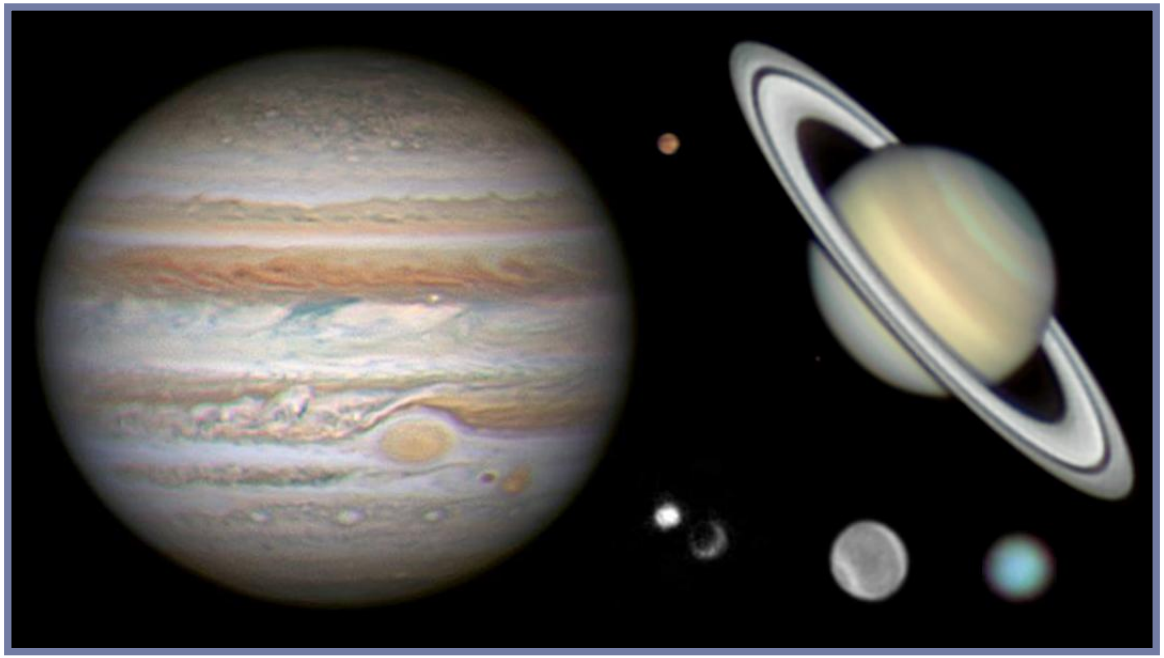


PVOL: Planetary Virtual Observatory & Laboratory

Ricardo Hueso, Jon Juaristi Campillo, A. Sánchez-Lavega & J. Legarreta
Planetary Sciences Group, UPV/EHU

eman ta zabal zazu
Universidad del País Vasco
Euskal Herriko Unibertsitatea

Grupo de Ciencias Planetarias
Zientzia Planetarioen Taldea

europlanet

What is PVOL?

Planetary Virtual Observatory & Laboratory

http://www.pvol.ehu.es

- **Database of planet observations from amateur astronomers**
  - Images ***mainly*** provided by amateur astronomers
  - Used by both amateur and professional astronomers

- **Scope:** Giant Planets (initially developed to serve as the database for the *International Outer Planets Watch*, a project with roots at the time of the Galileo mission in 1995)

- **PVOL operative since 2005**

  Developed as an unfunded project by A. Morgado & A. Sánchez-Lavega

  Described in a scientific paper (*Hueso et al. Planet. Space Sci., 2010*)

- **NOW: Redesigned & Modernized with funding from EUROPLANET 2020 RI**

  Incorporation of other planetary objects:
  - **Mars**
  - **Venus**
  - Mercury
  - New searching capabilities, images with several observations, etc...

Why PVOL?

- **Other excellent databases**
  - ALPO – JAPAN: http://zetta.jpn.ph/alpo/indexE.htm (more complete database)
  - France – SAF: http://www.astrosurf.com/planetessaf/jupiter/ (easy to surf)
  - Italy: http://pianeti.uai.it/ (high-level data: Jupiter Maps)
  - Juno Jupiter https://www.missionjuno.swri.edu/ **(scientific planning for Juno)**
- **Role of new PVOL: Link from amateurs and professionals over an extended time and and range of objects** (data from 2000 onwards on Jupiter, Saturn, Uranus & Neptune)
- **NOW: Redesigned & Modernized with funding from EUROPLANET 2020 RI**

Incorporation of planetary objects

- **Mars**
- **Venus**
- Mercury

Simplify submission

- No name recommendation
- Several images in one file
- Images, projections, movies

Improve visibility of observers

New searching capabilities, images with several observations, etc...

