVF,  
a laboratory of École Polytechnique,  
Affiliated to E4C center

### ***Marieke Stein***

Associate Professor at FoAP,  
a laboratory of ENSTA

### ***Fabien Leurent***

Professor at CIRED,  
a laboratory of ENPC

### ***Philippe Ciblat***

Professor at LTCI,  
a laboratory of Télécom Paris

### ***Catherine Lepers***

Professor at SAMOVAR,  
a laboratory of Télécom SudParis

# PROGRAM

<b>8:30 am</b>	Opening doors and welcome coffee	
<b>9:00 am 9:05 am</b>	Opening speech	<b>Patrick Olivier</b> Dean of Télécom Paris
<b>9:05 am 9:10 am</b>	Research address	<b>Jamal Atif</b> VP Recherche & Innovation IP Paris
<b>9:10 am 9:15 am</b>	Special speech	<b>Anthony Briant</b> Dean of École nationale des ponts et chaussées
<b>9:15 am 9:55 am</b>	Plenary 1	<b>Patrick Pélata</b> Alumni of École Polytechnique and ENPC President of Meta Strategy Consulting, President of the National Academy of Technology of France
<b>9:55 am 10:33 am</b>	Plenary 2	<b>Silke Biermann</b> Professor at École Polytechnique - CPHT, Co-scientific director M4S
<b>10:35 am 11:15 am</b>	Plenary 3	<b>Freddy Bouchet</b> Director of LMD laboratory, ENS / IPSL
<b>11:15 am 11:35 am</b>	Pitch posters	
<b>11:35 am 1:30 pm</b>	Lunch break, stands of interdisciplinary centers and research services, poster session	
<b>1:30 pm 3:30 pm</b>	Symposium 1 «Climate and Meteorology»  LECTURE HALL THÉVENIN	<b>1.30 PM – 2.00 PM</b> <b>Marc Bocquet</b> Deputy Director of the Center for education and research in atmospheric environment (CEREA), École nationale des ponts et chaussées, Affiliated to E4C  <b>2.00 PM – 2.30 PM</b> <b>Aglaé Jézéquel</b> Researcher at Dynamic Meteorology Laboratory (LMD), École Polytechnique  <b>2.30 PM – 3.00 PM</b> <b>Olivier Lopez</b> Professor at CREST Laboratory, ENSAE Paris, Head of the Excellence Research Chaire CARE (Allianz France - ENSAE Paris)  <b>3.00 PM – 3.30 PM</b> <b>Loïc Landrieu</b> Researcher at Gaspard Monge computer science Laboratory (LIGM), École nationale des ponts et chaussées and Associate Researcher at IGN-LASTIG

<b>1:30 pm 3:30 pm</b>	Symposium 2 «Energy»  LECTURE HALL 3	<b>1.30 PM – 2.00 PM</b> <b>François Trahay</b> Full professor at SAMOVAR Laboratory, Télécom SudParis  <b>2.00 PM – 2.30 PM</b> <b>Daphné Tuncer</b> Researcher at City, Mobility, Transportation Laboratory (LVMT), École nationale des ponts et chaussées  <b>2.30 PM – 3.00 PM</b> <b>Louis-Gaëtan Giraudet</b> Researcher at International Research Centre on Environment and Development (CIRED), École nationale des ponts et chaussées  <b>3.00 PM – 3.30 PM</b> <b>Yann Marco</b> Professor at Dupuy de Lôme Research Institute (IRDL), Head of the Mechanics Department at ENSTA
<b>1:30 pm 3:30 pm</b>	Symposium 3 «Transportation and Mobility»  LECTURE HALL 4	<b>1.30 PM – 2.00 PM</b> <b>Andréa Araldo</b> Associate Professor at SAMOVAR Laboratory, Télécom SudParis  <b>2.00 PM – 2.30 PM</b> <b>Marion Leroutier</b> Assistant Professor at CREST Laboratory, ENSAE Paris  <b>2.30 PM – 3.00 PM</b> <b>Virginie Boutueil</b> Researcher at City, Mobility, Transportation Laboratory (LVMT), École nationale des ponts et chaussées  <b>3.00 PM – 3.30 PM</b> <b>Axel Parmentier</b> Professor at Research center in mathematics and scientific computing (CERMICS), École nationale des ponts et chaussées
<b>3:30 pm 4:00 pm</b>	Coffee break, stands exhibition and poster session	



