

# JEREMIE VAUBAILLON

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## EDUCATION

IMCCE, PARIS OBSERVATORY, CNES (French Space Agency, France)

PhD. Astronomy, (with high honors)

Sept. 2000-Oct.2003

Thesis: "Dynamic of meteoroids in the solar system; application to the prediction of the Leonid meteor storms"

Advisor: W. Thuillot, F. Colas (IMCCE)

PARIS OBSERVATORY (FRANCE)

DEA. Astronomy (Graduate degree), Celestial mechanics and geodesy (with honors)

2000

UNIVERSITY OF PARIS 7 (France)

DESS. Optics and material (graduate engineer degree)

1999

Interaction between light and matter (with honors)

## SUMMARY OF TECHNICAL SKILLS & PROFICIENCIES

- Scientific Instruments: Subaru (8m), Spitzer Space telescope (IR), Palomar Transient Factory, Palomar (200in), OHP (1.2m), Pic-du-midi (1m), video wide FOV camera (meteors) on ground or in airplane, Paris observatory 38-cm refractor (built in 1856)
- Languages: English (fluent), French (native)
- Specific knowledge: MOPS (PanSTARRS software), frequent usage of parallel supercomputers (CINES & IDRIS - France, SDSC - USA) and knowledge of the EGEE Grid (Europe).
- Program languages: C, F90, F77, PYTHON, Perl, Shell, Pascal, Basic, PHP, XML
- Database: MySql, AMGA (Grid)
- Software: IDL, DS9, CODE V
- Operating System: Linux/UNIX, MacIntosh, Windows
- Frequent interactions with space agencies (NASA, ESA, CNES) regarding the protection of artificial satellites

## RESEARCH & PROFESSIONAL EXPERIENCE

INSTITUT DE MÉCANIQUE CÉLESTE ET DE CALCUL DES ÉPHÉMÉRIDES (FRANCE)

Astronomer (staff)

Jan 2009 - Present

Project: 2011 Draconids international airborne observation campaign

Sept2010 - Present

- Purpose: observe the Oct 8th 2011 Draconids exceptional meteor shower from 2 aircrafts (CNRS and DLR) with as many cameras as possible (visible/IR, vide/photo, B&W/color) (INSU SO6)
- Role: PI of the whole project (2 airplanes, 6 scientists, 20 cameras) ; PI of the French aircraft campaign (SAFIRE/CNRS - Falcon 20) ; onboard observation
- Impact: Get scientific record of a unique event from 2 different aircrafts in order to study the most fragile cometary matter at its entry in the Earth atmosphere.
- Results: As of Feb. 2012: performed the predictions of the outburst, successfully coordinate the whole observation campaign and observed the Draconids outburst happening exactly as predicted! 3+To of Data reduction ongoing ; workshop organized in March 2012 at IMCCE and 2 special session at international conferences coming (IMC and EPSC) ; 2 documentaries performed for public outreach purposes, by CNRS (J. Mouette) and NHK (Japanese TV).
- see also: <http://www.imcce.fr/langues/en/ephemerides/phenomenes/meteor/DATABASE/Draconids/2011/index.php>

Project: CAmera for BEtter Resolution NETwork (CABERNET): the French meteor observation network. 2010-present

- Purpose: provide France with the its first meteor observation network (INSU SO6)
- Role: PI of the whole project (project, people and money management) ; 3 to 7 people at a time involved in the project (300k€ for 3 years + 100k€ dedicated to hire postdocs only ; main sponsor: "Ville de Paris" program "Emergence" and Paris Observatory - for the postdoc position).
- Impact: Measure the most accurate meteoroid orbit in the world to study their origin and link with comets and asteroids.
- Results: Developed the first high resolution meteor dedicated camera based on 4kx2.6k CCD with an electronic shutter allowing to measure the most accurate orbits ; Automated remote observation and development of the local reduction pipeline ongoing ; permanent installation of the 1st stations at Pic du midi and Guzet in early 2012.

- see also: <http://www.imcce.fr/langues/en/ephemerides/phenomenes/meteor/CABERNET/index.php>

Project: PODET-MET: the first official meteoroid streams and meteor showers ephemeris server in the world.

- *Purpose*: provide the international community with an expertise of meteoroid streams in the whole Solar system, the associated meteor shower on every planet and provide the ephemeris of all meteor showers (INSU SO1)
- *Role*: PI of the project (1 to 3 people)
- *Impact*: coordinate ground based and airborne based observation of meteor showers on Earth and on other planets, protect the artificial satellites
- *Results*: Forecasting of more than 50 meteor showers on all the planets of the Solar System ; development of a server for public access to the data
- see also: <http://www.imcce.fr/en/ephemerides/phenomenes/meteor/index.php>

Project: Create a pole of Earth environment (PoDET) in France

- *Purpose*: provide France with NEO orbit expertise as well as any object in the vicinity of the Earth (meteoroids, debris) (INSU SO1)
- *Role*: Scientific manager: define the general politic of the project, participate in the development, stimulate the exchanges with other organizations
- *Results*: definition and development with the project leader of the tools to communicate with automated telescope (ongoing); created collaboration with IfA (Pan-STARRS) and CALTECH in order to treat PTF observations with MOPS and share the results with IMCCE (ongoing).

**NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN (JAPAN)**

**Invited researcher**

Oct 2009, Feb.-Mar. 2010

*Project*: Comparative study of different methods of meteor shower forecasting (in collaboration with J. Watanabe and M. Sato)

- *Purpose*: To develop the latest method to perform meteor shower forecasting, 10 years after the last update
- *Impact*: explanation of the under-observed 2009 Leonid meteor shower ; outlining of international cooperation and multi-wavelength observations of meteor showers.

**CALIFORNIA INSTITUTE OF TECHNOLOGY (USA)**

**Postdoctoral Scholar (invited)**

May 2006 – Dec 2008

*Project*: Study of cometary trails as observed by the Spitzer Space Telescope, in collaboration with B. Reach

- *Purpose*: To develop a model of meteoroid stream at their very sources (the comets), and to understand the structure of cometary nuclei and their relation with other objects of the Solar System
- *Impact*: Constraining the population of large (mm-size) cometary particles undetectable by all other observations; showed that it may reflect the efficiency of planetesimal growth process
- Unveiling the dust and fragments from broken comet 73P and modeling the dust IR emission
- Responsible for the creation of artificial images reproducing the observations; Managed the dynamical study of the fragments and determination of their origin

**CALIFORNIA INSTITUTE OF TECHNOLOGY (USA) - SETI INSTITUTE (USA)**

**Embarked wide field imaging specialist**

2004 - today

*Project*: Observation from a NASA airplane (DC8 or Gulfstream) of the Genesis (NASA) and ATV (ESA) spacecraft reentry, and of the Aurigids and Quadrantids meteor showers

- *Purpose*: Get wide field images of the spacecraft atmospheric reentry or of the meteor shower (predicted by myself)
- *Impact*: successfully predicted the meteor shower events; observed the events; get the 1<sup>st</sup> published images of the ATV (ESA) also used to derive the temperature of the debris; obtained the activity curve of the activity of the meteor shower; several Astronomy Picture of the Day for NASA
- *Responsible for*: the forecasting of the 2007 Aurigids and 2008 Quadrantids events from which these 2 missions depended on; observation acquisition of the showers and spacecrafts reentry.

**ARMAGH OBSERVATORY, N. Ireland (UK)**

**Researcher (invited)**

Jan.-Mar. 2006

*Project*: Study of a meteoroid stream in the vicinity of Venus, in collaboration with A. Christou and D. Asher

- *Purpose*: Monitor the risk endured by the Venus Express spacecraft and to plan the very first observation of an impact in the Venusian atmosphere
- *Impact*: Investigated the Venus-intercepting dust trail of comet 45P in 2006 and showed that though the comet is close to the planet the spacecraft is safe
- *Method*: simulating the meteoritic environment of the planet caused by the comet and constraining the density of particles from direct cometary observations and meteor showers at Earth.

**THE UNIVERSITY OF WESTERN ONTARIO, London (ON, Canada)**

**Postdoctoral Scholar (invited)**

Jan.-Dec. 2005

*Project*: The meteor showers at Earth and Mars, in collaboration with P. Brown and P. Wiegert

- *Purpose*: Determine the origin of several meteor showers, comets and asteroids; Protect the Deep Impact spacecraft; Plan the first dedicated meteor observations from another planet
- *Impact*: Explained the 2005 Draconids event; Showed that Phaethon can be of cometary origin; Determine the meteoritic environment of comet 9P/Tempel 1 and the consequences for the Deep Impact spacecraft
- Prediction of a meteor shower at Mars caused by comet P/2001R1 and coordination of meteor observations by the Martian rover "Spirit"

**SETI Institute, Mountain View, (CA, USA)**

**Researcher (invited)**

Aug.-Dec. 2004

*Project*: The meteor showers at Earth for the coming 50 years, in collaboration with P. Jenniskens

- *Purpose*: To have the most complete view of the coming meteor showers in order to plan in advance future observation missions and alert all space agencies
- *Impact*: Active contribution to the book: "Meteor showers and their parent bodies": providing the forecasting for the coming 50 years
- Participation to the Genesis reentry observation campaign

**LABORATOIRE ASTRONOMIQUE DE MARSEILLE (France)**

**Researcher (invited)**

May-June 2004

*Project*: the meteoritic environment of comet 67P and the Rosetta spacecraft, in collaboration with L. Jorda and P. Lamy

- *Purpose*: Determination of the presence of old and large (mm size) particles in the vicinity of the nucleus
- *Impact*: Defined the best strategy to approach the nucleus and minimize the risk of impact for the spacecraft