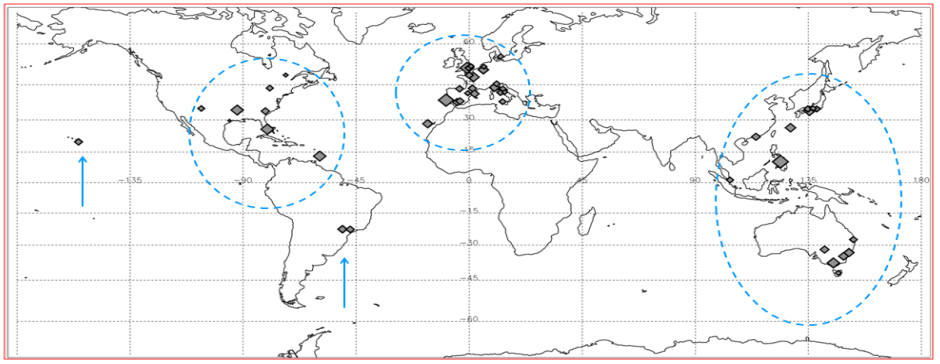
- Improve search capabilities
- Strengthen links with professionals
- Get permission of more observers

Data Maintenance (long-term)

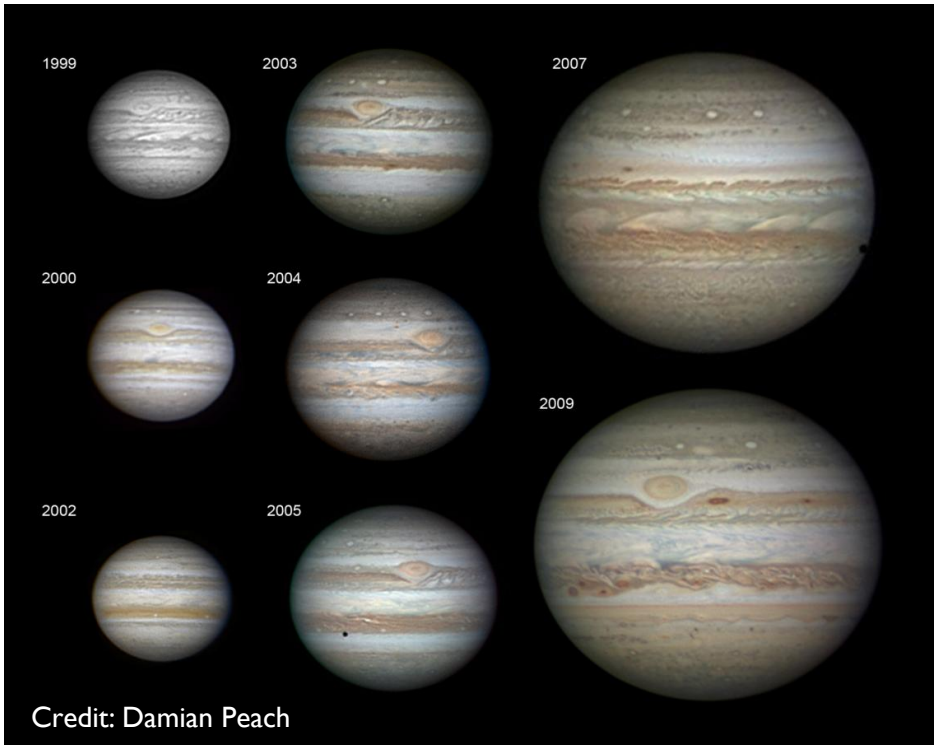
Accesible from VESPA (Virtual European Solar and Planetary Access)

