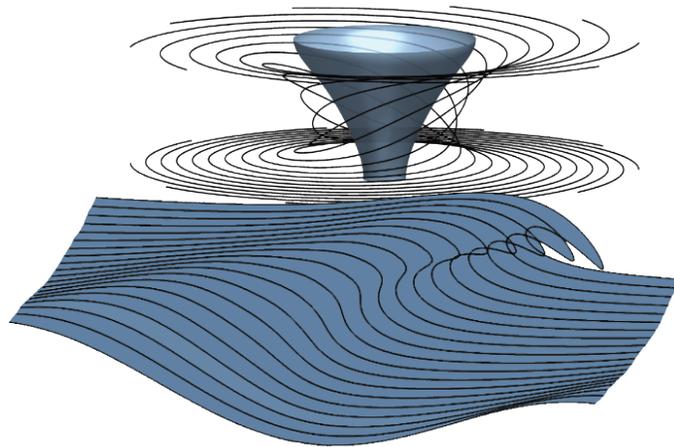# CIRM Introductory School

Introduction to
the Mathematics of Geophysical Fluid Dynamics

April 13–17, 2026

E. Dormy • C. Lacave • L. Oruba • A. Vasseur

1   Schedule

	Monday 13	Tuesday 14	Wednesday 15	Thursday 16	Friday 17
8h45-9h00	Welcome				
9h00-10h00	G. Vallis	G. Vallis	B. Wingate	G. Vallis	R. Klein
10h00-10h30	*break*	*break*	*break*	*break*	*break*
10h30-11h30	B. Wingate	R. Klein	A.L. Dalibard	A.L. Dalibard	A.L. Dalibard
11h30-12h30	R. Klein	A.L. Dalibard	R. Klein	R. Klein	E. Blayo
12h30-14h00	*lunch*	*lunch*	*lunch*	*lunch*	*lunch*
14h00-15h00	A.L. Dalibard	B. Wingate		E. Blayo	
15h00-16h00	Short pres. Posters	G. Vallis			
16h00-16h30	*break*	*break*		*break*	
16h30-17h30	Poster session	Oral presentations		G. Vallis	
17h30-18h00					
19h30				Bouillabaisse	

2   Lecture Series

The school features five comprehensive lecture series by leading experts in Geophysical Fluid Dynamics and Mathematical Modelling.

2.1   Numerical Forecasting Systems (3 hours)
Eric BLAYO (Univ. Grenoble Alpes)

This mini-course will explain how numerical forecasting systems for meteorology, oceanography, and climate are constructed: the chain from mathematical equations to numerical models and simulations, including issues such as parameter calibration, the role of observations, and the quantification of uncertainties. We will also discuss the constraints of "operational" needs (e.g., daily weather forecasts, IPCC CMIP exercises, etc.) and their practical consequences for models and methods.

We will then give various examples of contributions from mathematics to improving our understanding and/or enhancing numerical models (mathematical modeling, numerical schemes, etc.) and forecasting systems (calibration, dimensionality reduction, etc.).

2.2 Mathematical methods for the analysis of multi-scale problems in the ocean (5 hours)
Anne-Laure DALIBARD (Sorbonne Université)

These lectures will be devoted to the theoretical analysis of systems of partial differential equations for the ocean. Oceanic models (and more generally, geophysical models) often involve small dimensionless parameters, and a natural question is to understand the behavior of the system in the limit where these small parameters vanish. This general issue can be addressed in a number of different ways, and the other lectures of this research school will cover in particular modelling questions and numerical analysis methods. Our purpose here will be to focus on the theoretical analysis.

We will address in particular filtering methods and boundary layer techniques, covering both ideal settings for which a general theory is available and which are therefore amenable to a systematic treatment, and specific cases in which these general approaches fail. This will lead us in particular to discuss the importance of geometric aspects.

