



# EPN2020-RI

**EUROPLANET2020 Research Infrastructure**

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## **Deliverable 5.7 PSWS Annual Report (third year)**

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Responsible WP Leader: CNRS, Nicolas André

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| <b>Dissemination level</b>   |   |   |
| <b>PU</b>  | Public  | x |
| <b>PP</b>  | Restricted to other programme participants (including the Commission Service)         |   |
| <b>RE</b>  | Restricted to a group specified by the consortium (including the Commission Services) |   |
| <b>CO</b>  | Confidential, only for members of the consortium (excluding the Commission Services)  |   |

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| <b>Project Title</b>    | EPN2020 - RI                                  |
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| <b>Author (s)</b>                    | Nicolas Andre (CNRS)            |

**Abstract:** Under Horizon 2020, the Europlanet 2020 Research Infrastructure (EPN2020-RI) includes an entirely new Virtual Access Service, “Planetary Space Weather Services” (PSWS) that extends the concepts of space weather and space situational awareness to other planets in our Solar System and in particular to spacecraft that voyage through it. PSWS provide twelve new services to the research community, space agencies, and industrial partners planning space missions. These services are in particular dedicated to the following key planetary environments: Mars (in support of the NASA MAVEN and European Space Agency (ESA) Mars Express and ExoMars missions), comets (building on the outstanding success of the ESA Rosetta mission), and outer planets (in preparation for the ESA JUPITER ICy moon Explorer mission), and one of these services aims at predicting and detecting planetary events like meteor showers and impacts in the Solar System. This gives the European planetary science community access to new methods, interfaces, functionalities and/or plugins dedicated to planetary space weather as well as to space situational awareness in the tools and models available within the partner institutes. The present report summarizes the status of the project after the third year.

## Contents

|   |    |
|---|----|
| <b>1. Continuous reporting</b> .....  | 4  |
| <b>1.1 Publications</b> .....   | 4  |
| <b>1.2 Dissemination</b> .....  | 4  |
| <b>1.3 Deliverables</b> .....   | 7  |
| <b>1.4 Milestones</b> .....   | 8  |
| <b>2. Explanation of the work carried out by the beneficiaries and Overview of the progress</b> ..... | 8  |
| <b>2.1 Objectives</b> .....   | 8  |
| <b>2.2 Explanation of the work carried per WP</b> .....   | 8  |
| <b>2.3 Impact</b> .....   | 10 |
| <b>2.4 Statistics</b> .....   | 11 |
| <b>2.5 Access</b> .....   | 12 |
| <b>3. Deviations from Annex 1</b> .....   | 13 |
| <br>Annex 1. PSWS participants.....   | 13 |

## 1. Continuous reporting

The following sections are also fed into the portal, under the continuous reporting, so that this document constitutes part of the second periodic report, for the third year of the project (PM24-PM36).

### 1.1 Publications

7 in total, including 3 for this period

1. N. André, M. Grande, N. Achilleos, M. Barthélémy, M. Bouchemit, K. Benson, P.-L. Blelly, E. Budnik, S. Caussarieu, B. Cecconi, T. Cook, V. Génot, P. Guio, A. Goutenoir, B. Grison, R. Hueso, M. Indurain, G.H. Jones, J. Liliensten, A. Marchaudon, D. Matthiä, *et al.*, Virtual Planetary Space Weather Services offered by the Europlanet H2020 Research Infrastructure, PV2018: proceedings of the 2018 conference on adding value and preserving data: ensuring the long-term preservation and value adding to scientific and technical data, <https://epubs.stfc.ac.uk/work/37981055>
2. Hueso, R.; Delcroix, M.; Sánchez-Lavega, A.; Pedranghelu, S.; Kernbauer, G.; McKeon, J.; Fleckstein, A.; Wesley, A.; Gómez-Forrellad, J. M.; Rojas, J. F.; Juaristi, J., Small impacts on the giant planet Jupiter, *Astronomy & Astrophysics*, doi:10.1051/0004-6361/201832689, 2018
3. Bocchialini, K.; Grison, B.; Menvielle, M.; Chambodut, A.; Cornilleau-Wehrlin, N.; Fontaine, D.; Marchaudon, A.; Pick, M.; Pitout, F.; Schmieder, B.; Regnier, S.; Zouganelis, I., Statistical Analysis of Solar Events Associated with Storm Sudden Commencements over One Year of Solar Maximum During Cycle 23: Propagation from the Sun to the Earth and Effects, *Solar Physics*, 2018, 10.1007/s11207-018-1278-5.

