



## EPN 2024 RI

### EUROPLANET 2024 Research Infrastructure

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#### Executive Summary / Abstract:

During the first year of the project, VA-VESPA has published 3 new data services and updated the oldest ones. Since the first two scheduled workshops proved difficult to organize, older projects from Europlanet-2020-RI were restarted with external contributors and will be published in the coming weeks. The PVOL amateur service has expanded dramatically with image surveys of Venus, Mars and Jupiter in support of current space missions. Sustainability of existing data services has been strengthened by setting up a VESPA hub that maintains definition files, and by entering the validation process of VESPA access standards. New tutorials have been published. VESPA is now part of the IPDA consortium which organizes access to planetary data from space missions, representing the Europlanet Society

1. **Nature:** R = Report, P = Prototype, D = Demonstrator, O = Other

2. **Dissemination level:**

PU	PP	RE	CO
Public	Restricted to other programme participants (including the Commission Service)	Restricted to a group specified by the consortium (including the Commission Services)	Confidential, only for members of the consortium (excluding the Commission Services)

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## Deliverable

### 1. Explanation of work & Overview of progress

#### 1.1 Objectives

##### VESPA-VA (VA2, WP6)

Task 1. Coordination — ObsParis, JacobsUni + CBK-PAN

Task 2. Enlarging VO content (beneficiaries) – BIRA/IASB, ObsParis + All

Design and implementation of services from beneficiaries

Task 3. Enlarging VO content (external AO) – JacobsUni, OeAW/IWF + CBK-PAN, ObsParis, CNRS/IRAP

Design and implementation of services from calls to the community and collaborations

Task 4. Amateur community linking / services – UPV/EHU, OeAW/IWF + ObsParis

Design and implementation of selected services from the amateur astronomy community

Task 5. Consolidation – INAF/OATs, Heidelberg Uni + ObsParis

A system to preserve data service definition files, perform technical reviews, and deploy them on EOSC when relevant

Task 6. Standards & Sustainability – ObsParis, Heidelberg Uni + JacobsUni, Bristol Uni

Publication of VESPA standards, contribution to other standards of interest, dissemination through consortia and conferences

### 1.2 Explanation of the work carried per WP

The first deliverable in VESPA is the present report. The milestone (MS) 7 for 2020, associated to the first Implementation Workshop, has been delayed to month 15.

The schematic VESPA infrastructure is summarized in Fig. 1 of the VESPA JRA section to help follow this discussion.

#### Task 1.

Coordination of the two VESPA WPs has focused on starting and maintaining coordinated activity, e.g. by organizing bi-monthly topical videocons during the first semester, and focused discussions in smaller groups later on. Due to a very busy schedule since September (EPSC, then Council, then international involvements in the same field), plenary videocons have not restarted after summer.

## Task 2.

In addition to services with evolving content, many older services from beneficiaries were updated or upgraded during the first year. These include:

APIS (planetary aurora observations), BASS2000 (composite solar database from several observatories), HRSC3nd (nadir images from Mars-Express), HST\_planeto (HST planetary data), Mars\_craters (reference catalogue), NDA (Jupiter radio observations from Nançay), Titan\_profiles (atmospheric profiles from Cassini CIRS), Venus\_atm\_profiles (atmospheric profiles from VEx SOIR), VVEx (VIRTIS on Venus-Express, now encompassing the complete dataset with geometry information from the PI database).

- Other services are being updated: Basecom (comet radio observations from Nançay), NASA dust catalogues (IDP catalogues with X spectra in INAF). More are being prepared.
  - SSHADE hosted 80+ new datasets and 1500+ more spectra in 2020, plus additional partners. A system to handle band lists of solids is being developed, and tested with various ices (CO, SO<sub>2</sub>, N<sub>2</sub>...).
- A SSHADE virtual meeting was held with the 7 new partners from Finland, Greece, Italy, France, Brazil and China to organize the creation of their database and plan the training of database managers.

## Task 3.

Although the first Implementation Workshop has been delayed (see section 5.1), several services have been published from external collaborations:

- SBNAF: the database from the H2020 programme Small Bodies Near And Far in Konkoly Obs;
- VIMS\_satellites, providing Cassini/VIMS calibrated spectral cubes with geometry in LPG Nantes;
- JASMIN: Jovian thermosphere models for winds and temperature in UCL London.