**CNES (French Space Agency), IMCCE-PARIS OBSERVATORY (France)**

**Researcher - PhD student**

2000-Apr. 2004

*Project*: Forecasting the strong meteor showers (Leonids) in order to protect the artificial satellites

*Advisor*: W. Thuillot, F. Colas (IMCCE), Jacques Foliard (CNES)

- *Purpose*: Modeling the evolution of natural cometary dust in the Earth environment in prevision of the strong Leonid meteor showers (1998-2002) in order to protect the artificial satellites
- *Impact*: Forecasted the 2002 Leonid, with an accuracy of less than 1 min. for the time of max. and 20% for the level of the shower (best forecasting worldwide)
- Assisted the space agencies (CNES, ESA) with decision making: to protect (cost ~ 1.3 M€) or not to protect the satellites (high risk)

**CONSULTING, REFEREE, MANAGEMENT & LEADERSHIP EXPERIENCE**

- PI of the 2011 Draconids international multiple airborne observation campaign (2 aircrafts, 6 scientists, 14 people on board, 17 flight hours in CNRS/SAFIRE aircraft, 84k€) 2010-2012
- PI of the French meteor network (CABERNET) based at IMCCE (France) ; Managing up to 7 persons (total of all grants: 300k€ for 3 years + 100k€ dedicated to hire postdocs) since 2009
- Science manager of the PoDET (Pole on the Dynamics of the Earth Environment) since 2009
- Invited by the team of the Palomar Transient Factory (CALTECH) on a project aimed at installing and using the PanSTARRS MOPS software to detect the objects of the Solar System since 2009
- Member of the management team of the International Astronomical Union, Commission 22 of the meteors since 2009
- Consulting about the risk for spacecrafts (Shuttle, space probes & artificial satellites) from meteoroid stream for NASA (MSFC), ESA and CNES since 2002

- Consulting for the advent of any meteor shower on Earth and other planets since 2002
- Expertise on the dynamics of meteoroid and explanation of unexpected meteor showers at Earth since 2002
- Referee of several books, data and papers in the following international journals: Planetary Data System Galileo and Ulysses dust detector, MNRAS (x5), The Astronomical Journal, Icarus (x3), Astronomy & Astrophysics (x3), Meteoritics & Planetary Science (3), Journal of Geophysical Research Earth (1), Moon and Planets (x7), Planetary and Space Science (x3), Advances in Space Research (x3), New Astronomy, Czech Science Foundation (GACR) (x4), Proceedings of the AOGS conference (Singapore, July 2006), Proceedings of the COSPAR conference (Paris, July 2004 and Beijing 2006) (x3), “Meteor showers and their parent bodies“ (600 pages) P. Jenniskens (SETI Institute/NASA-AMES, San Francisco, USA), Cambridge University Press, 2006, “Meteors and Meteor Showers”, (238 pages) P. Bias (Florida Southern College, USA), Miracle, 2006
- Organization of the International Meteor Conference, Barege, France (100 persons) 2007
- Supervisor of postdocs fellows, undergraduate and engineer students internship since 2002

### PRESENTATIONS & TEACHING EXPERIENCE

#### *Presentations:*

- Many talks given during international conferences and seminars (among which 7 as **invited speaker** and 1 as **invited review speaker**)
- Chairman & convenor duties ; organization of one international conference (Barege, France, 2006) and a workshop (coming in 2012)

#### *Teaching:*

- **OBSERVATOIRE DE HAUTE PROVENCE** (France), teaching of observation with a 1.20 m telescope since 2011
- **IMCCE** (FRANCE), teaching to master students, high school teacher (with J.E. Arlot), and engineer students (internship) since 2009
- **OBSERVATOIRE DE PARIS** (FRANCE), conference for the public, TV and radio interviews, Guide for the public, observations for the public at the 33cm telescope (build in 1856) since 2000
- **California Institute of Technology** (USA), organized 2 star parties in the desert, TV interview, participation to science articles for the public, conference in high school 2006-2008
- **ARMAGH OBSERVATORY** (N. Ireland), Guide for the public 2006
- **CRONYN OBSERVATORY** (UWO, London, Canada), Guide for the public 2005
- **University of Paris 13** (Saint-Denis, France) : teaching of computer science (undergraduate level), 120hrs 2001-2002
- **PUBLIC OUTREACH:** Participation to many activities of **popularization of science** (articles in public papers, radio and TV interviews, conferences for the public and high schools students, organization of a star parties, guide of Paris Observatory, invited researcher at “café des sciences” etc.), 2 documentaries on the 2011 Draconids event (CNRS and NHK TV) since 2000

### PROFESSIONAL AFFILIATIONS

- IMCCE, Assistant-Astronomer since 2009
- American Astronomical Association, Division of Planetary Science since 2006
- International Astronomical Union, commission 22, division III, member of the organizing committee since 2005
- International Meteor Organization since 2001
- SF2A (French Astronomical Society) since 2000