### 1.2 Dissemination

56 in total, including 42 for this period

1. Dósa, M.; Opitz, A.; Szegő, K., Magnetic lasso: a new solar wind propagation method and its application concerning space weather at 67P/C-G, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-635PV
2. Opitz, A.; Szego, K.; Dalya, Z.; Timar, A.; Nemeth, Z.; Dosa, M.; Vech, D.; Andre, N., Validity and reliability of space weather predictions at Venus, Mars and Comet 67P, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-631
3. Nemeth, Z.; Dósa, M.; Goetz, C.; Madanian, H.; Opitz, A.; Richter, I.; Szego, K.; Timar, A., Estimating the solar wind pressure at comet 67P from Rosetta magnetic field measurements, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-612
4. Nathanaël, J.; Cecconi, B.; André, N.; Bouchemit, M.; Gangloff, M.; Budnik, E.; Jacquy, C.; Pitout, F.; Durand, J.; Rouillard, A.; and 6 coauthors, Interoperability science cases with the CDP tools, American Geophysical Union, Fall Meeting 2017, abstract #IN11C-0043
5. Cecconi, B.; Le Sidaner, P.; André, N.; Marmo, C., VOEvent for Solar and Planetary Sciences, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-908
6. Gangloff, M.; André, N.; Génot, V.; Cecconi, B.; Le Sidaner, P.; Bouchemit, M.; Budnik, E.; Jourdan, N., Implementation of a Space Weather VOEvent service at IRAP in the frame of

Europlanet H2020 PSWS, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-263

7. André, N.; Génot, V.; Budnik, E.; Bouchemit, M.; Gangloff, M.; Blanc, M.; Louarn, P., CDPP support to the Juno and Cassini missions: data access and valorization by models and tools, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-202

8. André, N.; Grande, M.; PSWS Team, Planetary SpaceWeather Services for the Europlanet 2020 Research Infrastructure, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-196

9. André, N.; Génot, V.; Rouillard, A.; Bouchemit, M.; Caussarieu, S.; Beigbeder, L.; Toniutti, J.-P.; Popescu, D., Extensions of the CDPP/Propagation tool to the case of comets, giant planet auroral emissions, and catalogues of solar wind disturbances, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-195

10. Goutenoir, A.; Bouchemit, M.; Budnik, E.; Tao, C.; André, N.; Génot, V., An heliospheric propagation model for solar wind prediction at planets, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-191

11. Indurain, M.; Goutenoir, A.; Bouchemit, M.; Blelly, P.-L.; Marchaudon, A.; Gangloff, M.; Jourdane, N.; André, N.; Génot, V., A Transplanet model of magnetosphere-ionosphere coupling at Earth, Mars, Jupiter, (Saturn and Venus), European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-190

12. Genot, V. N.; Cecconi, B.; Dufourg, N.; Gangloff, M.; André, N.; Bouchemit, M.; Jacquy, C.; Pitout, F.; Rouillard, A.; Nathanaël, J.; and 5 coauthors, CDPP supporting tools to Solar Orbiter and Parker Solar Probe data exploitation, American Geophysical Union, Fall Meeting 2017, abstract #SH23D-2677,

13. Achilleos, N.; Guio, P.; Arridge, C. S., Modelling Magnetodisc Response to Solar Wind Events, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-899

