28 & 29 November 2016

Labex UnivEarthS SCIENTIFIC COMMITTEE

USPC
Université Sorbonne Paris Cité

www.univearths.fr

UnivEarthS Scientific Committee
November 28-29, 2016 – Paris

Summary

Welcome World

The project will be end on December 31, 2019 and the 3 years that remain to be spent on:

- complete and finalize actions already started and financed
- prepare the renewal of Labex around new issues and new ideas
- start of focused projects that can be completed in 3 years

The objective is to plan for the next 3 years, the use of a large part of the funds that remain available. To date, 70% of available funding were used and 11% have already committed (HR) for the last 3 years.

Sixth assembly since the UnivEarthS program began in 2011, this 2016 meeting is an important time:

- it will assess the progress and results of current projects, the proposal of new projects and discuss the scientific and financial proposals of the teams for 2017 (also 2018-2019). The expertise and advice of SC members are more than ever essential for the LabEx program.
  The global 2017 budget (same for 2018 and 2019) is not sufficient to cover all the expenses claimed by all projects: 1,27 million € expected when 1,92 million € requested. The credits assigned have to bring out new themes supporting new aspects and opening up new prospects for the continuation, openness and enrichment of the Labex.
- a process of reviewers is organized since 2014 to provide written reports on each present project, following the 2013 SC recommendations. In 2014, reviewers were selected for one or two WP but have not been changed last year. To provide a good dynamic in the Labex, the chair and vice-chair of the SC were requested to nominate new reviewers.
- since 2014 too, we are pleased to highlight the knowledge of our SC members and present at each meeting a lecture from them. For this time, we will be pleased to hear our NASA's member, Neil GEHRELS.

We hope that you will spend a good time with us!

PROGRAM

Monday November 28

Hour	*Speaker*	*Project type*	
9h00			Welcome Coffee
9h30	G. Hulot		Executive Board welcome
9h35	P. Binétruy	Frontier	Support to PCCP
9h55	N. Shapiro	Frontier	Subduction today and in the past
10h15	H. Halloin	Frontier	Fundamental physics and Geophysics in space
10h35	D. Götz	Interface	Gamma-Ray Bursts: a unique laboratory for modern astrophysics
10h55			Coffee break
11h30	S. Charnoz / C. Michaut	Interface	From dust to planets
11h50	H. Halloin	Interface	UnivEarthS nanosatellite student project
12h10	S. Corbel	Frontier	The transient catastrophic Universe
12h30	S. Katsanevas		Labex presentation
12h50			Lunch
14h30	A.Lucas	Interface	New interface proposal 3
14h50	P. Hennebelle	New project	New interface proposal 2
15h10	S. Chaty	New project	New interface proposal 1
15h30	A. Coleiro	New project	New exploratory proposal
15h50			Coffee break
16h20	P. Labrot	New project	New valorization proposal 2
16h40	M. Moreira	New project	New valorization proposal 3
17h00	N. Gehrels		Plenary lecture "Time Domain Adventures with Swift and Fermi "
18h00			Social event

Tuesday November 29

Hour	*Speaker*	*Project type*	
8h20			Welcome Coffee
8h40	D.Franco	Young team	Direct Searches for Dark Matter with Liquid Argon detectors
9h00	K. Kosack	Young team	Advanced Gamma-Ray Science Methods and Tools
9h20	P. Philippot	Frontier	Earth as a living planet: from early ages to present dynamics
9h40	Y. Giraud-Héraud	Frontier	From Big Bang to the future of the Universe
10h00			Coffee break
10h20	A. Fournier	Interface	SolarGeoMag
10h40	A. Tonazzo	Interface	Geoparticles
11h00	V. Van Elewyck	Interface	Astroparticle research, geology and oceanography studies
11h20			Coffee break
11h40	V. Beckmann	Valorization	Data distribution, visualization and cloud computing
12h00	F. Casse	Exploratory	A Numerical Observatory of Violent Accreting systems (NOVAs)
12h20	M. Barsuglia	Exploratory	Geophysics and gravitational wave interferometric detectors
12h40	J. Bergé	Exploratory	Modified Gravity from the Earth's outskirts to the cosmos
13h00			End of open session
14h00	*Closed session - Scientific Committee + Executive Board*		

MEMBERS OF SCIENTIFIC COMMITTEE

You'll find here a short presentation of the SC members and their research interests.