Other services are nearly completed and will be published early 2021:

- eCallisto: large database of solar radio observations worldwide with continuous time coverage, in Geneva (from the 2019 VESPA workshop in Rome);
- GAIA-DEM: SDO measurements of the thermal structure of the Solar coronal plasma, in Orsay (from the 2018 VESPA workshop in Prague);
- Herschel planetary observations in ESA.

## Task 4.

PVOL content is increasing faster and faster and now includes more than 50,000 amateur images. Observations in support of the Venus flybys by the Parker Solar Probe and BepiColombo spacecraft were added, as well as monitoring of the current opposition of Mars, and the follow-up of large-scale convective eruptions at Jupiter. Inclusion of amateur spectra of planets is being assessed (in addition to images), for the moment as spectral plots and analysis from the amateurs themselves. Jupiter images obtained by JunoCam on the Juno spacecraft are being prepared for inclusion in PVOL as preprocessed cylindrical and polar maps, with navigation information.

## Task 5.

The main activity for the first year is the design and installation of a series of VESPA hubs maintaining the metadata and definition files of all published services. The study was in favour of a common gitlab with authentication services granting access to external persons – so that the 3 hub teams will manage all services in a single repository. The system is in place (in ObsParis) and being populated, it has already been used to interact on updated and new services (via gitlab issues). In the mid-term, these services can be deployed on EOSC from there when needed.

Two systems of doi attached to the data have been installed, the first one internal to SSHADE, the second for general use in VESPA – the latter is being tested on BASS2000 and MASER datasets.

## Task 6.

Considerable effort has been made to address sustainability:

- The EPN-TAP protocol and EPNCore metadata set from VESPA is now an IVOA Working Draft, under review from the community. It has also been presented to the IPDA and to the NASA Planetary Data Ecosystem Independent Review Board for discussion.

- An associated EPN-TAP local data dictionary has been placed in the PDS4 registry, which is the basis for interoperability with NASA planetary archives.
- The SSDM Data Model from SSHADE has been finalized and published on its website. A complete documentation of interface tools and codes has been written to guaranty sustainability of software developments.
- Many interactions with international consortia and projects, as detailed in next section (Impact).
- A paper was published in a peer-reviewed journal to summarise the outcome of VESPA in Europlanet-2020 and the project for the current programme. Another paper was published concerning the MASER service and links to radio observations and simulations.
- Seven other peer-reviewed papers using VESPA have been published.
- A new, simplified tutorial to install services has been produced.

### 1.3 Impact

No deviation is expected for impact . In practice, several actions have been conducted during the first year:

- Discussions in France around two future data hubs supported by CNES for Planetary surfaces and Small bodies, to which VESPA should provide interoperability.
- Increasing importance of data access according to FAIR principles at political level in many EU countries. For Planetary Science and Heliophysics, we expect the Europlanet hubs to promote the VESPA system at this scale.
- Implication with dedicated projects, such as DACE/PlanetS in Switzerland for exoplanets and extra-terrestrial materials. A collaboration with ISSI-BJ and Macau Univ has also been discussed.
- VESPA is tightening links with space agencies, through representation of the Europlanet Society in IPDA, participation to the NASA Planetary Data Ecosystem review board, and additional projects with ESA (e.g., planetary observations by Herschel) and NASA (EPN-TAP data dictionary).
- Continuous involvement in international consortia such as IVOA in astronomy, IHDEA for heliophysics, Research Data Alliance, and EOSC-related bodies.
- Although the current circumstances are not optimal, contacts have been made during conferences (EGU, EPSC, AGU) with teams looking for on-the-shelf solutions to distribute their data from various projects (including H2020 ones). In more normal times, such projects would be natural candidates for VESPA Implementation Workshops, although these have proven difficult to organize (see below).
- Dedicated data sessions were held during EPSC and AGU conferences, and some teams were involved in the amateur astronomy sessions.

### 1.4 Access provisions to Research Infrastructures

Data access is difficult to monitor with a system of distributed servers. It can however be interpolated from stats of the main Planetary Science server in ObsParis, which hosts 25% of VESPA services, then checked for consistency with analysis of connections on the heliophysics and radio servers (another 25%). Altogether, we estimate server accesses from 400-700 unique visitors, 1500 visits, and ~4 GB of data downloaded per month. The largest share is still from JAXA (nearly 50%), ESA, NASA, then academic institutes in Europe and some in the US. Interestingly, we measure an increasing weight of traffic from Romania and China in recent months.

Access stats on the servers are more comprehensive than the portal's, as they also reflect connections via tools, command line, and other APIs. The figures above are still difficult to interpret, and we're looking for a way to improve this.