14. Guio, P.; Sergis, N.; Achilleos, N.; Sorba, A. M.; Roussos, E.; Arridge, C. S.; Balasis, G.; Dougherty, M. K.; Giannakis, O.; Hamilton, D. C.; and 4 coauthors, Mapping Saturn's Night Side Plasma Sheet Using Cassini's Proximal Orbits., American Geophysical Union, Fall Meeting 2017, abstract #SM33A-2632

15. Yates, J. N.; Ray, L. C.; Achilleos, N., Magnetosphere - Ionosphere - Thermosphere (MIT) Coupling at Jupiter, American Geophysical Union, Fall Meeting 2017, abstract #SM33C-2667

16. Guio, P.; Staniland, N.; Achilleos, N.; Arridge, C. S., Trapped Particle Motion In Magnetodisc Fields, American Geophysical Union, Fall Meeting 2017, abstract #SM33C-2668

17. Sorba, A. M.; Achilleos, N.; Guio, P.; Arridge, C. S.; Dougherty, M. K.; Sergis, N., The Periodic Flapping and Breathing of Saturn's Magnetodisk During Equinox, American Geophysical Union, Fall Meeting 2017, abstract #SM33C-2682

18. Kuznetsova, M. M.; Heynderickz, D.; Grande, M.; Opgenoorth, H. J., Towards a Global Hub and a Network for Collaborative Advancing of Space Weather Predictive Capabilities., American Geophysical Union, Fall Meeting 2017, abstract #SH32B-02

19. Alzate, N.; Grande, M.; Matthiae, D., Mars Radiation Surface Model, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-1000
20. Jones, G. H., A software tool for the finding of potential cometary tail crossings, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-871
21. Delcroix, M.; Hueso, R.; Juaristi, J.; Sánchez-Lavega, A., DeTeCt planetary impact detection project-frequency estimations and big data set secondary results, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-904
22. Juaristi, J.; Delcroix, M.; Hueso, R., Sánchez-Lavega, A., DeTeCt 3.0: A software tool to detect impacts of small objects in video observations of Jupiter obtained by amateur astronomers, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-757
23. Gangloff, M., N. André, V. Génot, B. Cecconi, P. Le Sidaner, A Space Weather VOEvent service provided by the CDPF in the frame of Europlanet H2020 PSWS, PV2018: adding value and preserving data: ensuring the long-term preservation and value adding to scientific and technical data, Harwell, UK, 15-17 May 2018
24. N. André, M. Grande, N. Achilleos, M. Barthélémy, M. Bouchemit, K. Benson, P.-L. Blelly, E. Budnik, S. Caussarieu, B. Cecconi, T. Cook, V. Génot, P. Guio, A. Goutenoir, B. Grison, R. Hueso, M. Indurain, G.H. Jones, J. Liliensten, A. Marchaudon, D. Matthiä, *et al.* , Virtual Planetary Space Weather Services offered by the Europlanet H2020 Research Infrastructure, PV2018: adding value and preserving data: ensuring the long-term preservation and value adding to scientific and technical data, Harwell, UK, 15-17 May 2018
25. A. Opitz, M. Dosa, A. Timar, Effect of solar wind source variation events on planetary plasma environments, ESLAB 52nd Symposium on Comparative Aeronomy and Plasma Environment of Terrestrial Planets, ESA-ESTEC, Noordwijk, Netherlands, 14-18 May 2018
26. N. André, et al., Planetary Space Weather Services for the Europlanet 2020 Research Infrastructure, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
27. N. André et al., An heliospheric propagation model for solar wind prediction at planets, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
28. N. André et al., Extensions of the CDPF/Propagation tool to the case of comets, giant planet auroral emissions, and catalogues of solar wind disturbances, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
29. G.H. Jones et al., Estimating solar wind speeds from comet ion tail images, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
30. G.H. Jones et al., A software tool for the finding of potential cometary tail crossings, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
31. M. Grande et al., Mars Radiation Surface Model, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018