2.3 Multiscale modelling for the Atmosphere (5 hours)
Rupert KLEIN (Freie Universität Berlin)

This 5-hour lecture series will cover the systematic derivation and numerical solution of scale-dependent models for the atmosphere (lectures 1 & 2), their role in the analysis of multiscale interactions (lectures 3 & 4), and some pertinent reflections on methods of machine learning.
Lecture 1: Scale-dependent models for the atmosphere
Lecture 2: Multiple scale and matched asymptotic expansions
Lecture 3: QG-DL-Ekman theory
Lecture 4: Multiscale analysis for tropical cyclones
Lecture 5: Thoughts on machine learning

2.4 General Circulation of Atmospheres and Oceans (5 hours)
Geoffrey VALLIS (University of Exeter)

Lecture 1: General Structure of Atmospheres on Earth-like planets. (Theory of Hadley Cells, tropics vs midlatitudes, scales of motion etc).
Lecture 2: Circulation of Atmospheres on Earth-like planets (Theory of surface westerlies, jet theory, etc.)
Lecture 3: Vertical structure of Atmospheres. (Radiative-convective balance, theory of height and temperature of tropopause, etc). Effects of Moisture.
Lecture 4: Superrotation and other Exotic Phenomena (Terrestrial atmospheres and giant

planet atmospheres, like Jupiter.)
Lecture 5: Ocean Circulation on Earth and icy moons (Sideways convection, the meridional overturning circulation.)

2.5 Parallel-in-time methods in GFD (3 hours)
Beth WINGATE (University of Exeter)

Lecture 1 will cover introductory concepts that allow for a shared common language and will set the stage for understanding the successes and pitfalls of parallel-in-time methods in Lecture 3.

Lecture 2 will discuss multiscale problems in geophysical fluid dynamics relative to asymptotic methods, and their numerical solution. Simple examples that illuminate technical difficulties between asymptotic understanding and numerical methods will be given. This will prepare the student for understanding parallel-in-time methods for geophysical fluid dynamics.

Lecture 3 will introduce a selection of parallel-in-time techniques including 1) parallel-in-time runge-kutta type (RDIC) methods, 2) the challenges with oscillatory versus decaying problems, and 3) end with parallel-in-time techniques such as parareal.

3 Participants' Oral Presentations

2D stratified wave-turbulence model
Anne CADIOU (Laboratoire de Mécanique des Fluides et d'Acoustique)
Julian SCOTT
Solutions of a wave-turbulence model for decaying, two-dimensional, homogeneous flow will be presented. The two-dimensional approximation means here that there is no zero-frequency mode, and even if it is theoretically possible, it is probably not easily realisable in practice due to three-dimensional instabilities at the high Reynolds numbers for which turbulence appears. This model, however, allows to address questions in comparison to direct numerical simulations of stratified two-dimensional turbulence when turbulence intensity weakens and explore the influence of the numerical resolution in spectral space.

Semigeostrophic equations by entropic OT
Hugo MALAMUT (MAP5, Université Paris Cité)
Jean-David Bénamou, Guillaume Carlier, Colin Cotter, Jacob Francis
Semigeostrophic (SG) equations describe atmospheric and oceanic flows under strong rotation at large scales. They capture front formation and have a Hamiltonian structure that reflects the stability of the large-scale dynamics. SG were among the first PDEs linked to optimal transport (OT), starting with work by Michael Cullen and later developed by Yann Brenier and Jean-David Bénamou. Since then, SG has become a key application for Monge–Ampère

regularity and OT: as Monge–Ampère theory has progressed, it has repeatedly led to sharper results for SG. In this talk, I will present a natural entropic-OT approximation of SG, joint work with Jean-David Bénamou, Colin Cotter, Guillaume Carlier, and Jacob Francis, which gives well-posedness results for the approximating system and leads to efficient, accurate numerical simulations.

Rigidity of 3D capillary vorticous drops

Giuseppe LA SCALA (Scuola Superiore Meridionale)

Pietro Baldi, Domenico Angelo La Manna

Rayleigh proposed a free-boundary problem for irrotational perfect fluids to describe the motion of liquid drops, whose deformation is only due to capillarity. In particular, such a model arose to describe the small oscillations of nearly-spherical drops after the capillary jets break (Rayleigh 1879) or drops with no electric surface charge (Rayleigh 1882).