4:00 pm  
6:00 pm

Symposium 4  
«Models and Society»

LECTURE HALL THÉVENIN

4.00 PM – 4.30 PM

**Peter Tankov**  
Professor at CREST Laboratory,  
ENSAE Paris

4.40 PM – 5.00 PM

**Antoine Missemer**  
CNRS Researcher at International  
Research Centre on Environment  
and Development (CIRED),  
École nationale des ponts et chaussées

5.00 PM – 5.30 PM

**Claire Le Renard**  
Researcher at Technologies, Territories and  
Societies Laboratory (LATTs),  
École nationale des ponts et chaussées

5.30 PM – 6.00 PM

**Ada Diaconescu**  
Associate Professor at Information  
processing and communication Laboratory  
(LTCI), Télécom Paris

4:00 pm  
6:00 pm

Symposium 5  
«Materials and Sustainability»

LECTURE HALL 3

4.00 PM – 4.30 PM

**Polina Volovitch**  
Professor in chemistry, IPVF - ENSCP

4.40 PM – 5.00 PM

**Matthieu Vandamme**  
Researcher at Navier Laboratory,  
École nationale des ponts et chaussées

5.00 PM – 5.30 PM

**Bruno Levieil**  
Associate Professor at Dupuy de Lôme  
Research Institute (IRDL), ENSTA

5.30 PM – 6.00 PM

**Clémence Badie**  
Tenure-Track Assistant Professor at  
Condensed matter physics laboratory (PMC),  
École Polytechnique

4:00 pm  
6:00 pm

Symposium 6  
«Water and Environment»

LECTURE HALL 4

4.00 PM – 4.30 PM

**Pierre-Antoine Versini**  
Research Director at Hydrology, Meteorology  
and Complexity Laboratory (HM & CO),  
École nationale des ponts et chaussées

4.40 PM – 5.00 PM

**Marie-Christine Gromaire**  
Research Director at Water, environment  
and urban systems Laboratory (LEESU),  
École nationale des ponts et chaussées

5.00 PM – 5.30 PM

**Rémi Carmigniani**  
Researcher at Saint-Venant Hydraulics  
Laboratory (LHSV),  
École nationale des ponts et chaussées

5.30 PM – 6.00 PM

**Cédric Tard**  
Professor at Molecular Chemistry Laboratory  
(LCM), École Polytechnique

## Plenary sessions

### Digital Twins and AI for the Ecological Transition



**Patrick Pélata**

is CEO of Meta Strategy Consulting, a graduate of the École Polytechnique and the École nationale des ponts et chaussées, as well as the École des Hautes Études en Sciences Sociales in Paris. He holds a doctorate in socioeconomics. In 2023 he was elected president of the National Academy of Technology of France.

### Insights into the challenges of materials design «in silico»



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**E4C**

**Silke Biermann**

is Professor at École Polytechnique - CPHT  
Co-scientific director M4S.

Her research activities focus on systems known as strongly correlated electron systems. She is particularly interested in developing methods for describing such systems based on first principles.

CPHT: a joint research unit CNRS, École Polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France

LMD: a joint research unit CNRS, ENS - PSL, Sorbonne Université, École Polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France

### Artificial Intelligence and Rare Event Algorithms to Study Extreme Climate Events and the Resilience of the Power System



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**Freddy Bouchet**

is Director of the Dynamic Meteorology Laboratory (LMD), ENS / IPSL. His work bridges mathematical physics, climate science, data science, and statistical mechanics, focusing on turbulent flows, climate extremes, and large deviation theory.



