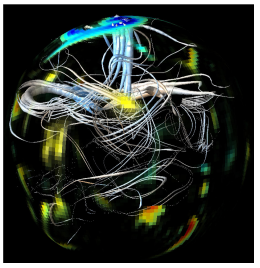
Maylis LANDEAU
Maître de Conférences
IPGP & Université Paris Cité
landeau@ipgp.fr
gender : female

1, rue Jussieu
75005 Paris



RESEARCH INTERESTS

- **Fluid dynamics** of **planetary interiors** using **laboratory experiments** and **numerical modelling**.
- **Formation** of terrestrial planets by **planetary impacts**.
- **Convection** and **dynamo action** in **planetary cores**.

RESEARCH POSITIONS

2018–present **Assistant professor (maître de conférences)**, **Institut de Physique du Globe de Paris (IPGP)** & **Université Paris Cité**, France.

2016–2018 **Marie Skłodowska-Curie research fellow** (EU Horizon 2020), **University of Cambridge**, DAMTP, UK.
Collaborators : S. Dalziel & J. Neufeld.
Outcomes : Multiphase fluid dynamics experiments to model planetary impacts.

2013–2016 **Blaustein postdoctoral fellow, Johns Hopkins University**, Earth & Planetary Sciences, USA, with P. Olson.
Outcomes : Analogue experiments on Earth's core stratification after giant impacts, numerical simulations on the signature of inner-core nucleation on the geodynamo.

EDUCATION

2009–2013 **Institut de Physique du Globe de Paris** (IPGP), France.
PhD in **Geophysics**,
Dissertation : *Two aspects of fluid dynamics in planetary cores.*
Advisor : J. Aubert.
Outcomes : Convective dynamo simulations with no inner core (code PARODY).

2008–2009 **Ecole Polytechnique** and **Pierre & Marie Curie University**, Paris, France.
Master's Degree in **Fluid Mechanics**, Summa Cum Laude.

2006–2008 **Ecole Normale Supérieure (ENS) de Lyon**, France (normalienne).
Bachelor's Degree in **Earth and Planetary Sciences**, Summa Cum Laude.

GRANTS, FELLOWSHIPS & AWARDS

2022 IPGP funding to host M. Nakajima (U. of Rochester) as a visiting researcher (4k €).
2022 Simons Fellow from the Isaac Newton Institute, Cambridge (2k €).
2020-2022 CNRS research funding (PI, 17k €).
2019 IPGP research funding (PI, 40k €).
2019 CNRS research funding (PI, 8.5k €).
2018 Doornbos Memorial Prize, Committee on Studies of the Earth's Deep Interior.
2017 Urop scheme to fund summer internships, EPSRC (UK research agency) (PI, 2k €).
2016 by-Fellowship at Churchill college, University of Cambridge.
2016 Corrsin-Kovasznay Outstanding Paper Award from Johns Hopkins University.
2016-2018 Marie Skłodowska-Curie Individual Fellowship, European Commission (PI, 184k €).
2013-2014 The Blaustein postdoctoral fellowship, Johns Hopkins University (PI, 50k €).
2013-2015 XSEDE (USA computing system), project EAR140023, 100000 CPU hours (PI).
2009-2013 PhD fellowship from ENS Lyon (80k €).
2006-2009 Student fellowship from ENS Lyon (51k €).

ADVISING & MENTORING ACTIVITIES

2021-present	Advisor of A. Maller, PhD student, IPGP (with S. Charnoz).
2022-present	Collaboration with L. Allibert, postdoctoral fellow at the Berlin Natural History Museum in Germany, visiting researcher at IPGP for 2 weeks.
2022	Co-advisor of H. Chevalier, master student, IPGP, 3 months (with A. Fournier & T. Gastine).
2021	Advisor of A. Maller, master student, ESPCI, 5 months.
2020	Collaboration with M. Bouffard, postdoctoral fellow at the Max-Planck Institute for Solar System Research, Germany.
2020	Advisor of T. Lorand, master student, ESPCI, 3 months.
2019	Advisor of Nina Servan-Schreiber, 1^{st}-year student, Université Paris Cité, 2 weeks.
2018-2022	Mentor of four master students in Environmental Engineering (E. Lardoux, A. Bouchenez, F. Le Tallec, S. Zaidi).
2018	Advisor of R. Ammaturo, 3^{rd}-year student, University of Cambridge, 10 weeks.
2017	Advisor of D. Phillips, 2^{nd}-year student, University of Cambridge, 10 weeks.
2016-2018	Mentor within Churchill college of two PhD students (Y. Ma, T. Winder).