What if such drops have constant vorticity? In this talk, I will show that in this case: nearly-spherical configurations are not allowed; any static solution is symmetric with respect to the equatorial plane; if the intersection between the drop and such plane is convex or nearly-disk, then it must be necessarily a disk. The latter result, in particular, is attained by the interplay of techniques coming from Alexandrov moving planes, elliptic equations and Isoperimetric Inequality.

Joint work with Pietro Baldi and Domenico Angelo La Manna (Università di Napoli Federico II).

Learning Nonlinear Ocean Mode Coupling

Clément LACROUTS (Ifremer)

Bertrand Chapron; Pierre Tandeo

Satellite ocean observations, mostly provide instantaneous snapshots, without direct measurements of time evolution. These underlying geophysical dynamical systems governing the instantaneous state of observed fields are inherently nonlinear; these nonlinearities are then possibly reflected in the non-Gaussian statistical characteristics of satellite observations. Stationary non-Gaussian fields exhibit cross-statistics between Fourier modes involving triads and higher-order interactions. We develop a method that determines whether two modes exhibit cross-statistics, regardless of the order of the cross-moment. To this end, we study a score-based diffusion equation, a generative modelling approach. Analyzing the scattering of the spectral energy governed by this equation enables the identification of interactions between Fourier modes. To validate the method, we apply the methodology to a generalized turbulence dataset, which exhibit varying dynamical locality properties.

4   Participants' Posters

Semi-Lagrangian Exponential Integrators
Yuri ASSIS PINTO (University of São Paulo)
Governing equations modeling atmospheric circulation are dominated by nonlinear advective processes and stiff linear waves, which impose stability restrictions. With these conditions, special numerical methods are required; in this work, we further explore the semi-Lagrangian exponential method proposed by (Peixoto and Schreiber 2019) and higher order methods proposed by (Steinstraesser 2025). To construct this class of methods, it is necessary to investigate Exponential Integrators and semi-Lagrangian methods, as well as their coupling.

Here, we explore numerical challenges related to increasing the order of this class of schemes and try to understand the relation between advection and the exponential integrator operator to solve this specific physics problem. In addition, we bring some ideas to achieve the third order method, in the near future.

Estimation of numerical entropy loss
Marie BOUSSARD (Inria Paris, Sorbonne Université)
Nina Aguillon, Julien Salomon
Ocean circulation models rely notably on systems of hyperbolic conservation laws. To ensure mathematical uniqueness when considering discontinuous solutions of such equations, an entropy inequality must be added. At the discrete level, one would like the numerical scheme, if convergent, to select the entropic solution. In general, such a property cannot be established. An alternative approach is to quantify entropy production numerically, a posteriori, and to verify a discrete entropy inequality. Methods in the literature exist but only deal with the one-dimensional case. We propose a method of quantification applicable to two-dimensional high-order finite-volume schemes, for equations with source terms. The main idea is to project a consistent numerical entropy flux, on the set of fluxes satisfying a discrete entropy inequality. With realistic hypotheses, the resulting flux can be shown to lead to a good estimate of numerical entropy loss. Numerical examples will also be provided.

Freely floating cylinder on a 3D fluid
Ewan CONTENTIN (IRMAR)
Geoffrey Beck, Ludovic Martaud
We have an interest on a freely floating cylinder on a 3D fluid governed by the Boussinesq equations in the case of the axisymmetric without swirl case. After having taking care of reformuling the model, we prove local well-posedness results. Afterwards we focus on a particular case where the cylinder is dropped without any speed in a fluid at rest, in the linear regime. In such a case we are able to describe the behavior of the motion of the solid in a large time scale and to perform numerical simulations.

