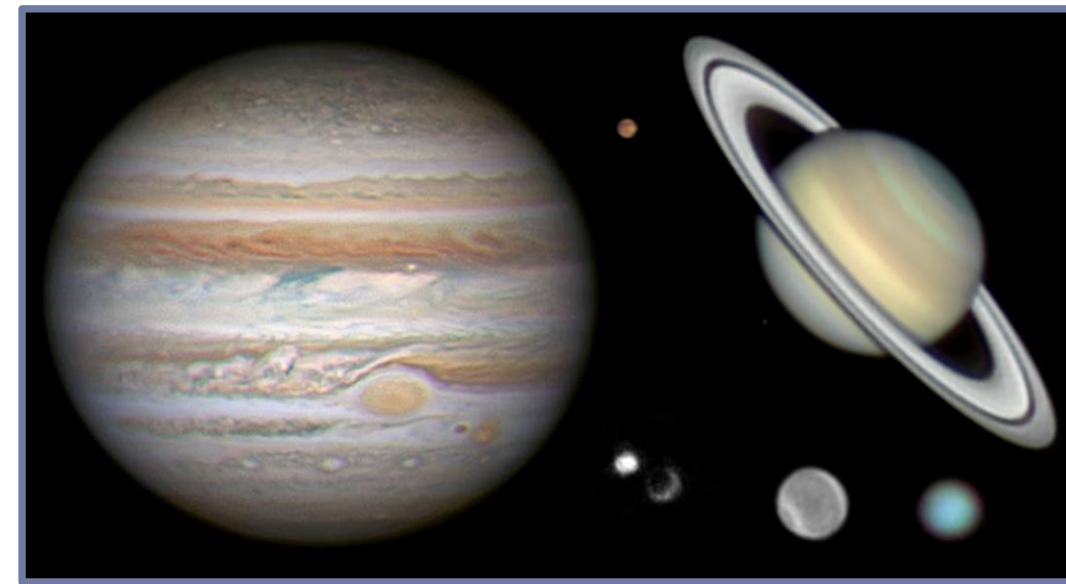
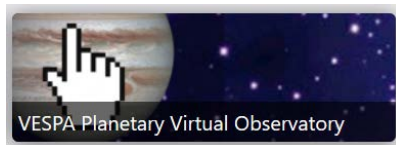


The PVOL amateur images database in Europlanet 2024 RI

Ricardo Hueso, Agustín Sánchez-Lavega, Jon Legarreta,
Iñaki Ordóñez-Etxeberria, Jose Félix Rojas,
Stephane Erard, and Pierre Le Sidaner



<http://pvol2.ehu.es/>



PVOL (Planetary Virtual Observatory and Laboratory) is an online database of amateur observations of solar system planets and includes images of planets and their major moons. PVOL is one of the data services integrated in **VESPA**: a large collection of data services that makes the **Virtual European Solar and Planetary Access services** (<http://vespa.obspm.fr/planetary/data/>).

The PVOL database is fully documented in Hueso et al. Planet. Space Science (2020), freely available at: <https://arxiv.org/abs/1701.01977>