REVIEWING & CONVENING ACTIVITIES

Examiner of 3 PhD Thesis : T. Clarté (IsTerre), T. Tassin (IPGP), B. Qaddah (LMV).
Selection Committee for an assistant professor in ENS Lyon in 2022.
Reviewer for scientific journals (PNAS, Earth & Planetary Sciences Letters, Progress in Earth and Planetary Science, Journal of Fluid Mechanics, International Journal of Multiphase Flow).
Convener of 2 sessions at the Fall AGU meeting (2021 & 2022), 1 session at the SEDI meeting (2022).

TEACHING

		Level	**Format**
2018 & 2021	Ecole de Physique des Houches (10 hours)		
	Dimensional analysis	PhD	lectures
	Formation and differentiation of the Earth	PhD	lectures
2018-2022	Université Paris Cité (760 hours)		
	Strain and stress	master	lectures & tutorials
	Data analysis with Python	master	lectures & practicals
	Physics and chemistry of the deep Earth	master	lectures & tutorials
	Introduction to Python Programming	bachelor	computational project
	Thermodynamics	bachelor	tutorials
	Mathematics - Calculus	bachelor	lectures & tutorials
2019	Ecole Polytechnique (8 hours)		
	Environmental fluid dynamics lectures by J. M. Chomaz	master	tutorials
2018	Summer school on the Fluid Mechanics of the Sustainability and the Environment (1 hour)		
	Fluid dynamics of Earth formation	PhD	lecture
2017-2018	University of Cambridge (28 hours)		
	Mathematics for Natural Sciences	first year	supervisions
2010-2012	Preparatory school, Henri IV (88 hours)		
	Computer Sciences	bachelor	computer project
2009	Université Paris Cité (16 hours)		
	Geological Fluid Dynamics	master	tutorials

INVITED SEMINARS

2023 (upcoming)	Laboratoire de Planétologie et Géosciences, Nantes, France.
2023 (upcoming)	Department of Earth Sciences, University of Oxford, UK.
2022	Physique et Mécanique des Milieux Hétérogènes, ESPCI, Paris.
2022	Institut Jean Le Rond d'Alembert, Department of Mechanics, Paris.
2022	DAMTP, University of Cambridge, UK.
2022	Berlin Natural History Museum, Germany.
2021	University of Münster, Department of Geophysics, Germany.
2021	Earth & Environmental Sciences, University of Rochester, USA.
2021	Institut de Recherche en Astrophysique et Planétologie (IRAP), Toulouse, France.
2019	Géosciences Montpellier, France.
2018	Bayerisches Geoinstitut, Germany.
2018	Institute of Astronomy, University of Cambridge, UK.
2017	Institut des Sciences de la Terre (ISTerre), Grenoble, France.
2017	DAMTP, University of Cambridge, UK.
2016	Laboratoire de Géologie, ENS Lyon, France.
2016	Carnegie Institution, Washington DC, USA.
2015	Center for Environmental and Applied Fluid Mechanics, USA.
2015	Fluides, Automatique et Systèmes dynamiques (FAST), Paris, France.
2015	Laboratoire d'hydrodynamique (LadHyX), Ecole Polytechnique, Paris, France.
2015	Institut Jean Le Rond d'Alembert, Department of Mechanics, Paris.
2014	Institut de Mécanique des Fluides de Toulouse (IMFT), Toulouse, France.
2014	Lamont-Doherty Earth Laboratory, Columbia University, New York, USA.
2013	Institut des Sciences de la Terre (ISTerre), Grenoble, France.
2012	Institut Jean Le Rond d'Alembert, Department of Mechanics, Paris.
2011	ENS Paris, Non Linear Physics group, France.
2011	IPGP, geomagnetism group, Paris, France.