Separation of ocean boundary currents
Corentin GENTIL (Département de Mathématiques et Applications, ENS-PSL)
Anne-Laure Dalibard

The goal of this poster is to present a joint work with Anne-Laure Dalibard, in which we studied an idealised model describing the separation from the coast of western boundary currents in the ocean, in presence of both topography and stratification. The presence of these two elements enables a separation with meaningful features that are observed in the real ocean. Moreover, an approximate solution can be computed quasi-explicitly, which consists of the superposition of an interior term, and two types of boundary layers in interaction, Munk-type that are quasi-geostrophic, and an Ekman-type that are not. Even though the Munk part of the approximate solution has some similarities with previously studied 2D models, the analysis of the Ekman part is completely new, and several of its properties differ strongly from the ones of classical Ekman layers.

Mathematical Developments in Geophysical

zeineb BEN YAHIA (École supérieure des sciences et de la technologie de Hammam Sousse, Tunis)

Title : Positive Solutions of a Singular Polyharmonic Problem at the Origin. Abstract We consider a polyharmonic problem in Rn 0, with n > 2. In the first part, we derive estimates for specific potential functions associated with Karamata classes. In the second part, we establish the existence of positive solutions to the problem by employing tools from potential theory and applying Schauder's fixed point theorem.

GLM Theory and Energy Budgets for Waves

Philomène DUFOUR (University of Hamburg)

The Generalized Lagrangian Mean (GLM) theory, originally formulated by Andrews and McIntyre (1978) and later given a geometric reformulation by Gilbert and Vanneste (2018), provides a consistent mathematical framework to define mean flows in fluids subject to oscillatory motions. It plays a central role in the theoretical description of wave–mean flow interactions. In this work, I first introduce the GLM framework and its main mathematical ingredients in the context of waves. I then discuss how this approach can be used to formulate and explore energy budgets, with particular attention to the decomposition of mean and wave contributions. Finally, I consider an application to a specific class of waves, namely surface waves. This part represents ongoing work aimed at improving the understanding of energy transfers between waves and mean flows.

Synchronisation in turbulence

Masanobu INUBUSHI (Tokyo University of Science)

Colm-cille P. Caulfield

In Navier–Stokes (NS) turbulence, large-scale turbulent flows inevitably determine small-scale flows. Previous studies using data assimilation with the three-dimensional NS equations indicate that employing observational data resolved down to a specific length scale enables the successful reconstruction of small-scale flows [1, 2]. Such a length scale of 'essential resolution of observation' for reconstruction is close to the dissipation scale in three-dimensional NS turbulence. Here, we study the equivalent length scale in two-dimensional NS turbulence and compare with the three-dimensional case [3]. Our numerical studies reveal that the length scale is actually close to the forcing scale, substantially larger than the dissipation scale.

[1] T.A. Zaki, Annu. Rev. Fluid Mech., 57 (2024).
[2] M. Inubushi, Y. Saiki, M.U. Kobayashi, and S. Goto, Phys. Rev. Lett., 131 (2023).
[3] M. Inubushi and C.P. Caulfield, J. Fluid Mech., 1027 (2026).

Ill-posedness of viscoplastic flows
Maëlle LABEILLE (Laboratoire Jean Kuntzmann (Université Grenoble Alpes))
Pierre Saramito, Didier Bresch
The $\mu(I)$ rheology for continuum modeling of dense granular flows shows well agreement with many physical properties of granular media and has been validated by both numerical simulations and physical experiments. However, incompressible models using the $\mu(I)$ rheology are also known to present instabilities when perturbed at high frequencies, and as such are ill-posed in the sense of Hadamard. This result can actually be extended to any incompressible viscoplastic model where the yield stress depends on pressure. I propose a way to regularize these kinds of model, by making the yield stress depends not on pressure directly, but rather on some new internal variable whose value relaxes toward the pressure.

Wave turbulence - non linear source term
Louis MILHAMONT (Sorbonne Université - LATMOS)
ORUBA Ludivine, DORMY Emmanuel, LACAVE Christophe
In third-generation spectral wave models, the nonlinear interaction term is as important as the source and dissipation terms. It controls how energy is redistributed across the spectrum and largely determines the spectral shape. The exact expression, derived by Klaus Hasselmann in the 1960s as a Boltzmann-type integral, is computationally expensive and long considered impractical for operational use. As a result, most models rely on the Discrete Interaction Approximation (DIA), which is efficient but relatively crude. Recent progress based on the GQM formalism has shown that the exact term can be evaluated efficiently with optimized quadrature methods. Building on this, we propose a new approach that computes the nonlinear source term with improved treatment of singularities and higher accuracy, while remaining computationally feasible for practical wave modeling.