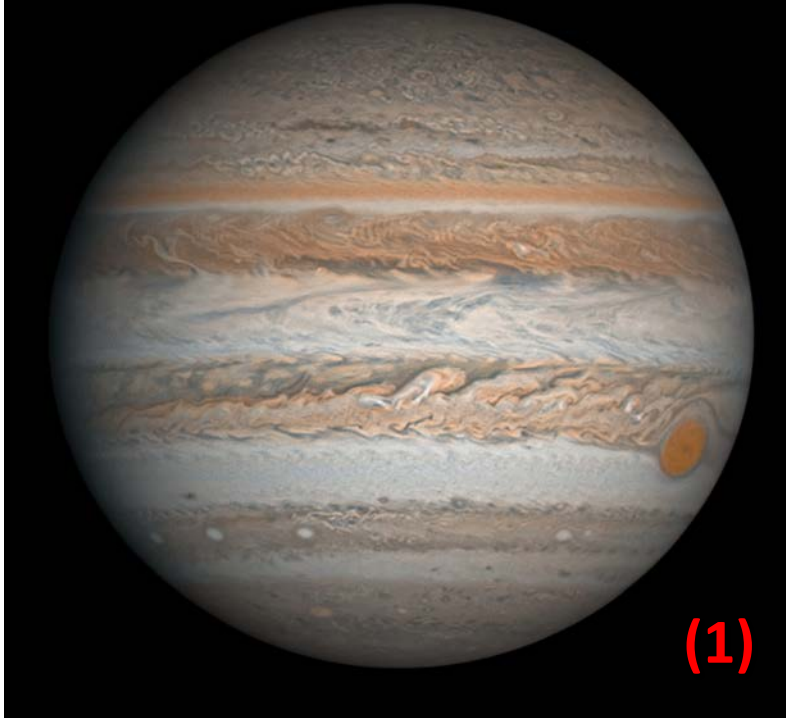
VESPA is documented in Erard et al. Planet. Space Science (2020), freely available at <https://arxiv.org/abs/1705.09727>

Here we document **science outcomes** from the use of images in the PVOL database and **future plans** to implement new characteristics on PVOL through the next few years which include **alert systems**, **navigated images** and a **JunoCam images service** that will allow to put amateur and space images in the same searchable engine.

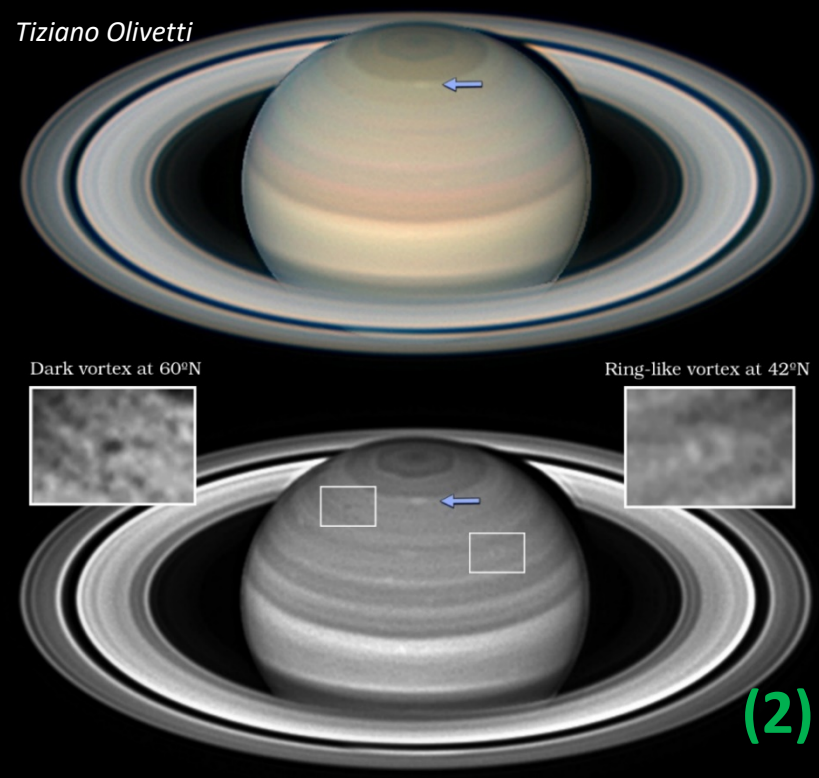
DATA in PVOL

Not ranked by quality but excellent data available to users that know the amateur world