George F. SMOOT

- *LBNL and PCCP - Laboratoire national Lawrence-Berkeley & Paris Centre for Cosmological Physics*

George Fitzgerald Smoot is an astrophysicist, cosmologist, Nobel Prize in Physics in 2006 for his work on the Cosmic Background Explorer to the «discovery of the black body form and anisotropy of the cosmic microwave background radiation».

Edouard KAMINSKI

- *IPGP - Institut de physique du globe de Paris*

Theoretical, experimental and numerical study of the dynamics of geological fluids

Piercarlo BONIFACIO

- *GEPI - Galaxies, Stars, Physics and Instrumentation*

Thesis "Chemical composition of three Population II stars".
Publication: "Galactic globular cluster 47 Tucanae: new ties between the chemical and dynamical evolution of globular clusters?"

Donald DINGWELL

- *LMU Munich Department of Earth and Environmental Sciences, Section of Mineralogy, Petrology and Geochemistry*

Dingwell's principal research interest is the physico-chemical description of molten rocks and their impact on volcanic systems.
Publication: Experimental constraints on phreatic eruption processes at Whakaari (White Island volcano) Journal of Volcanology and Geothermal Research, 202, 150-162. dx.doi.org/10.1016/j.jvolgeores.2015.06.014.

Neil GEHRELS

- *NASA/GSFC - NASA's Goddard Space Flight Center*

Experimental physicist working in gamma-ray astronomy who is active in instrument development and data analysis, and dabbles in theory.

Pierre-Olivier LAGAGE

- *AIM - Astrophysique, Instrumentation, Modelisation*

Publication: "Metrology calibration and very high accuracy centroiding with the NEAT testbed". French scientific head of the James Webb Space Telescope (JWST) MIRI instrument.

Bernard MARTY

- *CRPG Nancy - Centre de Recherches Pétrographiques et Géochimiques*

Origin of isotopic variations in the Solar System, Geochemistry of volatile elements (C, N, water, noble gases), Early Earth geodynamics and environments, Mantle geodynamics -ridges, mantle plumes, volcanic provinces, Fluid circulations in the crust

Stéphane MAZEVET

- *LUTh - Laboratoire Univers et Théories*

Publication: "Ab initio calculation of x-ray absorption of iron up to 3 Mbar and 8000 K"
Publication: "Melting and metallization of silica in the cores of gas giants, ice giants and super Earths"

Alessandro MORBIDELLI

- *OCA - Observatory of Nice*

Specialist in solar system dynamics, especially planetary formation and migration and the structure of the asteroid and Kuiper belts.

Eric PLAGNOL

- *APC - AstroParticule et Cosmologie*

Publication on General Relativity and Quantum Cosmology: "Data series subtraction with unknown and unmodeled background noise"

Publication: "State space modelling and data analysis exercises in LISA Pathfinder"

Edward STOLPER

- *Caltech - Division of Geological and Planetary Sciences*

Involved in a wide range of experimental, analytical, theoretical, and computational studies principally aimed at understanding the origin and evolution of igneous rocks on the earth and other planets (Melting of the mantle, Deep drilling into a Hawaiian volcano, Generation of arc and back-arc magmas, Diffusion of water in volcanic gases, Concentration and isotopic composition of CO2 in air in the Los Angeles Basin)

Pierre TOUBOUL

- *ONERA - French national aerospace research center*

Participation on scientific mission definition studies in solid earth and fundamental physics areas, Development of electrostatic accelerometers for space and inertial applications.
Publication: "Astrodynamical Space Test of Relativity using Optical Devices I (ASTROD I) - A class-M fundamental physics mission proposal for Cosmic Vision 2015-2025: 2010 Update"