On the cyclone-anticyclone asymmetry
Vincent MOKUENKO (Université de Bretagne Occidentale, France)
Jonathan Gula, Xavier Carton
Submesoscale coherent vortices (SCVs), which are not resolved in climate models, can be long-lived structures that influence the transport of heat and tracers. They are commonly generated by the separation of slope-boundary currents, and although this process should be symmetrical, observations show a predominance of anticyclones. Using a high-resolution numerical simulation and a potential-vorticity-based eddy tracking algorithm, we study the SCV population near the Mid-Atlantic Ridge on the 27.8 isopycnal surface (2100 m depth), close to the Equator where the Coriolis frequency is weak. We analyze SCV statistics including size, intensity, lifetime, and propagation. Cyclonic SCVs are more numerous and can be as long-lived as anticyclones, but the largest and most mobile SCVs are predominantly anticyclonic. We suggest that this asymmetry results from the greater ability of anticyclones to merge and remain coherent under adverse strain, leading to a higher probability of detection.

Thermal Anisotropy in Rotating MHD
Krishnendu NAYAK (Department of Mathematics, National Institute of Technology Warangal, Telangana, 506004, India)
Hari Ponnamma Rani, Yadagiri Rameshwar, Jaya Krishna Devanuri
The effect of anisotropic thermal diffusion on the stability of Rayleigh-Bénard oscillatory

convection under a horizontal magnetic field and vertical rotation is studied. Linear stability analysis using the normal mode method shows, the structure of convective rolls depend strongly on the anisotropy parameter α (ratio of horizontal to vertical thermal diffusivities). The influence of α is non-monotonic due to its interplay with the rotation rate and magnetic field strength. At low rotation, increasing α stabilizes the flow, whereas at high rotation the stabilizing order alternates with α, with multiple transitions observed for both cross/oblique and parallel rolls. To examine the weakly nonlinear regime, a 2D anisotropic complex Ginzburg-Landau equation is derived using multiple-scale analysis. Benjamin-Feir stability analysis shows that unstable regimes give rise to amplitude defects, localized structures, and phase turbulence, while stable regimes sustain coherent traveling waves.

NS equations with Navier-slip boundary

Tien-Tai NGUYEN (Vietnam National University, College of Science)

In this talk, we will present the instability of the trivial steady states to the incompressible viscous fluid with Navier-slip boundary conditions. For the linear instability, the existence of infinitely many normal mode solutions to the linearized equations is shown via the operator method of Lafitte and Nguyen (2022). Hence, we prove the nonlinear instability by adapting the framework of Desjardins and Grenier (2003) studying some classes of viscous boundary layers to obtain two separated solutions at escaping time. Our work performs a different approach from that of Ding, Li and Xin (2018).

Wind–Rotation Instability in Shear Flow

S PREETHI (Indian Institute of Technology Hyderabad)

We investigate the linear stability of a shear flow driven by surface wind stress and rotation at the lower boundary, as a minimal model for wind-driven oceanic flows under Earth's rotation. The resulting eigenvalue problem is solved using a pseudospectral collocation method, together with a complementary longwave asymptotic analysis.

Our computations reveal a previously unreported longwave instability that appears for nonzero rotational Reynolds number. The most unstable disturbance occurs at the lowest critical parameters and corresponds to a spanwise longwave mode with vanishing streamwise wavenumber. The asymptotic theory captures this instability mechanism and shows excellent quantitative agreement with the full numerical results.

These findings demonstrate a new instability arising from the combined action of wind shear stress and rotation, and highlight a mechanism that may be relevant for understanding large scale dynamics in wind-driven oceanic shear flows.