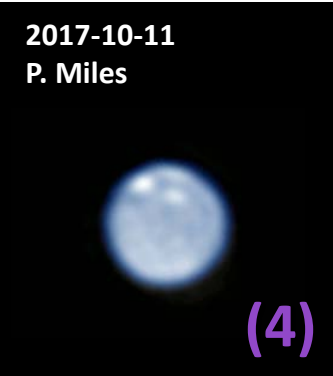
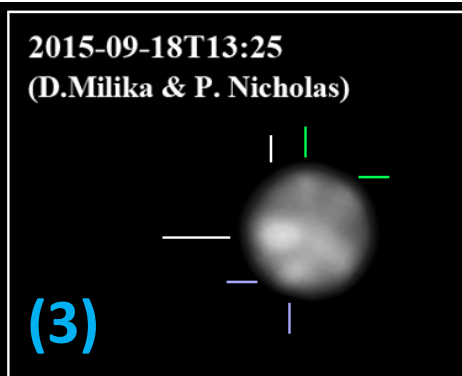
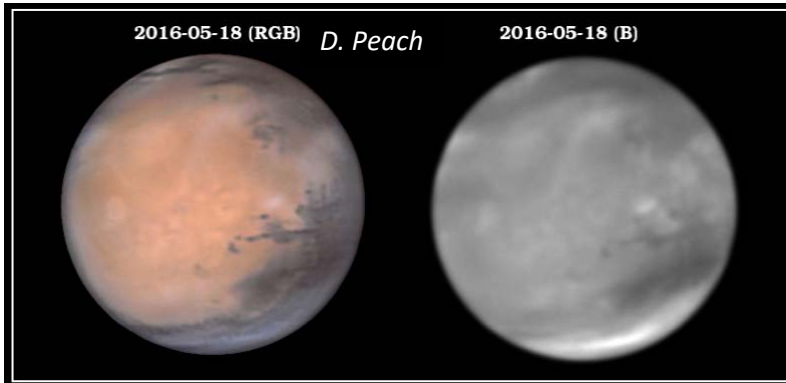
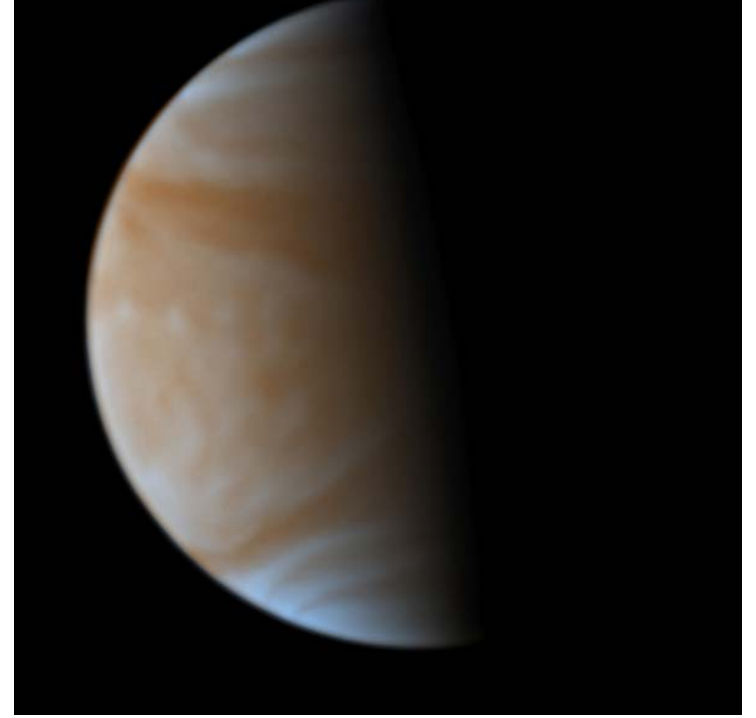
June 10th 2017; Obtained at Pic du Midi, processed by D. Peach



Tiziano Olivetti



June 2017, Obtained at Pic du Midi, processed by D. Peach



Most of these images were key elements in regular publications on the meteorology of these planets and appear in studies that use HST and Keck data. **(1)** *Simon et al. ApJ. (2017)*, **(2)** *Hueso et al. Icarus (2020)*, **(3)** *Hueso et al. Icarus (2017)*; **(4)** *Molter et al. Icarus (2019)*.