32. J. Guo et al., A generalized approach to model the spectra and radiation dose rate of solar particle events in deep space and on the surface of Mars, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
33. N. Andre et al., A Transplanet model of magnetosphere-ionosphere coupling at Earth, Mars, Jupiter, (Saturn and Venus), 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
34. M. Gangloff et al., Implementation of a Space Weather VOEvent service at IRAP in the frame of Europlanet H2020 PSWS, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
35. A. Opitz, Planetary and cometary space weather predictions from observations near and far, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
36. T.A. Cook et al., Automatic Lunar Flash Investigation (ALFI) Software, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
37. B. Grison et al., Testing space weather connections in the solar system, 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
38. J. Guo et al., Revealing the pivot energy of SEPs contributing to the Martian surface radiation environment , 14<sup>th</sup> European Space Weather Week (ESWW), Oostende, November 27, 2018
39. Matthiä, D.; Berger, T., Modelling the radiation on the Martian surface, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-655
40. B. Grison et al., Testing space weather connections in the solar system, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-178, 2017
41. B. Grison, J. Soucek, V. Krupar, D. Písa, O. Santolik, U. Taubenschuss and F. Nemeč, Testing space weather connections in the solar system, European Planetary Science Congress 2017, held 17-22 September, 2017 in Riga Latvia, id. EPSC2017-178
42. B. Grison, J. Soucek, V. Krupar, O. Santolik, D. Pisa, U. Taubenschuss, F. Nemeč, ICME SHOCK DECELERATION BETWEEN MERCURY AND 1 AU, Solar Wind 15 conferece, June 2018, Bruxelles

### 1.3 Deliverables

- D5.7 D63 PSWS Annual Report (third year), PM36  
This document.
- D5.2 D56 PSWS VA Review Board Report (second year), PM28
- D5.10 D133 Small impacts on the giant planet Jupiter: the March 2016 and May 2017 impacts, PM29
- D5.11 D134 DeTeCt3.1: Jupiter Impact detection software + updated documentation and webpage, PM30

## 1.4 Milestones

- MS35: 2<sup>nd</sup> PSWS Coordination Meeting, PM25

Date: 19 September 2017 14:00-17:30

Place: Riga, Radisson Blue Hotel, Latvia

<http://meetingorganizer.copernicus.org/EPSC2017/session/26067>)

- MS84- Prototype Diary Service, PM25

Date: 18 September 2017 14:00-17:30

Place: Riga, Radisson Blue Hotel, Latvia

- MS85- Prototype Alert Service, PM26

Date: 10 October 2017

Place: IRAP, Toulouse, France

## 2. Explanation of the work carried out by the beneficiaries and Overview of the progress

### 2.1 Objectives

Space Weather – the monitoring and prediction of disturbances in our near-space environment and how they are controlled by the Sun - is now recognised as an important aspect of understanding our Earth and protecting vital assets such as orbiting satellites and power grids. The Europlanet 2020 Research Infrastructure (<http://www.europlanet-2020-ri.eu/>) aims to enhance the science of space weather, by extending its scope throughout the Solar System. An entirely new Virtual Access Service, “Planetary Space Weather Services” (PSWS, <http://planetaryspaceweather-europlanet.irap.omp.eu/>) has therefore been included in the Europlanet H2020 Research Infrastructure funded by the European Union Framework Programme for Research and Innovation.

The Planetary Space Weather Services provide 12 services distributed over 4 different service domains – Prediction, Detection, Modelling, Alerts - having each its specific groups of end users. The PSWS portal (<http://planetaryspaceweather-europlanet.irap.omp.eu/>) gives access to a presentation of PSWS activities (WP5 and WP10, see below).

### 2.2 Explanation of the work carried per WP

#### WP10:

The deliverables of WP10 feed into WP5.



During the third year of the project the Prototype phase of WP10 consisted in adapting and developing software for solar wind propagation, modelling of planetary environments, detection of events, and building of alerts based on VOEvents.

#### **WP5:**

PSWS WP5 includes 12 services that are fully or partly accessible at the end of year 3 (August 2018).

