

# François FORGET

Laboratoire de Météorologie Dynamique, Institut Pierre Simon Laplace  
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## • Employment

- **Since 2010** : CNRS Senior Scientist, Laboratoire de Météorologie Dynamique (LMD).
- **2004 - 2005** : Scientist, NASA Ames Research Center, Space Science Div., California, USA.
- **1998-2010** : CNRS Research scientist at IPSL/LMD, Paris, France.
- **1996-1998** : CNES (French Space Agency) Post-doctoral Fellow.
- **1993-1996** : Phd Student, LMD.
- **1992-1993** : NASA Ames Research Center (California), Engineer (preparation of the "Mars Balloon" project for the Mars 96 mission; analysis of Viking and Mariner 9 data)
- **1991-1992** : Off-shore engineer, La Defense, France (submarine pipelines)

## • Education

- **2007** : **Habilitation** ("Habilitation a diriger les recherches") P. et M. Curie University, Paris
- **1996** : **Ph.D. in Physics**, Pierre et Marie Curie University, Paris
- **1991** : **D.E.A (M.S.)** in Oceanography and Meteorology, University of Paris VI.
- **1988-1991** : Graduated from the Grande Ecole ENSTA (Advanced Technologies, engineering).

## • Awards

- **2019**: ERC Laureate, project "*Mars through Time*" (Advanced Grant, European Research Council)
- **2017**: Elected at the French "**Academie des Sciences**" (Funded in 1666, 255 members elected for life)
- **2014** : **David Bates Medal** (European Geophysical Union) "for exceptional contributions to planetary and solar system sciences".
- **2007** : Award: **Fondation del Duca** (Institut de France)
- **2004** : Prize: "Best science book 2004" ("Grand Prix") at the "Salon du livre scientifique d'Orsay" for the french version of the book "*Planet Mars: Story of Another World*".
- **2002** : **Zeldovich medal**, Committee on Space Research (COSPAR)
- **2001** : ``**Bronze medal**`, CNRS

### For my supervised PhD Student :

- **2019** : SF2A Best PhD thesis in astrophysics (*Société Française d'Astronomie et d'Astrophysique*) for **Martin Turbet**, also 2<sup>nd</sup> of *Daniel Guinier prize* of SFP (*Société Française de Physique*)
- **2018** : "*Aguirre-Basualdo*" award (best PhD thesis in Physics, Chemistry, Sciences of the Universe & Technology) delivered by the "*Chancellerie des Universités de Paris*" to **Tanguy Bertrand**
- **2015** : Award: "Best PhD thesis in geophysics" (Prix de thèse du *Comité National Français de Géophysique et de Géodésie*: CFNGG ) awarded to my PhD student **Benjamin Charnay**.
- **2009** : Award: "Best 2008 PhD thesis in Earth, Universe and Space Science" (*Fondation EADS*) awarded to my PhD student **Aymeric Spiga**.

## • Management and Service to the Community

### Management and Advisory Committees:

- **2016-present**: **Deputy Director**: *Laboratoire de Météorologie Dynamique* (LMD), Paris, France. (about 200 scientists and engineers).

- **2018 - present** : Member of *Paris Observatory High Scientific Council (HCS)*
- **2009-2017**: Head of the *Solar System Center* ("Pôle Systeme Solaire"). Institut Pierre Simon Laplace (IPSL) (140 scientists and engineers).
- **2003-2017**: Founder and chief of the "*Planetology*" team, LMD (15 to 20 scientists and engineers)

### Space Programming and committees:

- **2019-2024** : Member of "Science Program Committee" (CPS), Centre National d'Etudes Spatiales (CNES) : (senior advisory body in Exploration, Astronomy, Earth, Life and Physical Sciences)
- **2014-2017**: Member of the *Space Science Advisory Committee (SSAC)*, European Space Agency's senior scientific advisory body (Solar system exploration, astrophysics and fundamental physics)
- **2014-2017**: CNES "Research and Space Exploration Evaluation Committee" (CERES).
- **2009-2010**: Member of the NASA/National Academy of Science Planetary Science **Decadal Survey**, Mars Panel. (official team gathered to define the exploration strategy in the next decade).
- **2007-2009** : Member of the scientific committee of the "International Space Science Institute" (Bern)
- **2008-2009** : Member of the NASA/MEPAG *Mars Architecture Tiger Team* (A small team of experts gathered to help define NASA Mars program . I was the only non-american member).
- **2004-2006**: Member of the *Solar System Working Group*, European Space Agency
- **2001-2003**: Member of the *Solar System Working Group*, Centre National d'Etudes Spatiales.
- **2001**: Member of NASA Mars Reconnaissance Orbiter payload selection committee.