DATA CONTENT in PVOL



Home Search data Upload image News Reports Users
Publications from PVOL data External links Jovian impacts |
Venus BepiColombo Flyby Help

News and Observational Alerts

New storm in the NTropZ-NTBs jetstream

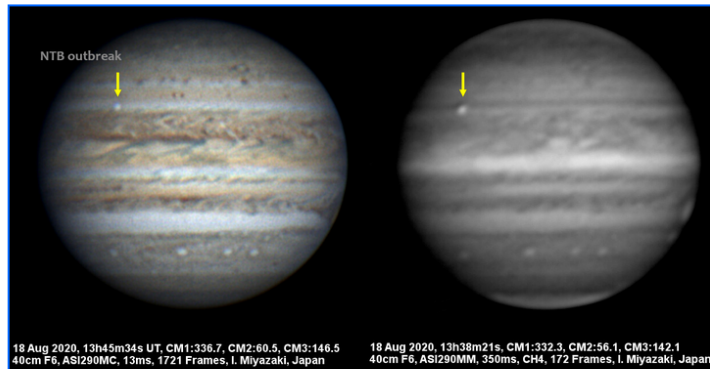
2020-08-18

Isao Miyazaki and John Rogers report on a new very bright spot in the NTropZ visible in images acquired by Isao Miyazaki on 18 August 2020. The storm is visible as a bright spot in visible wavelengths and is very bright in methane band images. This storm is the start of a new outbreak in the NTBs jetstream. Such convective storms produce NTB Disturbance in a regular cycle with the current event occurring one year ahead of the expected timeline.

Observations at all wavelengths and methane band of all longitudes of the planet are required to monitor the NTB. The outbreaks in the NTB are generally multiple with outbreaks separated in longitude tens of degree and initiated with time differences of one to a few Jupiter rotations.

The drift rate of the initial disturbance is -12.2 ± 0.1 %/day (system III) at $22.9 \pm 0.5^\circ$ (Pg). The plume moves at 165 m/s at 22.9° (pg) just a bit south to the NTB peak jet which in 2016-2017 had a peak velocity of 150 m/s. This means that, as predicted from observations of previous events, the convective disturbance moves faster than the zonal winds with the typical behavior of previous disturbances in the NTB.

We would like to encourage observers to observe ALL LONGITUDES in Jupiter combining visible or IR with methane band images. All previous similar disturbances produced different convective plumes in different longitudes. It is very important to catch the initial convective disturbance in its first 2 Jupiter rotations to acquire a quantitative measurement of its initial growth rate which is directly related with the energy released.