Peter VON BALLMOOS

- *IRAP - Research Institute in Astrophysics and Planetology*

Developing a new type of telescope, a «gamma lens» to look for antimatter and radioactivity produced by the stellar explosion.2014 publication on High Energy Astrophysical Phenomena: "Antimatter in the Universe: Constraints from Gamma-Ray Astronomy"

SPEAKERS

Matteo BARSUGLIA
Joël BERGÉ
Volker BECKMANN
Pierre BINETRUY
Cécile CAVET
Sébastien CHARNOZ
Marc CHAUSSIDON
Fabien CASSE
Stéphane CORBEL
Alexandre FOURNIER
Davide FRANCO
Yannick GIRAUD-HÉRAUD
Diego GÖTZ
Hubert HALLOIN
Gauthier HULOT
Karl KOSACK
Stavros KATSANEVAS
Chloé MICHAUT
Pascal PHILIPPOT
Nikolaï SHAPIRO
Alessandra TONAZZO
Véronique VAN ELEWYCK

Leaders of new proposals:
Sylvain CHATY
Alexis COLEIRO
Patrick HENNEBELLE
Philippe LABROT
Antoine LUCAS
Manuel MOREIRA

&

Neil GEHRELS

PLENARY LECTURE

Time Domain Adventures with Swift and Fermi

by Dr. Neil Gehrels

The gamma-ray sky is more dynamic than in any other wavelength band. Gamma-ray bursts, supernovae, and black hole accretors all are characterized by bursts and flares. We are in a rich period of gamma-ray time domain astronomy with Swift, and Fermi operating.

The hard X-ray through high energy gamma-ray skies are being monitored on hourly to daily time scales at sensitivities more than an order of magnitude better than ever before. Highlights will be presented of the exciting and often surprising results from time domain astronomy, with emphasis on the explosive gamma-ray bursts.

Neil Gehrels is the chief of the Astroparticle Physics Laboratory, at Goddard. He is also an adjunct professor, at the Univ. Maryland and at Pennsylvania State Univ. His father was an astronomer and he grew up as a «night assistant» on many mountain telescopes.

He is a member of the USA National Academy of Sciences (NAS). Gehrels is the Principal Investigator of the NASA Swift satellite observing gamma-ray bursts and other transient sources. He is a Mission Scientist for INTEGRAL, a deputy Project Scientist for Fermi and Project Scientist for WFIRST. He is an editor of 9 conference books, has over 600 published articles. He is Co-Chair of the US National Committee for IAU, and has been Chair of the Astronomy Section of the NAS and of COSPAR Commission E.

Awards include the 2016 Caltech Alumni award, 2016 Royal Astronomical Society Honorary Fellow, 2012 COSPAR Massey award, 2009 NAS Draper Medal, and 2007 AAS Bruno Rossi Prize. Dr. Gehrels received his B.S. in Physics, and Music from the University of Arizona and his Ph.D. from the California Institute of Technology.

18 ACTUAL PROJECTS

FRONTIER PROJECTS

- F1a: IPGP
  Earth as a living planet: from early ages to present dynamics
  Pascal PHILIPPOT

Reviewer: Donald DINGWELL

The timing and mechanisms of oxygenation of the Earth atmosphere, the so-called "Great Oxidation Event", remains one of the major mysteries in Earth System Science. Solving it will not only help us understand how the Earth supports life but also provide insights on the interplay between Earth geodynamics and the long-term geochemical oxygen cycle. This project aims at collecting new data on drill core samples collected throughout the 2.45 to 2.2 Ga old Turee Creek Group (Western Australia), which represents the only continuous stratigraphic sedimentary section worldwide hosting the Great Oxygenation Event and the first global glaciation (Snowball Earth).

- F1b: IPGP
  Subduction today and in the past
  Nikolaï SHAPIRO

Reviewer: Donald DINGWELL

A full understanding of the subduction process and of its role in the Earth's evolution requires studying the interplay between different involved physical and chemical processes with complementary contributions from different geosciences disciplines (seismology, geodynamics, tectonics, volcanology, geochemistry …).