### Teaching, Editing & Conferences organization (selection) :

- **2003-present**: Cofounder of Master 2 *Planetology and Space Exploration*. 1 course/year
- **2011-2017**: **Associate Editor** of *Journal of Geophysical Research - Planet*.
- **2003- 2017**: Organizer of the 6 conferences "*Mars atmosphere modeling and observations*" (Granada, Spain, 2003, 2006 ; Williamsburg, USA, 2008; Paris, 2011; Oxford, 2014, Granada, 2017). 130 to 150 participants.

## • Research activity

*I am a research scientist involved in space exploration, observations analysis, instrument development and modeling of other worlds like Mars, Pluto, extra-solar planets, Venus, Titan, Triton, etc. In particular I founded a team specialized in numerical Climate Models designed to accurately simulate the environment on other planets. The scientific applications are countless!*

### Planetary Climate Modeling:

- Development of the **LMD Mars Global Climate Model**, used by several teams around the world.
  - PI of the **Mars Climate database (MCD)** project supported by CNES and ESA. This a reference engineering and scientific tool used to prepare and analyse almost all missions to Mars. A Web version is on <http://www/mars.lmd.jussieu.fr/>. The Full version has been delivered to more than 560 teams in 25 countries.
  - Analysis of the Martian CO<sub>2</sub>, dust and water cycle, using both modelling and data analysis
  - Development of **mesoscale and microscale (LES) Mars atm. model** (project led by A. Spiga).
  - Development of the first coupled **mars atmosphere-thermosphere-ionosphere model** (with M. Angelats i Coll, F. Gonzalez-Galindo and J-Y. Chaufray, postdocs LMD).
  - Development of the first **3D photochemical model** of the Martian atmosphere (project led by Franck Lefevre, LATMOS). Investigation on the Martian Methane enigma.
  - Explanation of the **glacial and periglacial landforms** on Mars by the climate variations related to the variations of the obliquity and orbital parameters.
  - Proposition of a new formation scenario for the **Martian Gullies**, by CO<sub>2</sub> ice (with C. Pilorget, IAS).

- Development of 3D models to solve the **Early Mars Climate enigma**, 3.8 Billions years ago. Proposition of the "Icy Highland Scenario" (with R. Wordsworth). Modeling of the effect of CO<sub>2</sub> ice clouds, asteroids impacts, outflow channels floods, reduced gases (with M. Turbet, PhD student).

- **Modeling extrasolar and primitive atmospheres.**

Development of a new **3D "Universal" Climate model** designed to study the possible climates on exoplanets and the primitive atmospheres. **A few applications:**

- Resolution of the "**Faint young Sun paradox**" on the Earth (with B. Charnay, Phd student)
- First 3D simulations of the "**Runaway greenhouse effect**": Investigation on the long term future of the Earth and the edge of the "Habitable zone" (with J. Leconte)
- Among many cases: demonstration that Gliese 581d was the first discovered terrestrial planet in the habitable zone (with R. Wordsworth). Study of the environment on Proxima Centauri-b et on the worlds around Trappist-1 (with M. Turbet), etc.

- **Other planets.**

- Explanation of the distributions of the ices, glaciers and frost observed on Pluto by the New Horizon spacecraft using a simplified climate model (with T. Bertrand, PhD Student)
- Development of a 3D General Circulation Model of the **Pluto** atmosphere (circulation, methane cycle) and explanation of the New Horizons observations;
- Development of the first General Circulation Model of **Triton** (circulation, Nitrogen cycle), observed by Voyager in 1989.
- Development of the first true GCM of the Venus atmosphere (project led by S. lebonnois, LMD).