## Symposium 1

# Climate and Meteorology

1.30 PM – 3.30 PM  
LECTURE HALL THÉVENIN

*Chair:*  
Catherine Lepers,  
Professor at SAMOVAR,  
Télécom SudParis



*The AI revolution in numerical weather prediction:  
surrogate models and data assimilation*

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**Marc Bocquet**

is Deputy Director of the Center for education and research in atmospheric environment (CEREA), École nationale des ponts et chaussées. He works on data assimilation, inverse problems and statistical learning applied to geosciences. He develops mathematical methods to better estimate the state of the atmosphere, of the ocean and the climate, as well as their constituents, using massive observations and complex models.



[\*\*Full researcher biographies  
and project abstracts online\*\*](#)

*Heatwaves in a changing climate: from hazards to impacts*



**Aglaé Jézéquel**

is a civil engineer specializing in bridges, water, and forests. She is a researcher at the Dynamic Meteorology Laboratory (LMD) within the Department of Geosciences at the École Normale Supérieure. Her research focuses on the influence of climate change on extreme weather events and their impacts in Europe. She uses statistical methods to analyze climate data (observations, model outputs) and also conducts research on the transfer of scientific information for climate change adaptation.

*Parametric insurance:  
challenges and opportunities to reduce the climate insurance protection gap*

**Olivier Lopez**

is Professor at CREST Laboratory, ENSAE Paris. Principal investigator of the Excellence Research Chaire CARE (Allianz France - ENSAE Paris). His research topics cover applications of statistics to the evaluation of risks in insurance, with a particular focus on machine learning and their use in anticipating the impact of emerging risks (climate, cyber, health...).



*Learning Environmental Representations for Scalable,  
Long-Term, Tree-Level Forest Monitoring*

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**Loïc Landrieu**

is a senior computer vision scientist at Gaspard Monge computer science Laboratory (LIGM), École nationale des ponts et chaussées and an associate researcher at IGN-LASTIG. His research focuses on computer vision for environmental monitoring. He co-chairs ISPRS and IEEE GRSS Working Groups on Earth Observation, was Program Chair of the ISPRS Congress 2022, and co-organizes the CVPR EarthVision workshop 2021-2025 and the EurIPS 2025 Advances in Representation Learning for Earth Observation workshop.

## Symposium 2

### Energy

1.30 PM – 3.30 PM  
LECTURE HALL 3

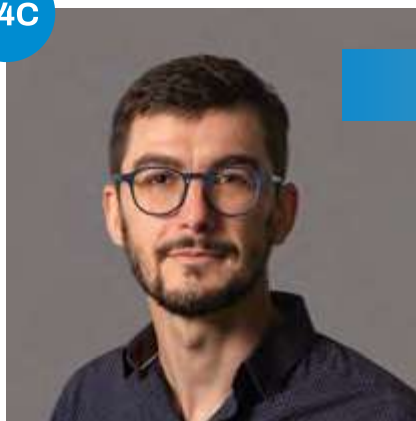
#### Chairs:

Tony Lelievre,  
Professor at CERMICS Laboratory, ENPC  
Marieke Stein,  
Associate Professor at FoAP Laboratory, ENSTA



#### *Energy Footprint of Numerical Simulations on Supercomputers*

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#### **François Trahay**

is Full Professor at SAMOVAR Laboratory, Télécom SudParis, where he specializes in the performance analysis and optimization of high- performance computing (HPC) systems. His research focuses on runtime systems for HPC, multithreading over multicore architectures, and the broader challenges of designing efficient high-performance systems.



**Full researcher biographies  
and project abstracts online**

#### *Inter-domain and multi-stakeholders system infrastructure orchestration*

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#### **Daphné Tuncer**

is researcher at City, Mobility, Transportation Laboratory (LVMT), École nationale des ponts et chaussées. Her research focuses on understanding how to manage the complexity of networked system infrastructures and resources. Daphné is the scientific co-chair the research action 7 of Energy4Climate (E4C) interdisciplinary center.

#### *The economics of home energy retrofits*

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#### **Louis-Gaëtan Giraudet**

is researcher at Centre international de recherche sur l'environnement et le développement (CIRED), École nationale des ponts et chaussées. His research focuses on evaluating energy renovation policies in the housing sector, including MaPrimeRénov', energy saving certificates, zero-interest eco-loans, carbon taxes, and renovation requirements. L.-G. Giraudet coordinates the development of the Res-IRF tool for evaluating energy renovation policies.



