

Name: BERHANU
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Position:

From October 2010: Permanent researcher (CR1) **CNRS** in the laboratory
“ Matière et Systèmes Complexes” **MSC** (“*Matter and Complex systems*”)
of the **Université Paris Diderot**.

Current research interests:

- Hydrodynamics of erosion by dissolution and application to geomorphology
- Surface Waves and Wave Turbulence. Gravity-capillary wave turbulence. Surface waves generation by an underwater moving bottom
- Turbulence and free surface flows. Interaction between surface waves and flows.
- Granular gas of magnetized particles
- Capillarity and aggregation of floating particles.

Previous research appointments and education:

2008-2010: Post-doctoral research at **Clark University** (Massachusetts/USA) in the group of **Arshad Kudrolli**. Experimental research about granular physics, capillarity, geomorphology.
2005-2008: PhD Student at the laboratory of statistical physics (LPS) in the « Ecole Normale Supérieure » (**ENS**). PhD thesis under the guidance of **Stephan Fauve** and **Nicolas Mordant** and defended September 15th 2008 : « Turbulent magnetohydrodynamics in liquid metals flows ».
2004-2005 : Master 2 of Physics at the ENS Lyon, option statistical physics and out of equilibrium phenomena.
2003-2004: Agregation de Sciences Physiques (2004) (National Competitive Exam for teaching in High school)
2001-2005 : Student at the Ecole Normale Supérieure de Lyon (ENS-Lyon) Master of physics (2001-2005), ENS-Lyon
1998-2001 : Undergraduate studies, Lycée Chaptal, Paris

Summary:

- 29 articles in international peer-reviewed journals
- 14 invited seminars
- 5 invited talks in international conferences
- 9 Conferences Proceedings

Membership : *European Mechanics Society*(Euromech), *Société Française de Physique* (SFP) and *American Physical Society* (APS).

Referee for Physical Review Letters, Physical Review E, Europhysics Letters, Langmuir, International Journal of Heat and Fluid Flow, Fluid Dynamic Research, Journal of Geophysical Research Earth Surface

Service:

- Co-organization of workshop : « Mini-Colloque des rencontres du Non-Linéaire 2017 : Interactions non linéaires entre ondes » Paris March 2017
- Co-organization of workshop : « Non-linear Hydrodynamic Waves: Wave interactions and Wave turbulence » Paris September 2013
- Co-organization of general seminars of the laboratory MSC since September 2011.

Teaching expérience:

- 2014- 2015 : Experimental physics projects, Physics Department, University Paris Diderot (96h by year)
- June-July 2011 : Oral examination at undergraduate Level for aspiring engineer students.
- 2005-2008 : Teaching assistant at the Ecole Normale Supérieure de Paris (ENS) in physics: Experimental physics and Hydrodynamics

Advising :

- Adrien Guérin (from September 2017). Postdoctoral researcher (co-supervised with Sylvain Courrech du Pont) ANR ERODISS (24 months) Hydrodynamics of erosion by dissolution.
- Cyril Ozouf (March 2017/July 2017) Stagiaire de Master 2, (co-encadré avec Sylvain Courrech du Pont). Hydrodynamique de l'érosion par dissolution. Solutal convection
- Julien Philippi (June 2016/december2016). Postdoctoral researcher (co-supervised with Julien Derr and Sylvain Courrech du Pont). CNRS (6 months). Hydrodynamics of erosion by dissolution.
- Annette Cazaubiel (January 2016/June 2016) Internship Master 2, (co-supervised with Eric Falcon) Submerged fountain and surface waves.
- Caroline Cohen (November 2014/Mai 2016) Postdoctoral researcher (co-supervised with Sylvain Courrech du Pont) ANR Exodunes (18 months). Hydrodynamics of erosion by dissolution.
- Florence Haudin (February 2015/ January 2016). Postdoctoral researcher (co-supervised with Eric Falcon) ANR Turbulon (12 months). Resonant interactions between waves. Bathymetry effect on soliton propagation.
- Annette Cazaubiel (July 2014) Internship L3, ENS
Experimental investigation of 3 wave interaction for capillary waves.
- Simon Merminod (October 2013/October 2016) Phd Student (co-supervised with Eric Falcon) Université Paris Diderot., (Internship M2 entre janvier et juillet 2013).
Subject : 2D Magnetic Granular Gas
- Leonardo Gordillo (November 2012/November 2014) Postdoctoral researcher (co-supervised with Eric Falcon). Bourse Axa Research Fund Fellowship (2 years), project "Generation of tsunami waves".
- Timothée Jamin (October 2012/January 2015) Phd Student (co-supervised with avec Eric Falcon).
Funding: DGA CNRS. : Subject : Surface waves and flows interactions : tsunamis, breaking, turbulence.