While many of Solid Earth geoscientists are dealing with some aspects of the subduction, most of existing studies are carried out in a frame of a single discipline and complex approaches to subduction are rare. A unique example of such a complex approach is the NSF-funded program GeoPRISMS (Geodynamic Processes at Rifting and Subducting Margins), while similar initiatives do not exist in Europe or in France. At the same time, the institutions involved in the LabeEx UnivEarthS and in particular the IPGP regroup specialists from a large spectrum of disciplines working on the subduction, providing us with a unique opportunity to take a leadership role in this area. Therefore, the main goal of the proposed workpackage is to develop an interaction between these different disciplinary teams and to create a group focusing on complex studies of the subduction processes.

- F2:APC
  From Big Bang to the future of the Universe
  Yannick GIRAUD-HÉRAUD

Reviewer: Neil GEHRELS

The goal of this workpackage is to give to the labex team, working in cosmology, some specific help to strengthen their contributions in the major international observational projects of the domain. This is developed along two principal axes: detector development for B-mode polarization of the CMB experiments and both data analysis and theoretical development to study the nature of Dark Energy in the forthcoming galaxy survey projects. In both cases, the aspects related to space projects are undertaken in close contact with the «FACe» and « University Paris Diderot Campus Spatial.

- F2a: APC
  Support to PCCP
  Pierre BINÉTRUY

Reviewer: Stéphane MAZEVET

As asked by the Scientific Committee, most of the activity of the F2a project was devoted to outreach and training: the continuation of the «Teaching the Universe» program for high-school teachers, and the implementation of an English version of our on-line course Gravity!. Among the scientific highlights is the L'Oréal-UNESCO fellowship awarded to our Labex postdoc Valerie Domcke.

- F3: AIM
  The transient catastrophic Universe
  Stéphane CORBEL

Reviewer: Stéphane MAZEVET

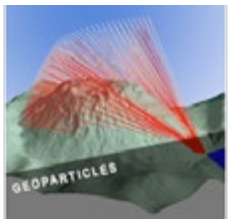
The Universe is far from being quiet and peaceful with many transient and catastrophic events detected across the whole electromagnetic spectrum. Over the next decade, new telescopes, with increased sensitivity and larger field of view, will open up the time domain to a wide range of astronomical fields. Radio astronomy is leading this effort, thanks to continental-scale digital very sensitive radio telescopes (LOFAR, MeerKAT and SKA). In this context, the frontier project FP3

targets innovative algorithmic improvement of radio software (Compressed Sensing framework and sparse representations, Direction-Dependent Effects,...) along the scientific exploitation of the forthcoming large flow of data originating from this new generation of radio telescopes.

INTERFACE PROJECTS

- I2: APC/IPGP
  Geoparticles
  Alessandra TONAZZO

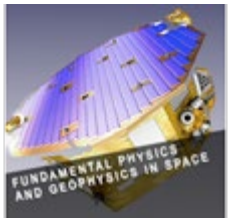
Reviewer: Bernard MARTY



The «geoparticles» project explores the use of elementary particles to study the Earth and its structures. Neutrinos from radioactive elements in the crust and mantle or originated from cosmic rays in the atmosphere can provide information on the composition of the Earth. From the measurement of the attenuation of the cosmic muon flux we can infer the density of geological structures: the method has been successfully applied to the study of volcanoes and is currently being extended to the exploration of archeological structures, such as burial tumuli in Greece.

- I3: APC/IPGP
  Fundamental physics and Geophysics in space
  Hubert HALLOIN

Reviewer: Edouard KAMINSKI



This work package is a joint project between APC and IPGP. Its aim is to explore synergies between planetary sciences and the detection of gravitational waves from space, both of these subjects share common technological challenges, in the same noise frequency range (1 mHz - 1 Hz).

Two projects are on-going: the first one focuses on the characterization of the station-keeping for the LISA Pathfinder mission (which was launched in December 2015 and will fly until May 2017). One PhD (and then post-doc) student, Henri Inchauspé, has been working on this project until last September. The second project is about applying interferometry techniques from GW detection to develop a novel optical readout system for planetary seismometers. Lucile Fayon, PhD student on a USPC grant, is working on this development, in parallel to the modeling of VBB seismomemeters transfer function on Mars surface.