Statistics

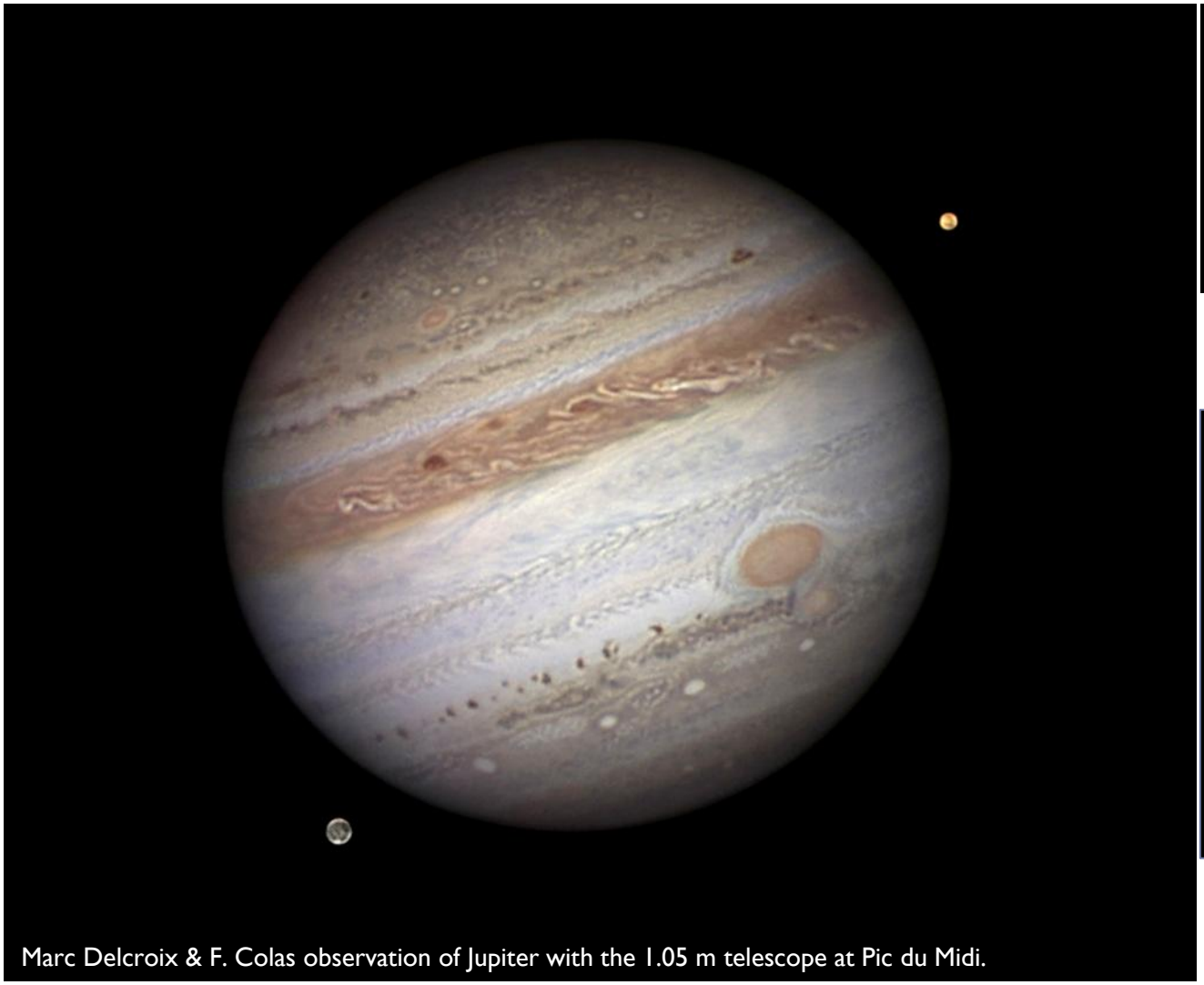
- More than 250 users from around the world. Need higher collaboration with Japanese observers, Asia & probably USA



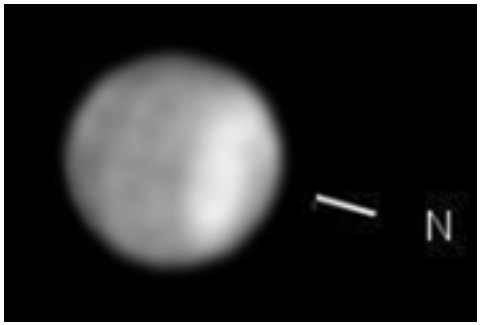
- About **27.000 images**
  - Jupiter comprises most of the images (>2000 per year in the latest apparitions).
  - Christopher Go is the observer with the highest number of Jupiter images, more than 1600.
- Improved technology means better images each year & larger percentage of usefull images.



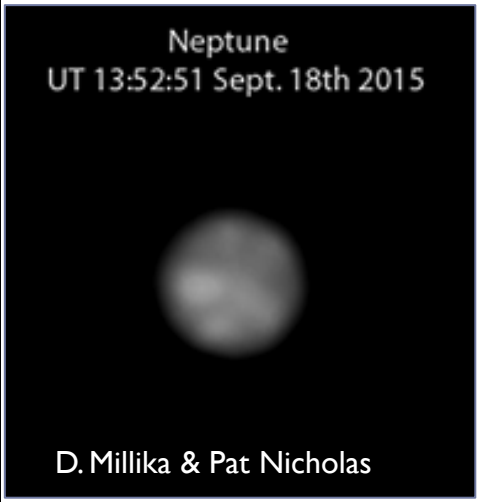
Data Quality: Highlights



Marc Delcroix & F. Colas observation of Jupiter with the 1.05 m telescope at Pic du Midi.