Wave turbulence and Schrödinger equation

Shayan ZAHEDI (École Polytechnique)

We derive rigorously the macroscopic system associated to a microscopic system of coupled quintic Schrödinger equations in the framework of discrete wave turbulence under a particular scaling law that describes the limiting process. Our system evolves from a pair of well-prepared random initial data. More precisely, in dimensions $d \geq 2$, we set up our microscopic system on a large box of size L with weak non-linearity of strength ϵ. In the limit $L \to \infty$ and $\epsilon \to 0$, under the scaling law $\epsilon L^{\frac{1}{\beta}} = 1$ with $\beta \in (1, \infty)$, we prove that the long-time

behaviour of our microscopic system is statistically described by a resonant system whose dynamics are driven by exact resonances. Our system exhibits fewer symmetries than is usual in the literature. In such systems with fewer invariances, exact resonances contribute significantly compared to quasi-resonances and essentially drive the effective dynamics in the large-box limit.

Convergence rates for a rotating MHD system
Zhuoya YAO (institute Camille Jordan)
In this talk, we will first give a brief introduction to the MHD system, and then we will focus on the MHD models which take into account the Coriolis force. In this case, the strength of the rotation is measured by the Rossby number $\varepsilon > 0$. Under the assumption that the rotation is strong (that is, when ε goes to zero), we first establish the global existence of weak solutions and the local existence of strong solutions, followed by the global existence and convergence theorem. Then, we use Strichartz estimates to give the explicit global-in-time convergence rates involving a parameter $\alpha > 0$ (it is small enough and defined on a given interval).

5 List of Participants

Mohammad Abdelshafy (visio)	University of Rochester
Malek Abid	Aix-Marseille Université / IRPHE
Ignacio Acevedo	Université Paris-Saclay, Orsay
Zamurat Ayobami Adegboye (visio)	Federal University of Health Sciences Otukpo
Ayesha Arooj (visio)	Comsat University Islamabad Campus Lahore
Yuri Assis Pinto	University of São Paulo
Erin Atkinson	University of Toronto
Mamadou Korca Ba	Université de Toulon - Institut de Mathématiques de Toulon
Satyanarayana Badeti (visio)	VIT-AP University
Amen Bargees (visio)	King Fahd university of Petroleum and Minerals
Zoé Bebin	CEA
Geoffrey Beck	INRIA Université de Rennes
Zeineb Ben Yahia	University of Monastir
Eric Blayo	Université Grenoble Alpes
Anissa Bouras	CNRS, LOPS
Marie Boussard	Inria Paris, Sorbonne Université
Daniel Boutros (visio)	University of Cambridge
Didier Bresch	CNRS Université Savoie Mont-Blanc
August Burg	LPENSL
Adriana Valentina Busuioc	Universite Jean Monnet
Anne Cadiou	CNRS
Nahuel Caruso	Institut de mathématiques de marseille
Grace Sudheer Kiran Ch (visio)	India Institute of Technology Kharagpur
Frédéric Charve	Université Paris-Est Créteil
Gaël Chauchadis	Laboratoire d'Océanographie Physique et Spatiale (LOPS)
Andrea Combette	LPENSL
Ewan Contentin	IRMAR
Milton Da Costa Lopes Filho	Universidade Federal do Rio de Janeiro
Anne-Laure Dalibard	Sorbonne Université
Marta De Santo	Scuola Superiore Meridionale
Paulin Dempowo Fouelefack (visio)	CEA Saclay
Gabriel Derrida	Laboratoire Jean Kuntzmann
Charlotte Dietze (visio)	CNRS Sorbonne Université
Emmanuel Dormy	CNRS, Ecole Normale Supérieure
Gregory Dritschel	University of Leeds
Etienne Dufour	University of Bergen
Philomene Dufour	University og Hamburg
Corentin Gentil	DMA (ENS-PSL)
Léo Glangetas	Université de Rouen