- I6: IPGP/AIM
  From dust to planets
  Sébastien CHARNOZ => Chloé MICHAUT

Reviewer: Edward STOLPER

Our project aims at studying the differentiation and surface dynamics of planets and, starting 2017, will focus on Earth and Mars. Theme 1 will combine high P/T experiments and isotopes geochemistry to understand the fate of volatile elements during planetary formation. Theme 2 will develop theoretical tools to probe the internal structure of planets using seismology. Theme 3 will focus on large-scale dune experiments to understand planetary surface and regolith dynamics.

- I7: AIM/APC
  Gamma-Ray Bursts: a unique laboratory for modern astrophysics
  Diego GÖTZ

Reviewer: Piercarlo BONIFACIO

Gamma-Ray Bursts (GRBs) are transient gamma-ray flashes lasting from a fraction of a second to several tens of seconds, appearing unpredictably at random directions on the sky. Our current understanding of these objects is that they are related to the catastrophic collapses of massive stars at cosmological distances and/or to the merging of two compact objects (neutron stars or black holes). This project aims at investigating the nature and origin of these elusive objects on one hand by trying to correlate them to the available multi-messenger signals (GRBs are among the best electromagnetic counterpart candidates for neutrino and gravitational wave sources), and on the other by characterizing the GRB environment and specifically the relation of GRB occurence with cosmic star formation.

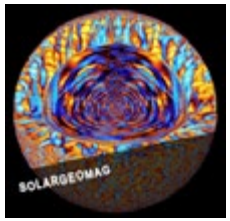
- I8: APC/IPGP
  Astroparticle research, geology and oceanography studies
  Véronique VAN ELEWYCK

Reviewer: Piercarlo BONIFACIO

The KM3NeT Collaboration has started the deployment of a next-generation neutrino telescope on two abyssal sites in the Mediterranean Sea, close to Toulon (France) and Capo Passero (Sicily). This provides new scientific and technological opportunities for interdisciplinary collaborations with Earth and Sea Sciences. The ARGOS project and aims at federating the available expertise at APC and IPGP, to exploit the unique abyssal location and infrastructure of KM3NeT for the deployment and exploitation of seismic and marine sensors and for the study of the composition of the inner Earth (mantle and core) through atmospheric neutrino oscillation tomography.

- I9: IPGP/AIM
  Improving Solar and Geo-dynamo predictability: towards advanced integrated data assimilation techniques
  Alexandre FOURNIER

Reviewer: Peter VON BALLMOOS



The main goal of the SolarGeoMag Interface Project is to improve our physical understanding, and our capability to predict, the long-term magnetic activity of the Sun and the Earth. This understanding will be based on the analysis of 3D simulations that will be parameterized and implemented in low dimensional models amenable to data assimilation experiments. A work package is in particular devoted to the design of a physics-based assimilation tool capable of predicting the activity of the Sun over its next cycle.

EXPLORATORY PROJECTS

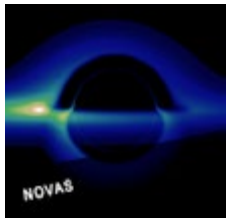
- E3: APC/IPGP
  Geophysics and gravitational wave interferometric detectors
  Matteo BARSUGLIA

Reviewer: Edouard KAMINSKI

We are investigating the detection of the prompt gravity perturbation by the mass redistribution due to an earthquake. The main interest of this study is to study the feasibility of a new earthquake early-warning system based on the detection of gravity, then much faster than conventional ones. These potential earthquake gravity detectors use concepts and techniques under development in the context of gravitational-wave detection.