- **Involvement in Space missions :**

- **Mars Express** (European Space Agencies, since 2004).
  - "*Interdisciplinary Scientist*" (IDS) in charge of atmospheric sciences.
  - *Co-investigator* (co-I) of the imaging spectrometer OMEGA and SPICAM spectrometers.
- **Mars Reconnaissance Orbiter** (NASA, since 2005): *Co-I* of Mars Climate Sounder.
- **New Horizons** (NASA): Fly-by of Pluto on July 14 2015. "*Mission Collaborator*".
- **Exomars 2016** (ESA) around Mars since October 19, 2016.
  - "*Interdisciplinary Scientist*" (IDS) on the **Trace Gas Orbiter** (TGO)
  - *Co-I*, "**Atmospheric Chemistry sounder**" (ACS) on TGO (PI, O. Korablev, IKI, Moscou).
  - Selected *Co-Principal Investigator* of the **AMELIA** experiment, (analysis of the Schiaparelli entry probe descent measurements).
  - **Project Manager** for the characterization of the atmospheric environment, *Exomars 2016 Descent Module* (contracts Thales-Alenia, ESA, CNES).
- **INSIGHT** (NASA Lander, 2018): *Science Collaborator* (in charge of large scale meteorology)
- **Rover Exomars 2020** (ESA, launch in 2020):
  - Member of the Landing Site Selection Working Group ("*LSSWG*")
  - **Project Manager** for the characterization of the atmospheric environment, *Exomars 2020 Lander* (contracts Thales-Alenia, ESA, CNES).
- "**Emirates Mars Mission**" (**Hope**), a Mars Orbiter from the Arabic United Emirates to be launched in 2020: *Member of the "Core Science Team"*.
- **DAVINCI, VICI** (Venus atmospheric descent probes, NASA) , *Co-investigator* .
- **ARIEL** (Atmospheric Remote-sensing Infrared Exoplanet Large-survey) *Member of the proposing team*. Selected by ESA for a launch in 2027.
- **Development of Mars Microwave sounding.** (with LERMA, Observatoire de Paris). PI of the *Mars Atmosphere Brightness Observer* (**MAMBO**, on the CNES Mars Premier mission cancelled at the end

of phase B in 2002). Co-PI of the *Submillimeter Observation for Atmospheric Research (SOAR)* proposed for the Exomars Trace Gas Orbiter in 2011. • Co-I of the *Climate Orbiter for Mars Polar Atmospheric And Subsurface Science (COMPASS)* including the sub-mm sounder **WAVE** (submitted to NASA Discovery program, 2019).

- **Publications.**

- Author /co-author of 230 peer-reviewed articles (with *10 Nature*, *9 Science*, *3 Nature Geosciences*)
- H-index 54 (Web of Science).
- 78 Invited presentations in international meetings.

- **Public Outreach.**

- Author of the popular science book: *Planet Mars: Story of another World* (Forget, F., F. Costard, P. Lognonne). First French edition in 2003. Augmented Edition (160 pages) 2006. Translated in Dutch, English, Japanese. "Best science book 2004" Prize at the "Salon du livre scientifique d'Orsay".
- Creation of an exhibition for high-schools and libraries about *climate, water and life on other planets* (in french, 2010): <http://expoplanetes.ipsl.jussieu.fr/> (About 150,00 students have seen the exhibition in France, Belgium, Canada, Israel)
- Co-author of the popular science book *Solar System and planets* (Edition Ellipses, 2009).
- Regular writing of public outreach article for *Pour la Science* (French edition of *Scientific American*), *la Recherche*, *Ciel et Espace*, etc.
- Regular Media appearances (TV and Radio shows, press interviews)
- Public Outreach conferences (~15/years)
- 2016-2018: Scientific advisor and contributor to the TV documentaries “*Living Universe*” by Vincent Amouroux & Alex Barry (ARTE France and ABC Australia).
- Contribution to TV documentaries “*Entre Terre et Ciel*, ep.4” (ARTE, 2014) and “*Et si la Terre était Unique ?*” (France Television, 2020). Shooting at Pic du Midi Observatory and in Mexico.