Those services and their status are summarized below (in parenthesis the institute responsible for the service; in bold the services that relate to WP5 only, the others being also related to WP10):

##### A1. 1D MHD Solar Wind Prediction Tool - Heliopropa (CNRS)

Status: fully operational (<http://heliopropa.irap.omp.eu/>)

Further developments during year 4 will aim to include layers with model outputs, catalogue outputs and giant planet auroral emissions

Further developments during year 4 will be implemented in order to propagate solar wind parameters from Stereo-A and Stereo-B in addition to L1 spacecraft

##### A2. Propagation Tool (GFI Informatique)

Status: fully operational (<http://propagationtool.cdpp.eu/>)

No further developments anticipated

##### A3. Meteor showers (OBSPARIS)

Status: prototyped, but limited progress achieved since year 2 partly due to limited interactions between teams at Observatoire de Paris IMCCE and LESIA; also limited time at Observatoire de Paris LESIA available for the service since heavily involved in VESPA WP6 and 11

##### A4. Cometary tail crossings - Tailcatcher (UCL)

Status: started but limited progress achieved since 30 January 2018 on the website since limited human resources at UCL available during that time period

<https://www.ucl.ac.uk/mssl/planetary-science/tailcatcher>

##### B1. Lunar impacts (ABER)

Status: Preliminary software available on demand, ongoing developments to develop a GUI at ABER but limited resource at ABER available

##### B2. Giant planet fireballs (EHU-UPV)

Status: fully operational at [http://pvol2.ehu.eus/psws/jovian\\_impacts/](http://pvol2.ehu.eus/psws/jovian_impacts/)

##### B3. Cometary tails – Solar Windsocks (UCL)

Status: started but limited progress achieved since 30 January 2018 on the website since limited resource at UCL available during that time period

[https://www.ucl.ac.uk/mssl/planetary-science/Solar\\_Windsocks](https://www.ucl.ac.uk/mssl/planetary-science/Solar_Windsocks)

#### C1. Transplanet – Earth, Mars, Venus, Jupiter (CNRS)

Status: fully operational (<http://transplanet.irap.omp.eu>)

Extension to Venus achieved during year 3

#### C2. Mars radiation environment (ABER, DLR+CNRS)

Status: fully operational at <http://radmaree.irap.omp.eu/>

#### C3. Giant planet magnetodiscs (UCL+CNRS)

Status: fully operational at <http://magnetodisc.irap.omp.eu/>

Developments of linkages with the Heliopropa service foreseen for year 4 (CNRS)

#### C4. Jupiter's thermosphere (UCL)

Status: Preliminary model outputs delivered by UCL to CNRS

Developments of linkages with the Heliopropa service foreseen for year 4 (CNRS)

#### D. Alerts (OBSPARIS and CNRS)

Status: Prototype in development at OBSPARIS in relation to A3. Meteor shower service, also at SRC PAS in relation to ESA SSA programme;

First version operational at CNRS (<http://alerts-psws.irap.omp.eu/>) in relation to the A1. Heliopropa, B1. Lunar impacts, B2. Giant planet fireballs and B3. Comet tail activity services.

### 2.3 Impact

Contact with CCMC established during the CCMC-LSW 2017 workshop ([https://ccmc.gsfc.nasa.gov/CCMC-LWS\\_Meeting/](https://ccmc.gsfc.nasa.gov/CCMC-LWS_Meeting/)).

Science session on planetary space weather and climate – science and services organized at the European Planetary Science Congress 2017 in Riga, September 17-September 22 (<http://meetingorganizer.copernicus.org/EPSC2017/session/26067>), 30 participants.

Science session on planetary space weather under implementation at the European Planetary Science Congress 2018 in Berlin, September 16-21 (<http://meetingorganizer.copernicus.org/EPSC2017/session/26067>).

NA1-Task1-PSWS workshop on the Sun's influence on planets, Toulouse, October 09 – 11 2017 (<http://planetaryspaceweather-europlanet.irap.omp.eu/workshops.html>), 24 participants.