#### *Future floating wind turbines: scientific obstacles and the contribution of modeling to synthetic anchoring solutions*

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#### **Yann Marco**

is Professor at Dupuy de Lôme Research Institute (IRDL) and Head of the Mechanics Department at ENSTA. His main research topics investigate design against fatigue and ageing of organic materials (Elastomers, Polymers, Composites) for various industrial fields, from Aeronautics to Automotive and Marine renewable Energy.



## Symposium 3

# Transportation and Mobility

1.30 PM – 3.30 PM  
LECTURE HALL 4

*Chair :*  
Fabien Leurent,  
Professor at CIREN Laboratory,  
ENPC



*Reducing Accessibility Inequality via Flexible Mobility:  
a Descriptive and Prescriptive Analysis*

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**Andrea Araldo**

is Associate Professor at SAMOVAR Laboratory, Télécom SudParis. His current research interests are Networked Systems Optimization, Mobility on Demand and Artificial Intelligence. He was awarded the French national Young Researcher funding (ANR JCJC) for the project «Multimodal Transit for Accessibility and Sustainability» (2022-2026).



[Full researcher biographies  
and project abstracts online](#)

*Tackling Car Emissions in Urban Areas: Shift, Avoid, Improve,  
co authored with Philippe Quirion*

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**Marion Leroutier**

is Assistant Professor at CREST Laboratory, ENSAE Paris. Her current research investigates the societal costs of air pollution, the health co-benefits of climate policies and the determinants of support for green policies, in the European context.

Marion Leroutier, is recipient of a research chair from the Île-de-France region for her project “Cyclomob”: toward sustainable urban mobility.

*Integrating intermediate modes in mobility research and policy:  
Prospects and challenges*

**Virginie Boutueil**

is researcher at City, Mobility, Transportation Laboratory (LVMT), École nationale des ponts et chaussées. Her research in the field of mobility socioeconomics focuses on innovative mobility solutions (including shared mobility solutions), the digital transformation of mobility services, and related public policies.



*Combinatorial Optimization Augmented Machine Learning  
for Sustainable Transport and Logistics*



**Axel Parmentier**

is Professor at Research center in mathematics and scientific computing (CERMICS), École nationale des ponts et chaussées where he founded and holds the artificial intelligence for air transport chair with Air France. His research lies at the intersection of operations research and machine learning, and notably enabled his group to win the 2022 EURO-NeurIPS challenge on dynamic vehicle routing.



## Symposium 4

### Models and Society

4.00 PM – 6.00 PM  
LECTURE HALL THÉVENIN

*Chair :*  
Gauthier Vermandel,  
Researcher at CMAP,  
École Polytechnique



*Tipping points, climate risks and emission reduction*

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#### Peter Tankov

is Professor of quantitative finance at ENSAE Paris affiliated to the CREST Laboratory. He is a mathematician, specialist in applied probability and quantitative finance. His research focuses on green and sustainable finance, where he aims to develop quantitative methodologies. He is the recipient of the 2016 Best Young Researcher in Finance award of the Europlace Institute of Finance and the 2024 Louis Bachelier Prize of London Mathematical Society, SMAI, and Natixis Foundation.



[Full researcher biographies  
and project abstracts online](#)

*Economists, their models, and public policy on energy issues: a retrospective view*

#### Antoine Missemmer

is CNRS researcher in economics at CIRED – International Research Centre on Environment and Development. His research focuses primarily on the history of environmental and energy economics, i.e. how the discipline of economics has addressed environmental and energy issues since the 18th century, in resonance with contemporary ecological challenges (natural resource depletion, energy transition, climate change, biodiversity loss). He is currently leading the ERC-funded ETRANHET project.

*Energy sufficiency in real life:  
domestic practices in a stratified society. Insights from winter 2022–2023*

#### Claire Le Renard

is researcher at Technologies, Territories and Societies Laboratory (LATTs), École nationale des ponts et chaussées. Her research focuses on the analysis of processes that involve undoing, doing less, doing with less: how do actors work around the discontinuation of a project? How can we reverse the course of modern technologies that have become problematic in terms of our understanding of environmental limits?