Uranus observed by J. Sussenbach with 40cm telescope.

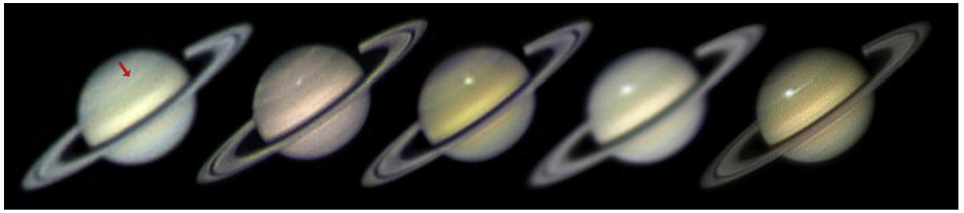


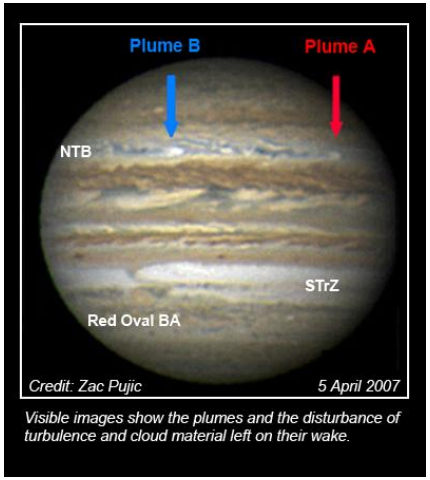
FIRST Neptune paper to rely heavily in amateur observations under preparation (Hueso et al.)

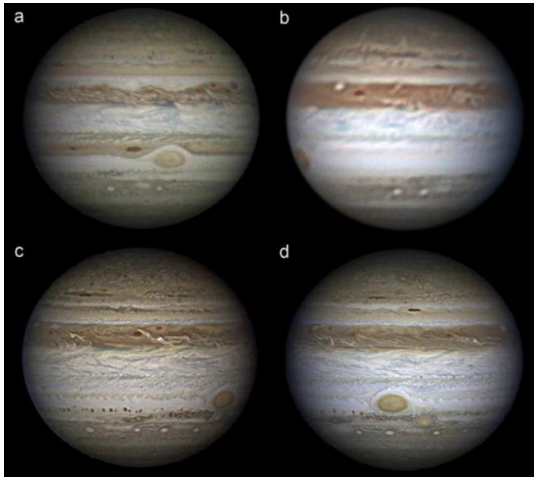
Scientific use of the database (I)

- Examples

(I) Studying the development of atmospheric phenomena

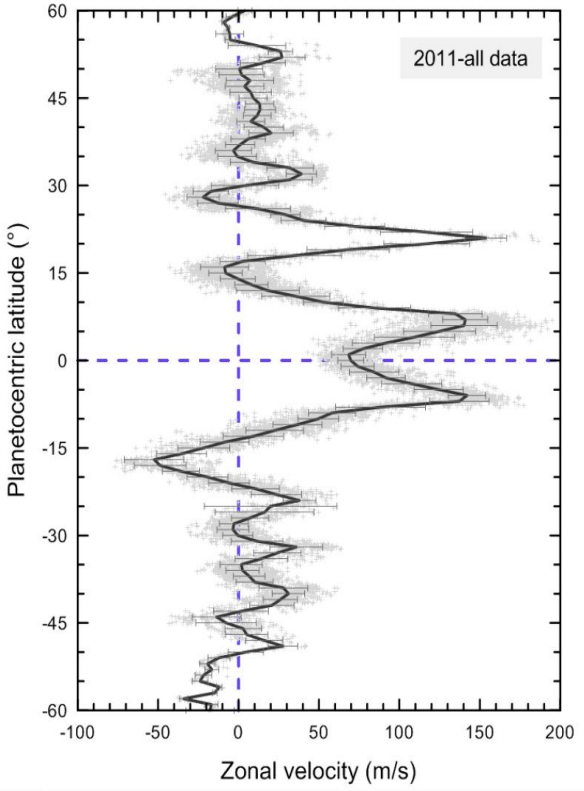






Sánchez-Lavega et al. Nature, 2011 *(Saturn Great White Spot)*
Sánchez-Lavega et al. Nature, 2008 *(Jupiter storms in the NEB)*
Pérez-Hoyos et al. Icarus, 2012 *(Fading of Jupiter's SEB)*