INVITED CONFERENCE PRESENTATIONS

2023 (upcoming)	IUGG, Berlin, Germany (invited oral).
2022	Fluid flow and magnetic field generation, Leeds, UK (invited poster).
2022	Frontiers in dynamo theory, Cambridge, UK (oral, invited visitor for 5 weeks).
2022	IUTAM Symposium on Particles, drops and bubbles in stratified environments, Toulouse, France (invited lecture).
2019	Fall AGU, abstracts 640544 & 488783 (two invited oral presentations).
2018	Summer school in fluid mechanics, University of Cambridge, UK (invited lecture).
2018	Summer school on the deep Earth, Les Houches, France (invited lecture).
2018	Study of the Earth's Deep Interior, Edmonton, Canada (invited oral).
2018	Workshop on planetary impacts, Berlin, Germany (invited oral).
2016	Magma Oceanology, ELSI, Japan (invited oral).
2015	Joint Assembly AGU, abstract GP31A-06, Montreal, Canada (invited oral).

SKILLS

Laboratory : Fluid dynamics experiments, flow visualisation techniques (shadowgraph, index matching, light-induced fluorescence, dye attenuation, synthetic Schlieren).
Computer : Fluid mechanics solvers (PARODY, Gerris), Python, Fortran.
Language : French (native), English (fluent, TOEFL score of 106), Spanish (basic knowledge).

OTHER RESPONSABILITIES

Science outreach : Lab demonstrations for the Science Festival (Paris 2009, Cambridge 2017), advisor for a kid TV show on the iron atom (on going), convener of a conference on planetary interiors to celebrate the 100th anniversary of IPGP (2022).
Sports : Aikido (vice-president of the club).

PUBLICATIONS

Landeau M., Fournier A., Nataf H.-C., Cébron D., Schaeffer N., 2022. Sustaining Earth's magnetic dynamo, *Nature Reviews Earth & Environment*, doi : 10.1038/s43017-022-00264-1.
Outcomes : Convection is the most likely mechanism to sustain Earth's magnetic field. Flows driven by precession are too weak to power the geodynamo.

Lherm V., Deguen R., Alboussière T., **Landeau M.**, 2022. Rayleigh-Taylor instability in impact cratering experiments, *Journal of Fluid Mechanics*, **937**, doi : 10.1017/jfm.2022.111.
Outcomes : scalings for mixing by Rayleigh-Taylor instability during planetary impacts.

Landeau M., Deguen R., Phillips D., Neufeld J., Lherm V., and Dalziel S., 2021. Metal-silicate mixing by Earth-forming impact, *Earth & Planetary Science Letters*, **564**, doi : 10.1016/j.epsl.2021.116888.
Outcomes : first fluid dynamics experiments to investigate large Earth-forming impacts.

Charnoz S., Sossi P., Lee Y.-N., Siebert J., Hyodo R., Allibert L., Pignatale F., **Landeau M.**, Oza A., and Moynier F., 2021. Tidal pull of the Earth strips the proto-Moon of its volatiles, *Icarus*, **364**, doi : 10.1016/j.icarus.2021.114451.
Outcomes : the Earth's tidal pull promoted hydrodynamic escape at the surface of the early Moon, possibly explaining why the Moon is depleted in volatile elements.

Lherm V., Deguen R., Alboussière T., **Landeau M.**, 2021. Rayleigh-Taylor instability in drop impact experiments, *Physical Review Fluids*, **6**, doi : 10.1103/APS.DFD.2020.GFM.V0019.
Outcomes : Visualisations of instabilities during the impact of a volume of salt solution into water.

Bouffard M., **Landeau M.**, and Goument A., 2020. Convective erosion of a primordial stratification atop Earth's core, *Geophysical Research Letters*, **47**, doi : 10.1029/2020GL087109.
Outcomes : primordial heterogeneities atop Earth's core can persist up to the present day.