- E5: APC/AIM/LUTh
  A Numerical Observatory of Violent Accreting systems (NOVAs): strong gravity and beyond
  Fabien CASSE

Reviewer: Pierre TOUBOUL, Brigitte ATTAL TRETOUT



Our project intends to describe the behavior of plasma in the vicinity of compact objects such as black hole or other exotic objects and to produce synthetic observations based on our simulations. We have developed over the last three years a state-of-the-art numerical code able to handle any kind of general relativistic object such as for instance black holes or boson stars. We have compared the behaviour of the plasma in the very close vicinity of various types of compact objects. Bringing physical constraint on the gas dynamics is a key element in order to shed light on the true nature of compact objects such as the one hosted in the center of our galaxy, SgrA*.

- E8: ONERA/AIM
  Modified Gravity from the Earth's outskirts to the cosmos
  Joel BERGÉ

Reviewer: Pierre-Olivier LAGAGE

The project aims to constrain, or investigate how to constrain, gravity at different scales. The MICROSCOPE mission is currently testing the Weak Equivalence Principle in the Earth gravity field; cosmological surveys provide tests of gravity at large scales; intermediate scale can then be tested with experiments in the Solar System, that allow us to bridge the gap between laboratory and cosmological scales. This project will allow us to rule out some beyond-Einstein gravity models, or to detect smoking guns for modified gravity.

YOUNG TEAM PROJECTS

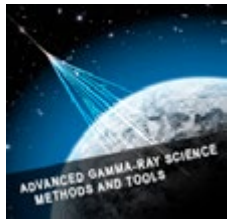
- JE2: APC
  Direct Searches for Dark Matter with Liquid Argon detectors
  Davide FRANCO

Reviewer: Eric PLAGNOL

The goals of the project were twofold: (1) reinforcing the APC and, more in general, the French role in the DarkSide project for the direct dark matter search with a liquid argon TPC, and (2) characterizing the liquid argon response with a small scale setup. Thanks to the LabEx support, (1) APC is now coordinating and leading the DarkSide-50 analyses and the Monte Carlo activities. APC has also a crucial role in the simulation and design of the next DarkSide detector with 20 ton fiducial mass (DarkSide-20k). At the same time, (2) The JE2 team proposed and lead a project, ARIS, with a collaboration counting 11 international institutions, to expose a small-scale liquid argon TPC to a neutron beam. The ARIS project started at the end of 2015 and the TPC was successfully exposed to the LICORNE neutron beam at IPNO in October. The data analysis are in currently ongoing. The JE2 team is now proposing a second set of measurements with a different setup to establish if the WIMP directionality can be inferred from a dual-phase liquid argon TPC response.

- JE3: AIM
  Advanced Gamma-Ray Science Methods and Tools
  Karl KOSACK

Reviewer: Eric PLAGNOL



The goal of this project is to study modern techniques of signal processing from the wider scientific and mathematical community and apply them to the analysis of very-high-energy gamma ray data. This applies both to the reconstruction of raw data from Cherenkov telescopes, where we strive to lower the energy threshold and improve angular resolution and cosmic-ray rejection, to the realtime detection of transient sources in high-level data. This study will benefit current

and future gamma ray instruments, in particular the upcoming Cherenkov Telescope Array (CTA) observatory while simultaneously giving visibility to local groups within several large projects.

EDUCATIONAL PROJECT

- K2: APC/IPGP
  UnivEarthS nanosatellite student project
  Hubert HALLOIN

Reviewer: Pierre TOUBOUL, Brigitte ATTAL TRETOUT

As a teaching activity of the LabEx, this work package has the objective of supporting the development of students' nanosatellites at the University Paris Diderot. With the collaboration of the CNES (an important funding agreement was recently signed) and many departments of the University, IGOSat recently entered Phase C and is planned to be launched 2019 (ready for launch late 2018). IGOSat is therefore entering a crucial phase of prototyping and realization of the engineering models. IGOSat's scientific mission is to measure the electrons and gamma-rays densities on Low Earth Orbit, as well as measuring the total electronic content of the ionosphere. Up to now, more than 200 students have been involved in the project (which started in 2012).