(II) Measuring winds in Jupiter



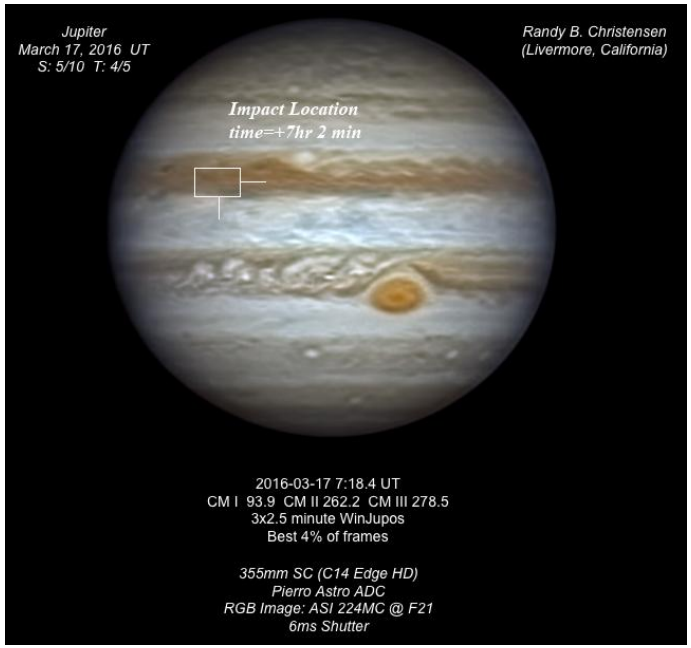
Barrado-Izagirre et al. A&A (2013)

- More than 18 scientific papers in the last 10 years based partially in PVOL data (8 based mainly) and at least from 4 different research groups.

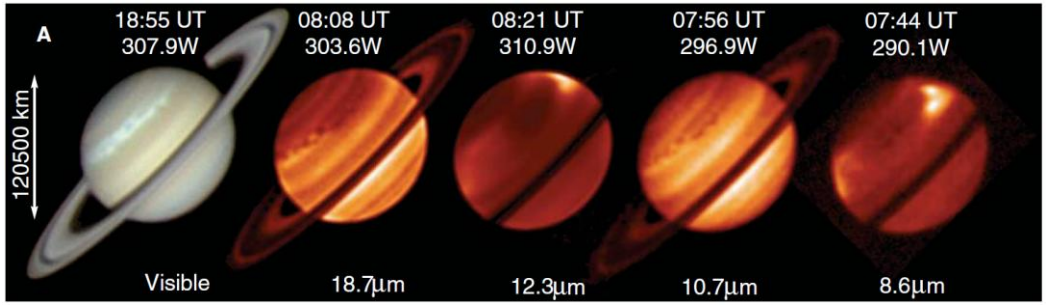
Scientific use of the database (II)

- Further examples

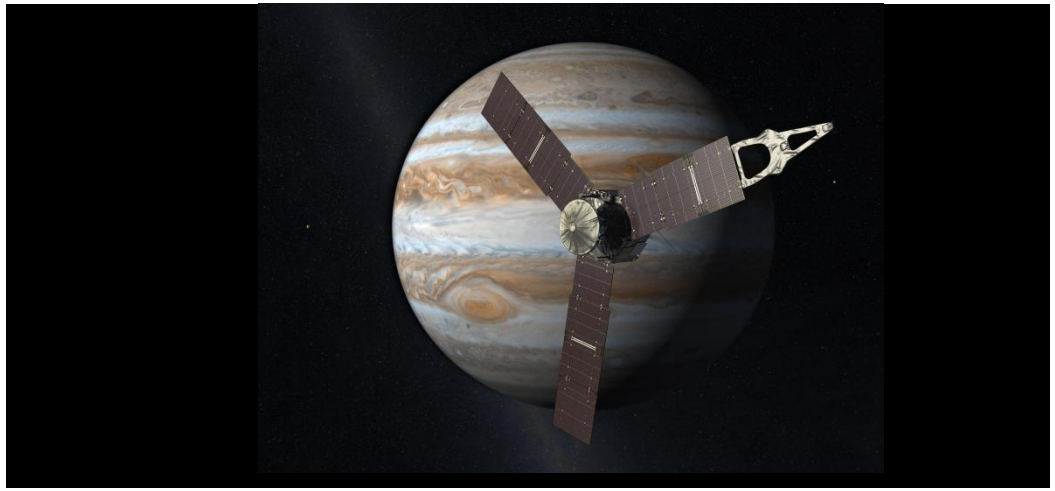
(III) Interesting phenomena
(like the recent impact in Jupiter)