Olson P., **Landeau M.**, Reynolds E. , 2018. Outer-core stratification from the high latitude structure of the geomagnetic field, *Frontiers in Earth Science*, doi : 10.3389/feart.2018.00140.
Outcomes : The Earth's magnetic field at high latitudes is consistent with up to 400 **km of laterally heterogeneous stratification atop Earth's core.**

Olson P., **Landeau M.**, Reynolds E, 2018. True dipole wander, *Geophysical Journal International*, **215**, 1523-1529, doi : 10.1093/gji/ggy349.
Outcomes : Events previously interpreted as true polar wander could be due to true dipole wander, rotation of the geomagnetic dipole.

Olson P., **Landeau M.** and Reynolds E., 2017. Dynamo tests for stratification below the core-mantle boundary, *Physics of the Earth & Planetary Interiors*, **271**, 1-18, doi : 10.1016/j.pepi.2017.07.003.
Outcomes : The stratification atop Earth's core cannot exceed 400 **km in thickness.**

Landeau M., Aubert J. and Olson P., 2017. The signature of inner-core nucleation on the geodynamo, *Earth & Planetary Science Letters* **465**, 193-204, doi : 10.1016/j.epsl.2017.02.004.
Outcomes : The birth of an inner core caused either a decrease in the axial octupole of the Earth's magnetic field or a drastic increase in the dipolarity of the field.

Olson P., **Landeau M.**, and Hirsh B, 2017. Laboratory experiments on rain-driven convection : implications for planetary dynamos, *Earth Planetary Science Letters*, **457**, 403-411, doi : 10.1016/j.epsl.2016.10.015.
Outcomes : Exsolution of light oxides from the core could have contributed to the powering of the dynamo on the Earth, Mercury and Ganymede.

Landeau M., Olson P., Deguen R. and Hirsh B, 2016. Core merging and stratification following giant impact, *Nature Geoscience*, **9**, 786-789, doi : 10.1038/ngeo2808.
Outcomes : the primordial layer inferred atop Earth's core today could be a vestige of the giant impact that formed the Moon 4.5 Gyrs ago.

Matsui H., Heien E., Aubert J., Aurnou J., Avery M., Brown B., Buffett B., Busse F., Christensen U., Davies C., Featherstone N., Gastine T., Glatzmaier G., Gubbins D., Guermond J., Kayashi Y., Hollerbach R., Hwang L., Jackson A., Jones C., Jiang W., Kellogg L., Kuang W., **Landeau M.**, Olson P., Ribeiro A., Sasaki Y., Schaeffer N., Simitev R., Sheyko A., Silva L., Stanley S., Takahashi F., Takehiro S., Wicht J., Willis A., 2016. Performance benchmarks for a next generation numerical dynamo model, *Geochemistry, Geophysics, Geostystems*, **17**, 1586-1607, doi : 10.1002/2015GC006159.
Outcomes : performance benchmark of dynamo codes.

Landeau M., Deguen R. and Olson P., 2014. Experiments on the fragmentation of a buoyant liquid volume in another liquid, *Journal of Fluid Mechanics*, **749**, 478-518, doi : 10.1017/jfm.2014.202.
Outcomes : a new turbulent regime for liquid fragmentation that prevail during Earth formation or the release of oil in the deep ocean.

Deguen R., **Landeau M.** and Olson P., 2014. Turbulent metal-silicate mixing, fragmentation, and equilibration in magma oceans, *Earth Planetary Science Letters*, **391**, 274-287, doi : 10.1016/j.epsl.2014.02.007.
Outcomes : scalings that predict the mixing between metal and silicates.

Landeau M. and Aubert J., 2011. Equatorially asymmetric convection inducing a hemispherical magnetic field in rotating spheres and implications for the past martian dynamo, *Physics of the Earth & Planetary Interiors*, **185**, 61-73, doi : 10.1016/j.pepi.2011.01.004.
Outcomes : a new convective regime in rotating spheres that generates localised magnetic fields and explain hemispherical magnetization of Mars' crust.