NA1-Task 5-PSWS workshop on Tools and Services for Planetary Observations and Image Analysis by Amateurs organized at Pic du Midi, France, July 17-19 2018 (<http://planetaryspaceweather-europlanet.irap.omp.eu/workshops.html>); <https://www.dropbox.com/home/EUROPLANET%20NA1%20Workshop%20Pic%20du%20Midi>, 16 participants.

Science session on planetary space weather organized at European Space Weather Week in Oostende, November 27-December 01 2017 ([http://www.stce.be/esww14/program/session\\_details.php?nr=1](http://www.stce.be/esww14/program/session_details.php?nr=1)), 50 participants.

Science session on Scientific and Technical aspects of planetary space weather under implementation at European Space Weather Week in Oostende, November 5-9 2018 ([http://www.stce.be/esww15/program/session\\_details.php?nr=14](http://www.stce.be/esww15/program/session_details.php?nr=14)).

Inclusion of the 1D MHD Solar Wind Prediction Tool - Heliopropa service in the ESA SSA programme (Period-E extension, Heliospheric European Science Center) proposed and accepted by ESA, developments starting in September 2018.

Topical issue on planetary space weather for Journal of Planetary Space Weather and Space Climate – Guest Editor: Nicolas André (CNRS), Andrea Optiz (WIGNER), Romain Maggiolo (BIRA, Belgique), Caitriona Jackman (University of Southampton), Manuel Grande (ABER); deadline for manuscript submission July, 15 2018. <https://www.swsc-journal.org/component/content/article/11-news/270-topical-issue-planetary-space-weather-deadline,16-manuscripts-targeted>.

Contribution through ISSI Beijing to the organization of the Space Science School on Study Space Weather Effects from the Sun to the Ground, October 10-19, Sanya, China  
<http://www.apsco.int/2nd%5Fspace%5Fscience%5FSchool/#what>

## 2.4 Statistics

Statistics for the PSWS portal (website) that has been developed during the first year of the project can be found at: <http://planetaryspaceweather-europlanet.irap.omp.eu/> **14674 visitors from 01/09/2015 to 30/07/2018**

Statistics for the PSWS tools that have been developed during the projects can be found at the following webpages:

- CDPP/AMDA tool (total number of connections, <http://amda.cdpp.eu/>):

<http://cdpp.eu/AMDA/depotUTILS/stats.html> **14674 connections since 01/09/2015 to 30/07/2018**

- Details on geographical distribution etc. can be found at CDPP/AMDA awstats: <http://amda.cdpp.eu/awstats/awstats.pl>

Similar tools for statistics have been implemented in all PSWS services.

- Access to CDPP/PROPTOOL (<http://propagationtool.cdpp.eu/>) **about 1000 visits since 01/09/2015 to 30/07/2018** <http://storms-st.irap.omp.eu/awstats/awstats.pl>
- Access to TRANSPLANET (<http://transplanet.irap.omp.eu/>) **138 runs requested and archived from 20 users since 01/09/2015 to 30/07/2018** <http://transplanet.irap.omp.eu/awstats/awstats.pl>
- Access to HELIOPROPA (<http://heliopropa.irap.omp.eu/>) **593 visits since 01/09/2015 to 30/07/2018** <http://heliopropa.irap.omp.eu/awstats/awstats.pl>
- Access to MAGNETODISC (<http://magnetodisc.irap.omp.eu/>) **30 visits since 01/01/2018 to 30/07/2018** <http://magnetodisc.irap.omp.eu/awstats/awstats.pl>
- Access to RADMAREE (<http://radmaree.irap.omp.eu/>) **31 visits since 01/01/2018 to 30/07/2018** <http://radmaree.irap.omp.eu/awstats/awstats.pl>

- Access to Alerts PSWS (<http://alerts-psws.irap.omp.eu/>)
- Access to DeTeCt3.1 ([http://pvol2.ehu.eus/psws/jovian\\_impacts/](http://pvol2.ehu.eus/psws/jovian_impacts/))  
Statistics of software use: [http://www.astrosurf.com/planetessaf/doc/project\\_detect.php](http://www.astrosurf.com/planetessaf/doc/project_detect.php)