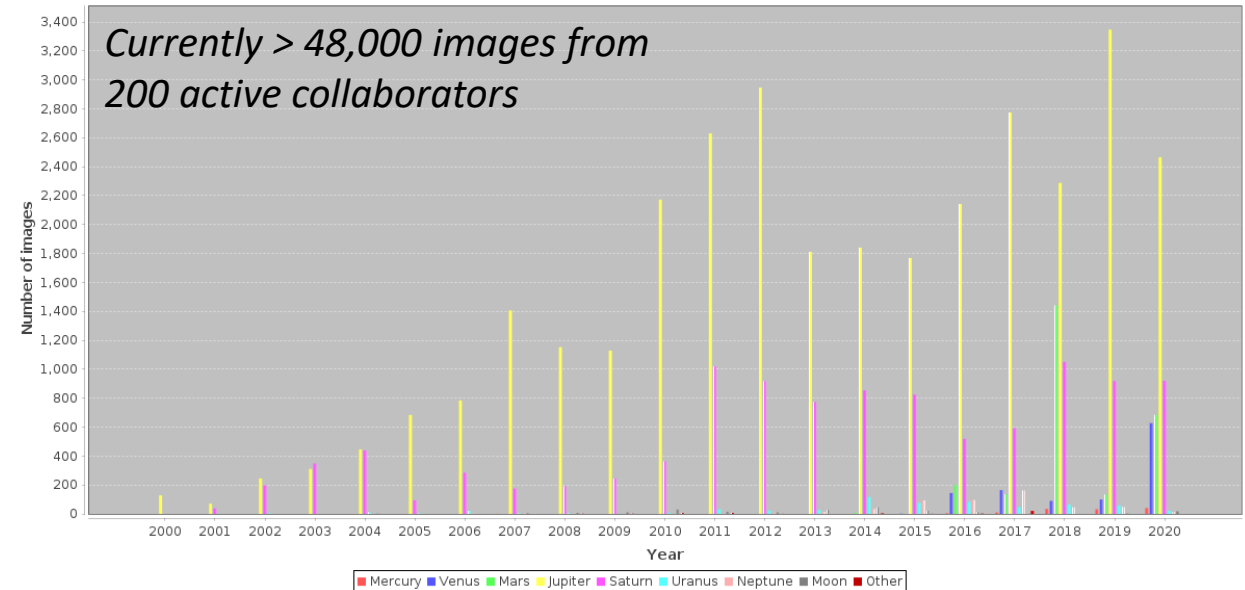


Besides data, PVOL contains a rapid alert system with ephemeris of features of interest. This alert system has been particularly active in 2020 and we plan to improve it.

Home Search data Upload image News Reports Users Publications from PVOL data External links
Jovian impacts | Venus BepiColombo Flyby Help