From February to November, the VESPA portal alone (<http://vespa.obspm.fr>) has received ~ 160 visits / month. Europe: 68%, N America: 20%, Asia: 9%, Other 3%.

The public web site (<http://www.europlanet-vespa.eu/>, entry to tutorials and docs) has received 120 visits / month, with marked peaks in April and early October (during EPSC).

The VESPA Confluence wiki (<https://voparis-wiki.obspm.fr>, with more technical information) has 400 connections / month with a low during summer followed by a large upturn in September.

SSHADE is simpler to monitor, as regular users are registered - there are currently 230 of them. The main access is through a single dedicated interface, not the VESPA portal; SSHADE access stats should be added to the VESPA servers above.

Raw stats indicate 910 visitors and 1800 visits per month for 2.1 GB downloaded each month. N America: 20%, Europe: 58%, Asia: 18%, Other 5%.

PVOL now has 405 registered contributors (~ 50 more in 2020), and the service content enlarged by 15% in 2020. Since it opened in 2000, this reflects a very strong increase in use.

## 2. Updated exploitation & dissemination plan

Exploitation and dissemination will carry on as planned in the DoA, although flexibility is of course required to adapt to evolution of national policies.

Future implementation workshops are however difficult to schedule, owing to the pandemic situation. During this period, we focused on projects partly designed during past workshops (in the previous RI; Europlanet-2020-RI) but not finalized at that time.

## 3. Update of data management plan

A first version of the VESPA DMP section was provided to Management in June 2020 and included in Deliverable D1.3. It will be updated and enlarged each year to cover new data services.

## 4. Follow-up of recommendations & comments from previous review(s)

The report from the VA Review Board was received mid-December, and has been reviewed by the VA management team:

- The second public call for services will be open in February 2021.
- Suggested modifications on the public web site have been implemented (e.g., more links to other VAs), and the VESPA internal monthly reports will be open to the Review Board.
- Mention of little progress on bringing in content from the amateur community is actually inaccurate. Most of this activity currently focuses on bringing new content to the PVOL service. The eCallisto project (a worldwide network of solar radio detectors which includes amateur contributions) has received an EPN-TAP interface that will be published in the coming weeks. Finally, RadioJove activity is also restarting on the US side, and we therefore hope to enlarge the current draft service in the coming year. Another amateur project will be selected during year 3.
- DMP: the VESPA section was provided in due time to Management, and included in Deliverable D1.3.
- New tutorials: a new simplified tutorial for beginner was finalized in November 2020, but is somewhat hidden in the VESPA wiki. Visibility has been increased on the web site. Another tutorial (EPN-TAP service access from Jupyter notebooks) has been published in the github in January 2021.

## 5. Deviations from Annex 1 (DoA)

### 5.1 Tasks (VA):

A call for projects and an associated workshop were scheduled at the onset of the programme. Two external teams were selected from the call, together with internal and collaborative projects, to be studied and possibly implemented during the 1-week workshop to be held in Toulouse in April 2020. This was of course delayed until now. We studied the feasibility of an on-line replacement in December, but this proved impossible to organize given the constraints in the supporting institutes. We will manage otherwise, probably in smaller groups. Meanwhile, we focus on older projects from the previous EPN-2020 programme.

Foreseen impact: the workshop was to be followed by a report (both organized by IRAP/CNRS), also delayed, and was also intended to collect user inputs about the main VESPA portal, as a basis for an improved design (SpaceFrog and ObsParis). User inputs have been collected online and from direct discussions, although probably in lesser amount.

Finally, a second workshop is scheduled in April 2021 in Bremen (JacobsUni) and is also at risk. Contingency plans are being drawn up.

- Of course, some team activities have been slowed down in some institutes because of lockdown periods and collisions with teaching schedules and activities on space missions.

- Too much activity in the coordinating teams made organising WP telecon impossible since September (preparation and running of EPSC virtual conference, EPN Council, reports, dissemination activities at national and international levels etc.).
- Finally, the main VESPA/SSHADE engineer at CNRS/IPAG was hired to a permanent position, but on a different project. A young engineer has taken over, but will be on maternity leave from March.

## **5.2 Use of resources**

Resources were redefined in the recent amendment, no modification since.

### **5.2.1 Unforeseen subcontracting**

In the VA, one contract has been started with Univ. of Heidelberg, as detailed in the GA. No unforeseen contract added.

### **5.2.2 Unforeseen use of in-kind contributions from a 3rd party against payment or free of charge**

None in the VA