Jupiter fireball detection statistics

|                             |                    |                     |                                |
|-----------------------------|--------------------|---------------------|--------------------------------|
| <b>Total : 79 observers</b> | <b>92.585 days</b> | <b>80678 videos</b> | <b>2004/02/29 - 2018/07/11</b> |
|-----------------------------|--------------------|---------------------|--------------------------------|

Saturn fireball detection statistics

|                             |                    |                    |                                |
|-----------------------------|--------------------|--------------------|--------------------------------|
| <b>Total : 17 observers</b> | <b>11.672 days</b> | <b>5147 videos</b> | <b>2005/02/04 - 2018/07/18</b> |
|-----------------------------|--------------------|--------------------|--------------------------------|

We plan to announce all operational services to a larger community in December 2018 by PM40 through various newsletters (e.g., SPA, Planetary Exploration Newsletters) and we expect the number of users to grow significantly. So far the Propagation Tool, Heliopropa, Transplanet and DeTeCt3.1 services have been extensively used since they are operational over a longer time period. The number of users for PSWS services varies at the moment between tens (e.g., Transplanet, Magnetodisc) to several hundreds (Heliopropa, Propagation Tool, DeTeCt3.1).

## 2.5 Access

The PSWS External review board is composed of the following independent persons:

**Chair :** Mark Lester (Male / Univ. Leicester, UK). He will help us to connect with ESA/SSA and space weather-related FP7 projects. [mle@leicester.ac.uk](mailto:mle@leicester.ac.uk)

Apostolos Christou (Male, Armagh Observatory, Ireland). He will help us to liaise with the amateur community. [aac@arm.ac.uk](mailto:aac@arm.ac.uk)

Angelica Sicard (Female, ONERA, France). She will help us to connect with industries / space agencies. [angelica.sicard@onera.fr](mailto:angelica.sicard@onera.fr)

Kirsti Kauristie (Female / FMI, Finland). She will help us to connect with COSPAR and their space weather roadmap. [kirsti.kauristie@fmi.fi](mailto:kirsti.kauristie@fmi.fi)

The PSWS External review board will be invited to participate in the PSWS coordination meeting organized during the European Space Weather Week in Leuven on November 5-9, 2018 following our PSWS session there ([http://www.stce.be/esww15/program/session\\_details.php?nr=14](http://www.stce.be/esww15/program/session_details.php?nr=14)).



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### 3. Deviations from Annex 1

PSWS WP5 includes 12 services that should have been made fully accessible by PM36. Listed below are some of the issues the PSWS Team had to deal with during the third year and that have delayed the release of some of the services:

ABER and UCL encounter difficulties in finalizing the developments of the B1: Lunar impacts (ABER), B3. Solar Windsocks (UCL) and A4. Tailcatcher (UCL) due to limited human resources in support during the time period at ABER and UCL.

In particular the two services at UCL are not online yet. UCL has been badly affected by personnel strikes in early 2018. Bob Bentley in charge of the development has had to produce deliverables for several other projects he's working on all due within a few weeks of each other, so that has added to the fact that progress has been slower than hoped. Despite that, significant progress has been made:

- The tailcatcher comet tail crossing software works as planned, as previously mentioned, we need to place the user upload capability online; this should only be 1-2 days' work for implementation and testing.
- All the individual elements of the solar windsocks solar wind speed code works. On a local test server, users can successfully upload comet images, which are then displayed for the tail positions to be recorded by clicking on several points on the screen, that are recorded as RA and dec. The code to convert those positions into solar wind speeds for a particular comet is functioning, but isn't yet integrated into the online interface. UCL also do need IT support staff to set this up as a public server.