*Science beyond quantification  
integrating objective and subjective views in unpredictable worlds*

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#### Ada Diaconescu

is Associate Professor at LTCI Laboratory, Télécom Paris. Her main research interests include design patterns for complex adaptive systems, multi-scale feedback systems and agent-based modelling, focusing on applications to large-scale socio-cyber-physical organisations.



## Symposium 5

# Materials and Sustainability

4.00 PM – 6.00 PM  
LECTURE HALL 3

*Chair:*  
Nathanaele Schneider,  
CNRS Senior Researcher at IPVF,  
École Polytechnique  
Affiliated to E4C



*Knowledge gap and data collection and treatment needs for durability evaluation in emerging photovoltaic applications (AgriPV ad FloatingPV)*



**Polina Volovitch**

is Professor in chemistry at Chimie Paris Tech, IPVF. Her research focuses on corrosion applied to various fields of application: nuclear, automotive, steel, and photovoltaics.



**Full researcher biographies and project abstracts online**

*Numerical modeling of various phenomena associated with the freezing of cement-based materials*



**Matthieu Vandamme**

is researcher at Navier laboratory, École nationale des ponts et chaussées. His research focuses in applying poromechanics to materials relevant for construction and subsurface energy applications (i.e., cement-based materials, soils, geomaterials...). He is interested in the in-pore physical processes that occur in those porous materials. He also studies their time-dependent behavior.

*From Durability Optimization to Solid-State Recycling: Pathways to Lower Environmental Footprints*



**Bruno Levieil**

is Associate Professor at Dupuy de Lôme Research Institute (IRDL), ENSTA. His research focuses on the relationships between manufacturing processes and the service life of metallic materials, with particular interest in understanding how processing parameters influence durability and mechanical behaviour.



*Thin films for the energy transition: atomic layer deposition, a well-suited technique*



**Clémence Badie**

is a Tenure-Track Assistant Professor at Condensed matter physics laboratory (PMC), École Polytechnique. Her research focuses on the development of nanometric thin films using Atomic Layer Deposition (ALD) for energy transition applications. She first specialized in ALD during her PhD, where she developed a H<sub>2</sub>-selective membrane (2018-2022).

## Symposium 6

# Water and Environment

4.00 PM – 6.00 PM  
LECTURE HALL 4

*Chair:*  
Philippe Ciblat,  
Professor at LTCI Laboratory,  
Télécom Paris



### *Numerical Modeling of Urban Water and Environment: Nature-Based Solutions for Climate Adaptation*



**Pierre-Antoine Versini**

is Research Director at Hydrology, Meteorology and Complexity Laboratory (HM & CO), École nationale des ponts et chaussées. His research focuses on adapting cities and territories to the consequences of climate change, primarily addressing issues related to hydrology, microclimate, and biodiversity.



**Full researcher biographies  
and project abstracts online**

### *Modeling the ecological transition of urban stormwater management*



**Marie-Christine Gromaire**

is Research Director at Water, environment and urban systems Laboratory (LEESU), École nationale des ponts et chaussées. She develops pluridisciplinary research on water and contaminant flows associated with urban runoff and their fate in the urban system, mainly developed as part of OPUR Observatory of Urban Hydrology in Paris.

### *Swimming in the Seine*

**Rémi Carmigniani**

is researcher at Saint-Venant Hydraulics Laboratory (LHSV), École nationale des ponts et chaussées. His research focuses on combining physical modeling, numerical simulation, experimental measurements, and computer vision to help athletes optimize their performance. Rémi, who is passionate about swimming, participated in the Sciences2024 research program.



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### *CO2 Extraction from Seawater: from Lab Bench to Ocean Depths*

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**Cédric Tard**

is Professor at Molecular Chemistry Laboratory (LCM), École Polytechnique. His research bridges fundamental electrochemistry and catalytic systems, with a focus on sustainable energy solutions, most recently advancing seawater usage for CO2 extraction and electrolysis for green hydrogen production.



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