(IV) Providing visible images suitable for comparison with professional observations



Fletcher et al. Science (2012)



(V) Ground-based support to Juno observations of Jupiter

PVOL 2.0 & VESPA

- **Key task:** Compatibility with VESPA & modernisation
  - Driven by the integration with **VESPA** Virtual European Space & Planetary Access (big project at Observatoire de Paris)
  - Support **existing and new research** on Mars & Venus from amateur images.
  - Increase its use & diffusion among amateurs & professionals.
- Website written in Java
  - Single website with permission levels. Users can edit their images.
- Key technologies:
  - Struts 2: web framework
  - JBCrypt: password hashing
  - JUnit: unit testing
  - Gradle: build automation
  - PostgreSQL: database (required for VESPA)
  - Apache Tomcat: web server

UPV - EHU

PVOL
Planetary Virtual Observatory & Laboratory

- Home
- Search data
- Upload image(s)
- News
- Reports
- User information
- Publications from PVOL data

Help

Welcome to the new PVOL

PVOL stands for Planetary Virtual Observatory and Laboratory. It is a searchable database of ground-based observations of solar sytem planets and its major satellites. The images are made available by amateur astronomers and are used for research purposes or astronomy popularization. The current PVOL service is an improved and modernized version over the PVOL server that used to contained Giant Planets Images. The new service hosts all previous data and new amateur images of all Solar System planets and major satellites. PVOL has been redesigned to include new functionalities and a more clear layout.

This project is part of VESPA (Virtual European Solar and Planetary Access), which is part of **Europlanet 2020 RI**. Europlanet 2020 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654208.

How to navigate through the website

The left menu will guide you to different sections of the website. Try **Search image** to find data. If you would like to supply observations of solar system planets you can submit them by e-mail to: iopw@ehu.eus. If you are a regular contributor you may use the **Log in/Sign Up** to log in in the system and upload data. If you don't have an account your application will be reviewed by the website administrators.

Important news

Test

2016-04-28

Welcome to the Planetary Virtual Observatory and Laboratory. This site hosts the online and public image database of observations of the Giant Planets obtained by small telescopes. PVOL depends on the Atmospheres Node of the International Outer Planets Watch (IOPW) which is aimed to encourage the observations and study of the atmospheres of the Giant Planets. The PVOL-IOPW database contains more than 15,500 image observations of Jupiter and Saturn in the visible range with a few contributions of Uranus and Neptune.

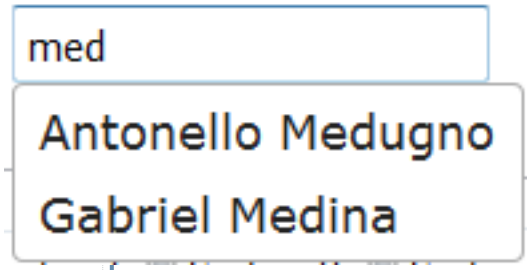
Read all the news

[Stats]

[Data access rights and copyright]

PVOL 2.0: Simple & Complex searches

Predictive autofilling



PVOL 2.0: Simple & Complex data upload

Compulsory fields
(can be read from the filename)

Optional data
(can be added later by the data owner or the system managers)

PVOL 2.0: Data view in gallery, list, table

Search results for your query in gallery format

46 images in total

[1]