OBSPARIS encounters difficulties finalizing the development of A3. Meteor shower service due to limited interactions between IMCCE and LESIA during this time period; the time available at Observatoire de Paris for the service is limited since they are heavily involved in other workpackages (VESPA, WP6 and 11). A prototype is currently available at [vespa.obspm.fr](http://voparis-tap-voevent.obspm.fr/tap) and can be selected by choosing custom resource and looking for resource url -> <http://voparis-tap-voevent.obspm.fr/tap> with schema Name -> meteor\_shower. The service will be finalized by PM40.

### Annex 1. PSWS participants

PSWS participants are listed below.

| <b>Participant</b> | <b>Permanent personnel</b>  | <b>Personnel hired by the project</b>   |
|--------------------|---|---|
| 2. OBSPARIS        | Baptiste Cecconi M<br>Pierre Le Sidaner M<br>Jérémy Vaubailon M                   | Maxime Paillassa, M (09/2016-12/2016)   |
| 3. UCL             | Nicholas Achilleos M<br>Geraint Jones M<br>Bob Bentley M                          | Patrick Guio, M   |
| 4. CNRS            | Nicolas André M<br>Vincent Génot M<br>Alexis Rouillard M<br>Pierre-Louis Blelly M | Mikel Indurain, M (01/2015-12/2015)<br>Arnaud Biegun, M (04/2016-06/2016)<br>Antoine Gouvenoir, M (10/2016-08/2017) |

|                      |  |  |
|----------------------|--|--|
|                      | Aurélie Marchaudon F<br>Frédéric Pitout M<br>Myriam Bouchemit F<br>Jean Liliensten M<br>Mathieu Barthélémy M |  |
| 11. DLR              | Daniel Matthiae M  |  |
| 12. ABER             | Manuel Grande M<br>Tony Cook M   | Patrick Dixon, M (18 July 2016-12/2016, part time)<br>Nathalia Alzate, F (04/2017-, 50%)<br>Zoe Hannah Lee-Payne F (part-time)   |
| 18. Wigner           | Karoly Szego M   | Andrea Opitz, F (01/09/2015-31/08/2019, 1/3 time)<br>Zsuzsanna Dály, F (02/2016-04/2016, 50%)<br>Kludia Szabó, F (07/2017-, 50%) |
| 19. IAP              | Jan Soucek M<br>Benjamin Grison M<br>Ulrich Taubenschuss M<br>Vratislav Krupar M                             |  |
| 23. GFI Informatique | Stéphane Caussarieu M<br>Laurent Beigbeder M<br>Jean-Philippe Toniutti M                                     |  |
| 28. UPV/EHU          | Ricardo Hueso M<br>Agustín Sánchez-Lavega M  | Jon Juaristi, M (02/2016-05/2017 and 01/2018-06/2018)  |
| 33. SRC PAS          | Lukasz Tomasik M<br>Mariusz Pożoga M<br>Maria Miłodrowska F<br>Iwona Stanisławska F                          | Piotr Koperski, M (12/2015-05/2016)<br>Michał Szwabowski M (30/11/2015-31/12/2015)   |

## **PSWS Structure**

PSWS activities consist of two work packages with Joint Research activities feeding Virtual Access activities. These activities consist of the following tasks:

- JRA (WP10)
  - *Task 1. Coordination (CNRS, ABER)*
  - *Task 2. Adapting available tools and methods for planetary space weather (UCL, CNRS)*
  - *Task 3. Enabling planetary event prediction/ensuring reliability of services (Wigner, OBSPARIS)*
  - *Task 4. Testing space weather connections in the Solar System (IAP, DLR, Wigner RCP)*
  - *Task 5. Alert Service (OBSPARIS, UCL, CNRS, SRC PAS)*
- VA (WP5)
  - *Task 1. Coordination (CNRS, ABER)*
  - *Task 2. Implementation (UCL, ABER, CNRS, SRC PAS)*
  - *Task 3. Detection (UPV/EHU, UCL, ABER)*
  - *Task 4. Liaison (CNRS, SRC PAS)*

## **Targeted objectives for year 4**

- By PM 40

Full access to all services (prototypes)

Topical issue on Planetary Space Weather published in Journal of Space Weather and Space Climate including user manuals for PSWS services