- Matthieu Leclerc (juin 2012) Internship L3, Université Paris Diderot, Gravity-capillary turbulence (co-supervised with Eric Falcon)
- Marie-Julie Dalbe (de mai à juillet 2010) Internship Master from ENS Lyon, at Clark University
- Darija Cosic (2009/2010) Undergraduate student (Junior) at Clark University
- Joshua Meyer (2008/2009) Undergraduate student (Senior) at Clark University

Invited communications:

- *Hydrodynamics in erosion by dissolution: the example of solutal convection induced by dissolution*
Séminaire Matière Molle de l'institut de Physique de Rennes. Mars 2018
- *Wave Turbulence of Gravity-capillary surface waves.*
Congreso de la division de dinamica de Fluidos, Puebla, Mexique, November 2015
- *Wave Turbulence of Gravity-capillary surface waves.*
Cargèse summer school " Wave propagation in complex media", August 2015
- *Magnetic Granular Gas"*
Seminario Extraordinario DFI, Universidad del Chile, Santiago Chili, November 2014
- *Experimental investigation of three-wave interactions of capillary surface-waves.*
Dynamics days South America, Valparaiso Chili November 2014
- *Gaz granulaire magnétique.*
Séminaire du Laboratoire de Physique Statistique ENS (Paris) April 2014
- *Agrégats granulaires formés par attraction capillaire .*
Séminaire Képler, laboratoire NAVIER, ENPC (France) January 2014
- *Magnetic Granular Gas.*
Physics Colloquium, Clark University (USA) November 2013
- *Turbulence d'ondes capillaires.*
Séminaire fluides de l'institut Jean Le Rond d'Alembert (Paris) April 2013
- *Aggregates shaped by capillarity.*
Séminaire du SPEC CEA Saclay (France) September 2012
- *Spatial statistics of capillary wave turbulence.*
Physics Colloquium, Clark University (USA) November 2011
- *Granular aggregates with capillary interactions*
Séminaire du GRASP Université de Liège (Belgium) March 2011
- *Granular aggregates with capillary interactions.*
Soft matter Seminar, Georgetown University (USA) August 2010
- *Granular aggregates with capillary interactions.*
Seminar of the center for Fluid mechanics, Brown University (USA) May 2010

• *MHD measurements with liquid Gallium, to understand turbulent dynamos.*
Séminaire LGIT Université Joseph Fourier (Grenoble) March 2010

• *Structure of a capillary granular aggregate.*
Role of rain in seepage erosion of granular material
Séminaire du laboratoire Matière et systèmes complexes (MSC) :
Université Paris Denis Diderot Décembre 2009

• *New results on the VKS experimental turbulent dynamo*
European geophysical union meeting, Vienne (Austria) April 2008

• *VKS : a turbulent homogeneous dynamo with liquid sodium*
Physics Colloquium, Clark University (USA) March 2008

Publications:

1. M. Berhanu, E. Falcon and L. Deike
« Turbulence of capillary waves forced by steep gravity waves »
 Accepted in **Journal of Fluid Mechanics**
2. G. Michel, B. Semin, A. Cazaubiel, F. Haudin, T. Humbert, S. Lepot, F. Bonnefoy,
M. Berhanu and E. Falcon
« Experimental gravity wave turbulence spectra resulting from the modulation of bound waves »
 Accepted in **Physical Review Fluids**
3. F. Bonnefoy, F. Haudin, G. Michel, B. Semin, T. Humbert, S. Aumaître, **M. Berhanu** and
 E. Falcon
« Experimental observation of four-wave resonant interactions in a wave basin »
La Houille Blanche - Revue internationale de l'eau 5, (2017)
4. L. Deike, M. Berhanu and Eric Falcon. « Observation of hydroelastic three-wave interactions»
Physical Review Fluids, 2, 064803 (2017)
5. C. Cohen, M. Berhanu, J. Derr and S. Courrech du Pont
« Erosion patterns on dissolving and melting bodies »
 (2015 Gallery of Fluid motion) **Physical Review Fluids, 1, 050508 (2016)**
6. F. Bonnefoy, F. Haudin, G. Michel, B. Semin, T. Humbert, S. Aumaître, E. Falcon
« Observation of resonant interactions among surface gravity waves »
Journal of Fluid Mechanics (Rapids) 805, R3 (2016)
7. F. Haudin, A. Cazaubiel, L. Deike, T. Jamin, E. Falcon and **M. Berhanu**,
« Experimental study of three-wave interactions among capillary-gravity surface waves »
Physical Review E, 93, 043110 (2016)
8. S. Merminod, T. Jamin, Eric Falcon and **M. Berhanu**
« Transition to a labyrinthine phase in a driven granular medium »
Physical Review E 92, (2015)

9. L. Deike, B. Miquel, P. Gutiérrez, T. Jamin, B. Semin, **M. Berhanu**, E. Falcon, F. Bonnefoy
«Role of the basin boundary conditions in gravity wave turbulence»
Journal of Fluid Mechanics 781 (2015)
10. T. Jamin, L. Gordillo, G. Ruiz-Chavarría, **M. Berhanu** and E. Falcon
«Experiments on generation of surface waves by an underwater moving bottom»
Proceedings of the Royal Society A 471, (2015)
11. L. Deike, D. Fuster, **M. Berhanu** and Eric Falcon.
«Direct numerical simulation of capillary wave turbulence»
Physical Review Letters 112 (2014)
12. S. Merminod, **M. Berhanu** and Eric Falcon
«Transition from a dissipative to a quasi-elastic system of particles with tunable repulsive interactions»
Europhysics Letters 106, (2014) (Editor's choice).
13. L. Deike, **M. Berhanu** and Eric Falcon
«Energy flux measurement from the dissipated energy in capillary wave turbulence»,
Physical Review E 89 (2014).
14. **M. Berhanu** and E. Falcon
«Space-time resolved capillary wave turbulence»
Physical Review E 87 (2013)
15. M. Dasgupta, B. Liu, H.C. Fu, **M. Berhanu**, K.S. Breuer, T.R. Powers and A. Kudrolli
«Speed of a Swimming Sheet in Newtonian and Viscoelastic Fluids»
Physical Review E 87 (2013)
16. **M. Berhanu**, A. Petroff, O. Devauchelle, A. Kudrolli and D.H. Rothman
«Shape and dynamics of seepage erosion in a horizontal granular bed»
Physical Review E 86 (2012)
17. L. Deike, **M. Berhanu** and E. Falcon
«Decay of capillary wave turbulence»
Physical Review E 85 (2012)
18. M.-J. Dalbe, D. Cosic, **M. Berhanu**, A. Kudrolli
«Aggregation of frictional particles due to capillary attraction»
Physical Review E 83, (2011)
19. **M. Berhanu**, G. Verhille, J. Boisson, B. Gallet, C. Gissinger, S. Fauve, N. Mordant, F. Pétrélis, M. Bourgoïn, Ph. Odier, J.-F. Pinton, N. Plihon, S. Aumaître, A. Chiffaudel, F. Daviaud, B. Dubrulle, C. Pirat,
«Dynamo regimes and transitions in the VKS2 experiment»
European Physical Journal B 77 (2010)
20. **M. Berhanu**, A. Kudrolli
«Heterogeneous structure of granular aggregates with capillary interactions»
Physical Review Letters 105 (2010)