Object: jupiter

Date: 2010-08-26

Time: 23:23:00

Filter: lrgb

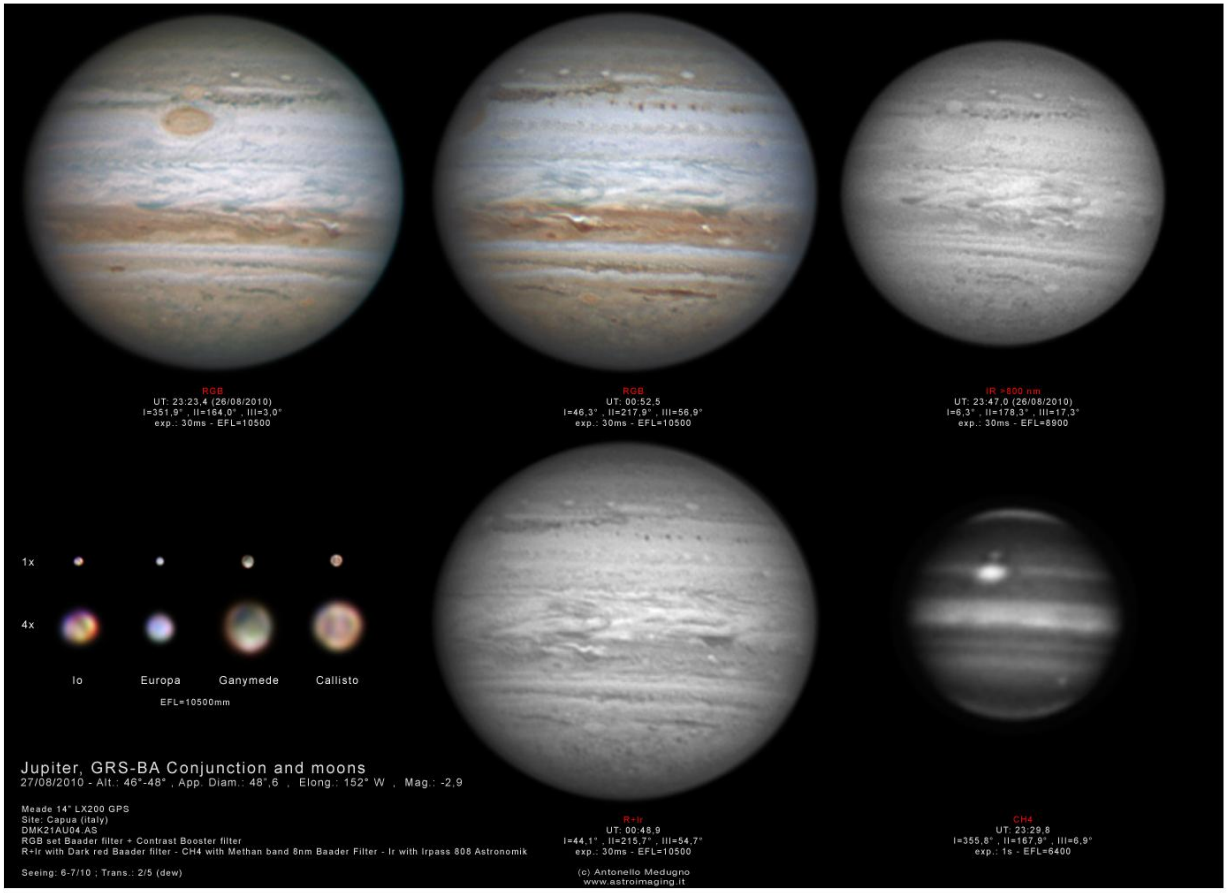
Author: Antonello Medugno

System I: 350.25

System II: 162.36

System III: 358.87

More details



Full support of images with multiple observations

PVOL 2.0: Data view in gallery, list, table

Search results for your query in list format

46 images in total

[1]