VALORIZATION PROJECT

- V1: APC/IPGP
  Data distribution, visualization and cloud computing
  Volker BECKMANN => Cécile CAVET

Reviewer: George SMOOT

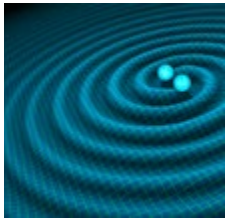
In this work package we have been developing and implementing new tools for data exchange and web access and we developed algorithms that can run on different computing architectures. New approaches to computing have been studied, comparing local cluster, grid, and cloud computing, and giving projects within the LabEx training and access to distributed and cloud computing. In the extension we aim at extending the support for BigData processing within the LabEx collaboration: we will develop interfaces for emerging cloud environments and study, use, and train the community on Hadoop systems for processing of BigData sets on distributed computing architectures.

7 NEW PROPOSAL PROJECTS

NEW INTERFACE PROJECT PROPOSALS

- New I1: AIM/APC
  From evolving binaries to the merging of compact objects
  Sylvain CHATY

Reviewer: Peter VON BALLMOOS

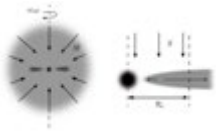


Most massive stars experience a binary interaction in the course of their life. In this project we plan to look carefully at the 3 most uncertain steps concerning the evolution of stellar binaries: common envelope phase, natal kick and metallicity.

By taking into account the new 6D-view (position and velocity) obtained from the Gaia satellite on binaries, we aim to better constrain their evolution towards the merging of two compact objects (binary neutron stars, binary black holes or neutron star/black hole), leading to the emission of gravitational waves.

- New I2: AIM/IPGP
  COR2DISC: From pre-stellar cores to protoplanetary discs
  Patrick HENNEBELLE

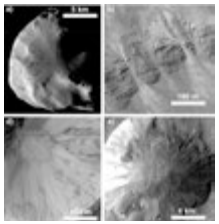
Reviewer: Alessandro MORBIDELLI, Edward STOLPER



Understanding star and planet formation is one of the major goal in modern astrophysics and must now be tackled using a multidisciplinary approach. Here we propose to combine star formation numerical simulations of cloud collapse with microphysical evolution gas and dust models to understand how material from the Interstellar Medium (ISM) is delivered into a protoplanetary disc, such as the solar nebula. Confrontations to meteoritic and specraft data thanks to the coupling of ISM simulations with solar nebula disc models will trigger important progress for our knowledge of the coupling between ISM and planet formation.

- New I3: AIM/IPGP
  Multi-wavelength & Multi-Physics Planetary Peeling
  Antoine LUCAS

Reviewer: Alessandro MORBIDELLI, Edward STOLPER

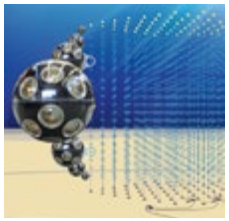


Solar System exploration unveiled the ubiquity of mass wasting. The project aims at combining data analysis with model simulation at various scales and wavelengths, thereby allowing a quantitative assessment of the geomorphology across a wide range of planetary environments. It will help to inform geomechanical models applied to mass wasting in both surface and sub-surface properties, as well as various triggering and feedback mechanisms operating throughout the Solar System. Ultimately, this project will provide new understanding on how planetary surfaces form and evolve over time, from small bodies to icy moons and planets.

NEW EXPLORATORY PROJECT PROPOSAL

- New E: APC/AIM
  Low Energy Astrophysics with KM3NeT: LEAK
  Alexis COLEIRO

Reviewer: Neil GEHRELS

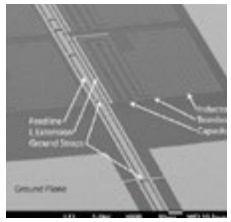


Although multi-wavelength observations of core-collapse supernovae (CCSN) are now routinely performed, specific features of the gravitational collapse can only be diagnosed by neutrinos. The objective of this exploratory project is to bring together experts in CCSN physics and members of the KM3NeT collaboration to assess the capability of the KM3NeT neutrino telescopes (optimized for GeV-PeV neutrinos) to detect MeV neutrino signal from the next close-by CCSN. Using state-of-the-art numerical simulations and theoretical developments, we will explore the potential of the novel KM3NeT optical module design to efficiently suppress the background, and thus to detect features of the neutrino light curve related to hydrodynamical instabilities, neutron star equation of state, and neutrino properties.