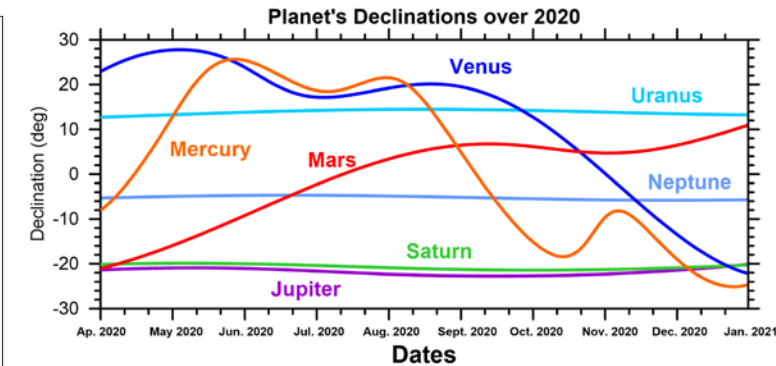
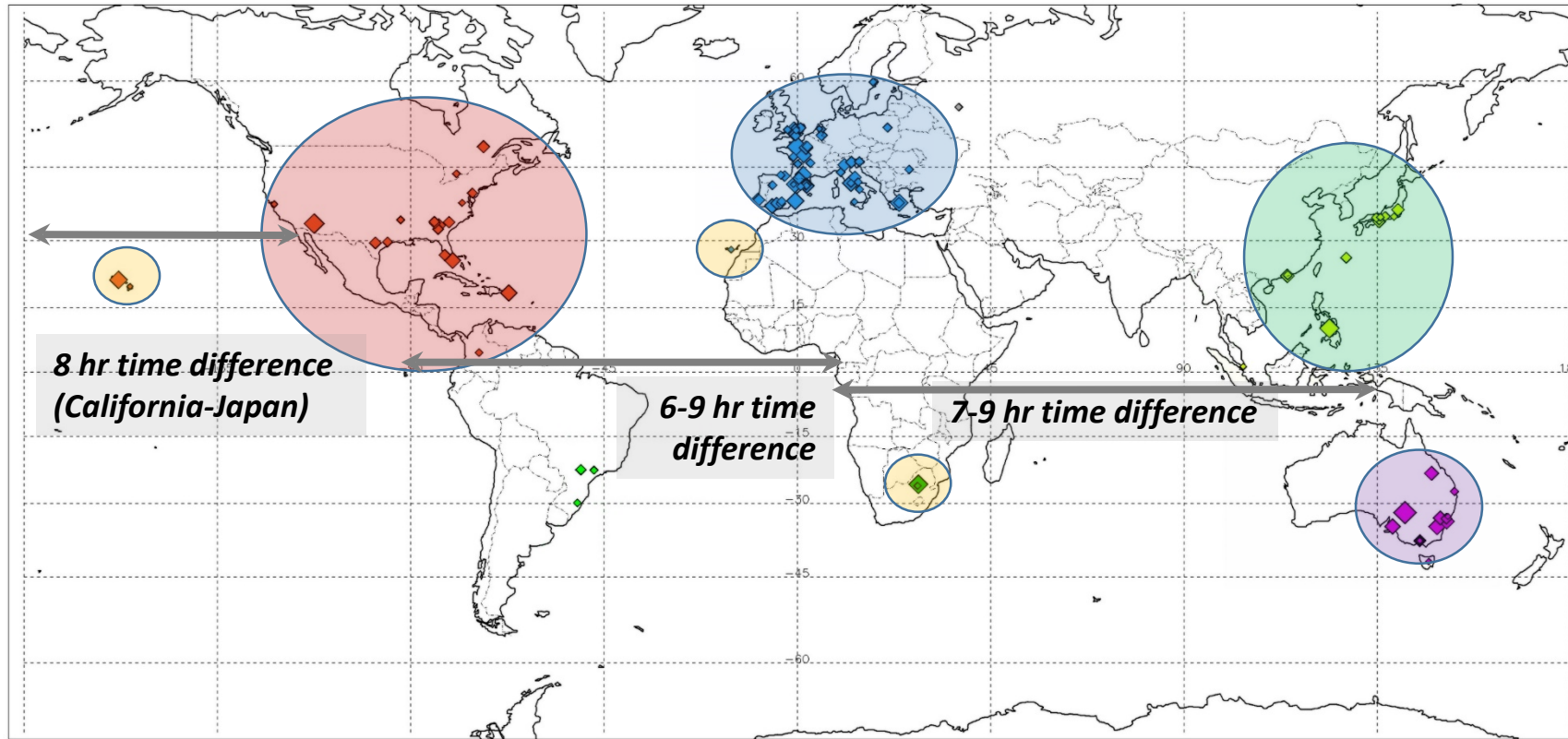
The PVOL upper header contains links to publications and how to join research on Jovian impacts or participate in observing campaigns.

Images per body per year



This high number of observations strengthened by the high quality of a great part of them allows to find complete time-series of atmospheric phenomena in planets like Jupiter and Saturn, the development of global dust storms in Mars, the evolution of cloud features close to the arrival of different mission to Venus (Akatsuki in 2015 but also flybys of Parker Solar Probe and BepiColombo in 2020) or the changing cloud patterns of Neptune as documented in the [publication list](#).