Date	Object	Author	System I	System II	System III	URL
2010-08-26	jupiter	Antonello Medugno	350.25	162.36	358.87	j2010-08-26_23-23_lrgb_am.jpg
2010-08-19	jupiter	Antonello Medugno	246.14	118.6	313.0	j2010-08-19_01-34_rgb_am.jpg
2010-08-19	jupiter	Antonello Medugno	332.19	197.65	32.297	j2010-08-19_23-36_rgb_am.jpg
2010-08-12	jupiter	Antonello Medugno	231.15	156.92	349.46	j2010-08-12_01-52_rgb_am.jpg
2010-08-12	jupiter	Antonello Medugno	253.1	178.68	11.232	j2010-08-12_02-28_rgb_am.jpg
2010-08-02	jupiter	Antonello Medugno	124.16	125.94	315.84	j2010-08-02_02-46_rgb_am.jpg
2010-07-15	jupiter	Antonello Medugno	140.46	279.76	104.86	j2010-07-15_02-13_rgb_am.jpg
2010-07-02	jupiter	Antonello Medugno	298.92	176.96	358.61	j2010-07-02_03-38_rgb_am.jpg
2009-07-20	jupiter	Antonello Medugno	176.9	183.34	272.67	j2009-07-20_01-08_ir_am.jpg
2009-07-20	jupiter	Antonello Medugno	211.65	217.79	307.13	j2009-07-20_02-05_ir_am.jpg
2009-07-20	jupiter	Antonello Medugno	179.94	186.36	275.69	j2009-07-20_01-13_rgb_am.jpg
2009-06-15	jupiter	Antonello Medugno	104.47	17.476	97.511	j2009-06-15_02-42_rgb_am.jpg
2008-08-25	jupiter	Antonello Medugno	111.05	101.48	103.51	j2008-08-25_20-55_lrgb_am.jpg
2008-08-13	jupiter	Antonello Medugno	18.661	100.62	99.467	j2008-08-13_20-59_rgb_am.jpg
2008-08-11	jupiter	Antonello Medugno	58.552	155.81	154.12	j2008-08-11_20-52_rgb_am.jpg
2008-07-10	jupiter	Antonello Medugno	122.57	103.31	93.137	j2008-07-10_23-01_lrgb_am.jpg
2008-07-08	jupiter	Antonello Medugno	162.33	158.37	147.66	j2008-07-08_22-54_lrgb_am.jpg
2007-09-09	jupiter	Antonello Medugno	59.875	209.28	117.92	j2007-09-09_18-14_rgb_am.jpg
2007-08-14	jupiter	Antonello Medugno	296.86	284.48	186.2	j2007-08-14_18-46_rgb_am.jpg
2007-08-12	jupiter	Antonello Medugno	352.17	354.95	256.15	j2007-08-12_19-04_r_am.jpg
2007-08-12	jupiter	Antonello Medugno	33.016	35.444	296.65	j2007-08-12_20-11_rgb_am.jpg
2007-08-12	jupiter	Antonello Medugno	359.48	2.2077	263.4	j2007-08-12_19-16_rgb_am.jpg
2007-07-09	jupiter	Antonello Medugno	92.416	354.02	246.2	j2007-07-09_20-56_ir_am.jpg
2007-07-06	jupiter	Antonello Medugno	4.8331	289.1	180.49	j2007-07-06_21-39_ir_am.jpg
2007-07-01	jupiter	Antonello Medugno	267.07	229.74	119.78	j2007-07-01_20-53_lrgb_am.jpg
2007-07-01	jupiter	Antonello Medugno	252.44	215.23	105.27	j2007-07-01_20-29_rgb_am.jpg
2007-06-29	jupiter	Antonello Medugno	311.78	289.7	179.21	j2007-06-29_20-54_lrgb_am.jpg
2007-06-10	jupiter	Antonello Medugno	159.16	288.58	172.81	j2007-06-10_00-22_lrgb_am.jpg
2007-06-08	jupiter	Antonello Medugno	313.01	90.477	334.43	j2007-06-08_23-03_lrgb_am.jpg
2007-06-03	jupiter	Antonello Medugno	219.87	35.695	278.31	j2007-06-03_22-25_lrgb_am.jpg
2007-05-31	jupiter	Antonello Medugno	97.957	296.73	178.54	j2007-05-31_22-12_lrgb_am.jpg
2007-05-26	jupiter	Antonello Medugno	325.06	208.79	89.041	j2007-05-26_00-48_rgb_am.jpg
2007-05-25	jupiter	Antonello Medugno	251.89	136.26	16.487	j2007-05-25_22-48_rgb_am.jpg
2007-05-12	jupiter	Antonello Medugno	36.816	20.034	256.81	j2007-05-12_23-52_lrgb_am.jpg
2007-05-12	jupiter	Antonello Medugno	36.207	19.429	256.2	j2007-05-12_23-51_lrgb_am.jpg
2007-05-06	jupiter	Antonello Medugno	82.695	118.69	353.63	j2007-05-06_01-50_lrgb_am.jpg
2007-04-29	jupiter	Antonello Medugno	66.392	155.71	28.8	j2007-04-29_02-06_r_am.jpg
2007-04-29	jupiter	Antonello Medugno	80.416	169.62	42.706	j2007-04-29_02-29_ir_am.jpg
2007-04-29	jupiter	Antonello Medugno	60.295	149.67	22.754	j2007-04-29_01-56_lrgb_am.jpg

PVOL 2.0: Data view in gallery, list, table

Fixed URLS (can be linked from outside)

http://pvol2.ehu.es/pvolimages/jupiter/j2010-08-26_23-23_lrgb_am.jpg

Compress data volumes in zip format & download

…

Orientative Development Time Line

- EPN-TAP & EPN_core fully implemented (May; compatibility with VESPA)
- Website outlook fixed (Mid-May)
- First tests (Late-May)
- Full database migration to the new service (June)
- Online (June)
- Fully operative (July)
- Database documented for later developments/ Corrections/Improvements (September-December)

- Work on impacts detections software to start in September (with PSWS)
- End of contract May 2017.
- Data base & Data management at UPV/EHU.
- Future upgrades depending on next Europlanet project (~ 2020)