Blandine Gorce	Sorbonne Universite - LJLL
Julien Guillod	Sorbonne Université
Runan He (visio)	ICMAT
Pranav Hegde	Helmholtz Zentrum Dresden-Rossendorf
Masanobu Inubushi	Tokyo University of Science
Catalina Jurja (visio)	University of Zurich
Mainak Kar	Aix-Marseille Université
Maria Kazakova	Université Savoie Mont Blanc
Rupert Klein	Freie Universität Berlin
Haram Ko	Brown University
Ashvath Kunadi	Aalto University
Giuseppe La Scala	Scuola Superiore Meridionale
Mohamed Labadi (visio)	University of Chlef
Maëlle Labeille	Laboratoire Jean Kuntzmann
Christophe Lacave	Université Savoie Mont Blanc
Clément Lacrouts	Ifremer
Rajaram Lakkaraju (visio)	Indian Institute of Technology Kharagpur
Abdelkader Lasmar	ENSC Constantine
Hoang Long Le	LAGA, Universite Sorbonne Paris Nord
Cassandre Lebot	Université Savoie Mont-Blanc
Anna Lemos (visio)	Federal University of Minas Gerais
Long Li	Institut de Physique de Nice
Yu-Hsi Lin (visio)	Aix-Marseille Université
Hugo Malamut	Map5, Université Paris Cité
Maxence Mansais	Université Evry Paris-Saclay
Anna Mazzucato	Penn State University
Matthieu Ménard	Université Paris Cité
Louis Milhamont	Sorbonne université
Vincent Mokuenko	Université de Bretagne Occidentale
Asif Nawaz	University of Edinburgh
Krishnendu Nayak	National Institute of Technology Warangal, India
Tien-Tai Nguyen	France-Vietnam in Mathematics and its Applications
Joscha Nickl	Aix-Marseille Université
Tuomas Niemi	University of Jyväskylä
Alexei Novikov	Penn State University
Helena Judith Nussenzveig Lopes	Universidade Federal do Rio de Janeiro
Ludivine Oruba	Sorbonne Université
Jules Ouya (visio)	Université Joseph Ki-Zerbo-Centre Universitaire de Kaya
Chitranjan Pandey (visio)	Indian Institute of Technology Kanpur, India
Tristan Pang (visio)	University of Oxford
Sasha Parry-Barnard	University College London
Ieva Pereslegina	University of Bergen
Amjad Hasan Peringampurath (visio)	Leibniz Institute for Baltic Sea Research Warnemünde (IOW)
Charlotte Perrin	CNRS Aix-Marseille Université

Sujan Pokharel (visio)	Kathmandu University
Mrinal Jyoti Powdel (visio)	ICTS-Tata IFR, Bengaluru, India
S Preethi	Indian Institute of Technology Hyderabad
Farid Rajkotia Zaheer	University of Victoria
Jyotiprasad Rana (visio)	Indian Institute of Technology Madras
Maria Reboredo Prado (visio)	University of Oxford
Alan Riquier	Fields Institute, Toronto
Emeric Roulley	Università di Milano
Ankita Roy Chowdhury (visio)	Indian Institute of Technology Hyderabad
Vitale Russo	University of Naples Federico II
Sandip Sahoo (visio)	International Centre for Theoretical Sciences (ICTS)
Maharun Nesa Shampa	BTU Cottbus-Senftenberg
Lekha Sharma (visio)	Indian Institute of Technology Kanpur, India
Thomas Shotton	Newcastle University
Shrijak Shrestha (visio)	Kathmandu University
Gemma Taylor	University of Cambridge
Adrien Tendani-Soler	Université de Bourgogne Europe
Giang To	Lund University
Josue Togbe Atti	Universite Le Havre
Amit Tomar (visio)	Bennett University India
Charlotte Tonnelier	LAMA (USMB)
Geoffrey Vallis	University of Exeter
Jérémie Vidal	CNRS CNRS, ENS de Lyon, Univ. Lyon 1
Krishan Vijayakumar (visio)	Université Grenoble Alpes
Beth Wingate	University of Exeter
Zhuoya Yao	Institut Camille Jordan
Shayan Zahedi	École Polytechnique