21. M. Berhanu, B. Gallet, R. Monchaux, M. Bourgoïn, Ph. Odier, J.-F. Pinton, N. Plihon, R. Volk, S. Fauve, N. Mordant, F. Pétrélis, S. Aumaître, A. Chiffaudel, F. Daviaud, B. Dubrulle, F. Ravelet, «Bistability between a stationary and an oscillatory dynamo in a turbulent flow of liquid sodium» **Journal of Fluids mechanics 641 (2009)**
22. B. Gallet, M. Berhanu, N. Mordant
«Influence of an external magnetic field on forced turbulence in a swirling flow of liquid metal» **Physics of Fluids 21 (2009)**
23. R. Monchaux, M. Berhanu, S. Aumaître, A. Chiffaudel, F. Daviaud, B. Dubrulle, S. Fauve, F. Ravelet, N. Mordant, F. Pétrélis, M. Bourgoïn, Ph. Odier, J.-F. Pinton, N. Plihon, R. Volk
«The VKS experiment : a turbulent dynamo» **Physics of Fluids 21 (2009)**
24. M. Berhanu, B. Gallet, N. Mordant, S. Fauve
«Reduction of velocity fluctuations in a turbulent flow of gallium by an external magnetic field» **Physical Review E 78,1, (2008)**
25. S. Aumaître, M. Berhanu, M. Bourgoïn, A. Chiffaudel, F. Daviaud, B. Dubrulle, S. Fauve, L. Marié, R. Monchaux, N. Mordant, P. Odier, F. Pétrélis, J.-F. Pinton, N. Plihon, F. Ravelet, R. Volk
«The VKS experiment: turbulent dynamical dynamos» **Comptes Rendus Physique 9,7 (2008)**
26. F. Ravelet, M. Berhanu, R. Monchaux, S. Aumaître, A. Chiffaudel, F. Daviaud, B. Dubrulle, M. Bourgoïn, P. Odier, J.-F. Pinton, R. Volk, S. Fauve, N. Mordant and F. Pétrélis
«Chaotic dynamos generated by a turbulent flow of liquid sodium» **Physical Review Letters 101, (7) (2008)**
27. R. Monchaux, M. Berhanu, M. Bourgoïn, Ph. Odier, M. Moulin, J.-F. Pinton, R. Volk, S. Fauve, N. Mordant, F. Pétrélis, A. Chiffaudel, F. Daviaud, B. Dubrulle, C. Gasquet, L. Marié, and F. Ravelet «Generation of magnetic field by a turbulent flow of liquid sodium», **Physical Review Letters 98, (2007)**
28. M. Berhanu, R. Monchaux, S. Fauve, N. Mordant, F. Pétrélis, A. Chiffaudel, F. Daviaud, B. Dubrulle, C. Gasquet, L. Marié, and F. Ravelet, M. Bourgoïn, Ph. Odier, M. Moulin, J.-F. Pinton, R. Volk
«Magnetic field reversals in an experimental turbulent dynamo» **Europhysics Letters 77, (2007)**
29. R. Volk, F. Ravelet, R. Monchaux, M. Berhanu, A. Chiffaudel, F. Daviaud, P. Odier, J.-F. Pinton, S. Fauve, N. Mordant and F. Pétrélis
«Transport of magnetic field by a turbulent flow of liquid sodium» **Physical Review Letters 97, (2006)**