PVOL Contributors



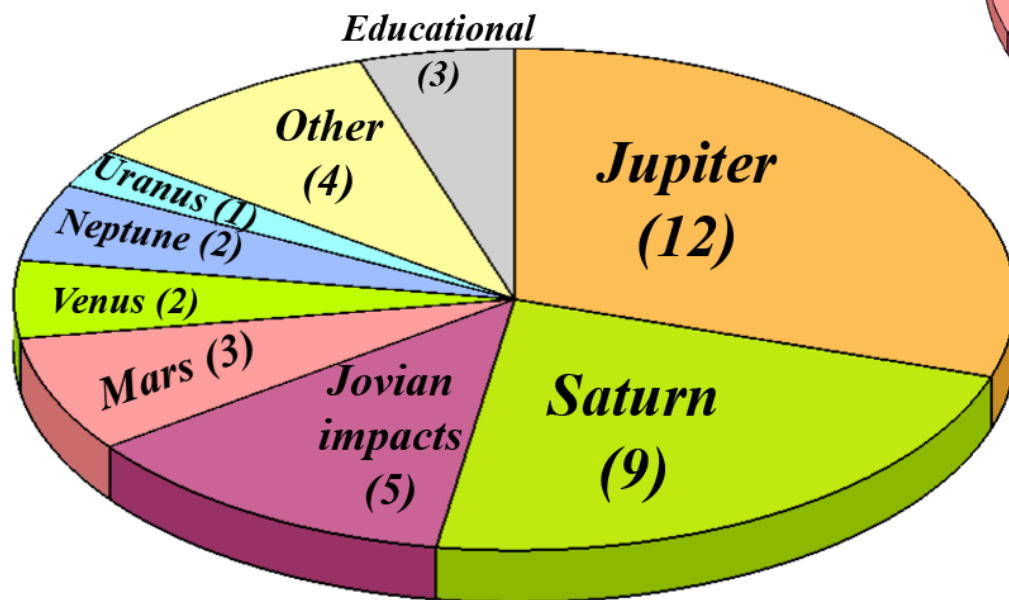
Although the largest number of observers are in the North hemisphere the concentration of excellent observers in equatorial latitudes, Australia, South Africa and Brazil offers an excellent monitoring of all planets no matter what their declination is.

About 100 observers concentrate 92% of the submissions (here each symbol signals a given observer with the size of the symbol proportional to the log of the images submitted). Most of these frequent observers are also those **obtaining consistently excellent results**. The combination of data from **US, Europe, South Africa, Thailand, Phillipines, Japan and Australia** results in an **efficient monitoring of planets as the Earth rotates**. The 6-10 hr time difference between these concentrations of observers is excellent to match the rotation period of Jupiter and Saturn obtaining full maps of the planets but also consistent monitoring in each single rotation. Nearly uniquely placed observers in South Africa, Hawaii and Canary Islands provide very useful data due to the time-zones and latitudes they cover. **More observers in the middle East, Central Asia and South America would put this network into a full monitoring potential.**

PVOL Science

40 publications use data from the PVOL database

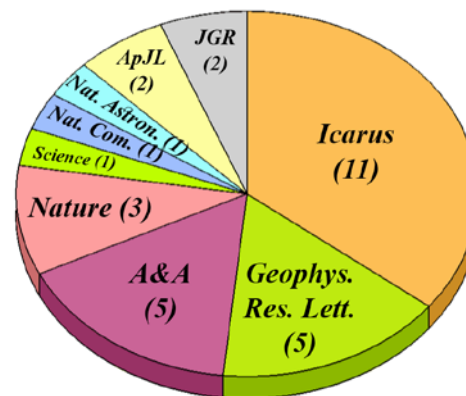
First authors from Spain, US, UK and France with frequent coauthors in the amateur community



All publications that we are aware of based on relying on amateur data obtained in PVOL are listed at:

<http://pvol2.ehu.eus/pvol2/publications>

FINDING THE UNEXPECTED: The extremely efficient monitoring of amateurs has resulted in discoveries of unexpected storms, high atmospheric phenomena and large and small impacts.