NEW VALORIZATION PROJECT PROPOSALS

- New V1: APC
  Detectors for the Future
  Pierre BINÉTRUY

Reviewer: Stéphane MAZEVET



We propose a future program of detector device and data acquisition systems that have strong potential to lead to new science capabilities, especially in astronomy, and novel systems for research and innovation e.g. medicine. We focus for the short run on cryogenic detectors of a new type (Microwave Kinetic Inductance Detectors, first developed by Caltech and JPL in 2003) and a corresponding new level data acquisition system.

- New V2: IPGP
  Virtual Reality: Mars telepresence with InSight and interactive seismology on Mars, Earth, and Stars
  Philippe LABROT

Reviewer: Pierre-Olivier LAGAGE, Edward STOLPER

Virtual Reality (VR) is a powerful tool that will tremendously change the way we learn and explore the Universe. In this twofold project, we propose to use all sensorimotors channels available in VR to communicate the goals and challenges of the InSight mission on Mars, and to develop an innovative application that will permit interaction with complex wave fields in terrestrial, planetary or helio seismology.

- New V3: IPGP
  In Situ Cosmogenic dating of extraterrestrial surfaces
  Manuel MOREIRA

Reviewer: Bernard MARTY, Edward STOLPER

The future of planetary sciences depends on both sample return from extraterrestrial objects and in situ chemical and isotopic analysis as well as absolute or relative dating. Here, we plan to develop a prototype of a spatializable mass spectrometer dedicated to the in situ measurement of cosmogenic nuclides to date extraterrestrial surfaces that will be central in the selection of samples to be returned on Earth.

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Notes

Notes

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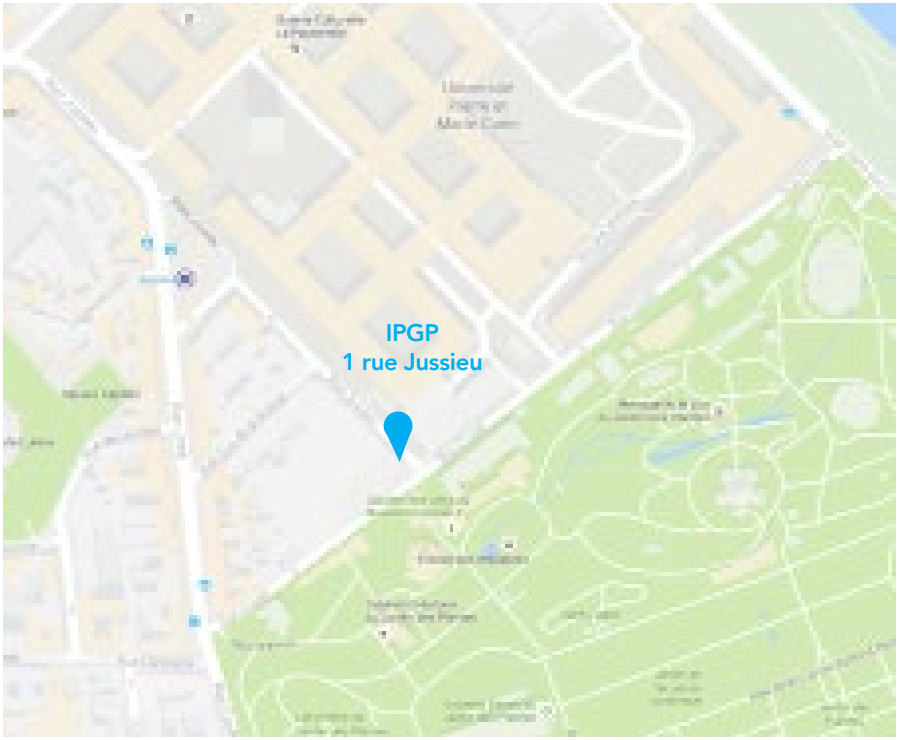

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