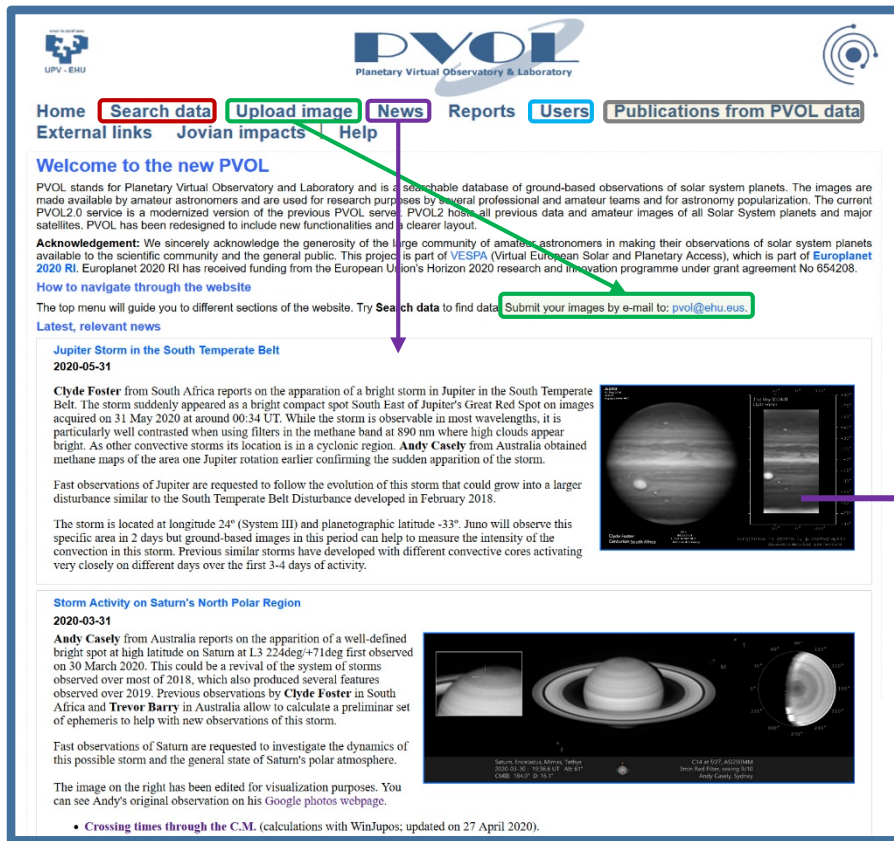


Selection of high-impact results



Current PVOL

A fully searchable online database with excellent observations and some limited news and alerts. **Please keep submitting your images to pvol@ehu.eus**



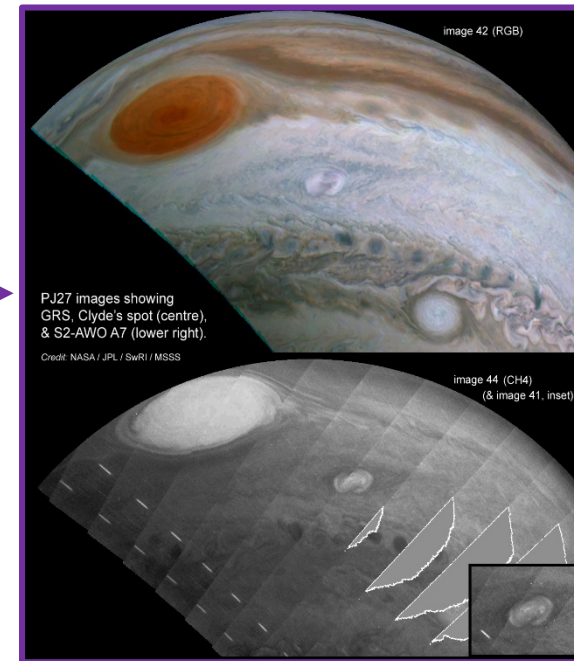
Future PVOL

With funding from Europlanet 2024 RI we plan 3 major improvements:

(1) Include ims files that will allow to retrieve navigated images with WinJupos

(2) Improve the news & alert system

(3) Add JunoCam images into our search engine with different science products including maps in different geometries. This should foster more Jupiter collaborations as recently demonstrated by *Clyde's spot*.



Acknowledgements: Europlanet 2024 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149. We are very grateful to the ensemble of amateur astronomers sending their data to PVOL.