



EPN2020-RI

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Deliverable 5.3 Third PSWS VA Review Board Report

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Responsible WP Leader: CNRS, Nicolas André

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

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Author (s)	Nicolas André (CNRS)

Abstract: Under Horizon 2020, the Europlanet 2020 Research Infrastructure (EPN2020-RI) will include an entirely new Virtual Access Service, WP5 VA1 "Planetary Space Weather Services" (PSWS) that will extend 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. WP5 will make five entirely new 'toolkits' accessible to the research community and to industrial partners planning for space missions: a general planetary space weather toolkit, as well as three toolkits dedicated to the following key planetary environments: Mars (in support of ExoMars or Mars2020), comets (building on the success of the ESA Rosetta mission and in preparation of future cometary exploration), and outer planets (in preparation for the ESA JUICE mission to be launched in 2022). This will give the European planetary science community new methods, interfaces, functionalities and/or plugins dedicated to planetary space weather in the tools and models available within the partner institutes. It will also create a novel event-diary toolkit aiming at predicting and detecting planetary events like meteor showers and impacts. The present report summarizes the review of the project after the third year.

The PSWS External review board is composed of the following persons, all independent of Europlanet 2020 RI:

Chair : Mark Lester (Male / Univ. Leicester, UK). He will help us connecting with ESA/SSA and space weather-related FP7 projects.

Apostolos Christou (Male, Armagh Observatory, Ireland). He will helps us connecting with the amateur community.

Angelica Sicard (Female, ONERA, France). She will help us connecting with industries / space agencies.

Kirsti Kauristie (Female / FMI, Finland). She will help us connecting with COSPAR and their space weather roadmap.

The PSWS consortium could unfortunately not meet **face to face** with our external Review Board during the European Space Weather Week (ESWW) in Leuven, Belgium on Friday, 09 November 2018 11:15-12:45. We have however presented our developments during a Europlanet-sponsored NA1 workshop (16 participants) and during a PSWS-dedicated session at last ESWW (30-50 participants) and we have obtained there feedback from users on each of our services. We have also submitted papers for several of our PSWS services in a topical issue of Journal of Space Weather and Space Climate and we have received feedback on them from reviewers.

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The user and reviewer feedback on each of our services is given in the next pages.

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PSWS/NA1-Task 5 workshop on Tools and Services for Planetary Observations and Image Analysis by Amateurs', Pic du Midi, France, 17-19/07/2018

Under Horizon 2020, the Europlanet 2020 Research Infrastructure includes an entirely new Virtual Access Service, "Planetary Space Weather Services" (PSWS) that will extend 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 will provide at the end of 2017 12 services distributed over 4 different service domains – 1) Prediction, 2) Detection, 3) Modelling, 4) Alerts. Several tools and services are in particular developed for planetary observations and image analysis by amateurs. These include software to detect giant planet fireballs, lunar impacts, cometary tail disruption events as well as other remarkable events. PSWS tools and services will be presented to the amateur community and applied to their own database of images. Dedicated campaign of observations will be discussed and prepared. Some observation nights at Pic du Midi will follow the workshop.

SOC: N. André (*IRAP*), T. Cook (*Aberystwyth Univ.*), M. Delcroix (*Amateur*), R. Hueso (*UPV*), M. Scherf (*IWF Graz*)

LOC: N. André (*IRAP*), M. Delcroix (*Amateur France*)

Agenda: Later

Participants: Nicolas André (*IRAP*), Tony Cook (*Aberystwyth Univ.*), Marc Delcroix (*Amateur*), Manuel Scherf (*IWF Graz*), Kevin Baillie (*OBSParis*), Helen Usher (*Amateur UK*), Alexei Pace (*Amateur Malta*), Manos Kardasis (*Amateur Greece*), Emil Kraaikamp (*Amateur Belgium*), Wolfgang Beisker (*Amateur Germany*), Josep Soldevilla (*Amateur Spain*), Sascha Cook (*Amateur UK*), Jérôme Frayret (*Amateur France*), Céline Blitz (*Amateur France*), Gonzague Bosch (*Amateur France*), Pascaline Jung (*Amateur France*)

ESWW15, Session 14 - Scientific and technological aspects of planetary space weather

Christina Plainaki (ASI - Agenzia Spaziale Italiana), Nicolas André (IRAP, France)

Friday 9/11, 11:15-12:45

MTC 01.03

Planetary Space Weather (PSW) is strongly determined by the interactions between the body in question and its local space environment. Different aspects of the conditions at the Sun, and of the solar wind and magnetospheric plasmas at different distances from the Sun, can influence the performance and reliability of space-borne technological systems throughout the Solar System. In this context, Planetary Space Weather Services (PSWS) aim at extending the concept of space situational awareness also to planetary bodies in our Solar System other than the Earth.

This session welcomes papers on space weather impacts that affect planetary exploration, e.g. environmental assessment for future planetary missions (approved or candidate under current calls) and lessons learned from recent and existing missions.

Focus will be given in cross-disciplinary issues, including:

- the interaction of solar wind/magnetospheric plasmas with planetary/satellite ionospheres and atmospheres, including the generation of auroras
- the satellite interactions with their neutral environments and dust
- the variability of the magnetospheric regions under different solar wind conditions
- the inter-comparisons of space weather conditions in different planetary environments.

Contributions addressing new studies, methods, interfaces, and functionalities distributed over the PSWS domains of Prediction, Detection, Modelling, and Alerts are welcome. Inter-comparisons and interpretation of measurements at different planetary systems and quantification of the possible effect of the environment interactions on components and systems (e.g. radiation dose studies) are strongly encouraged.

Talks : Time schedule

Friday November 9, 11:15 - 12:45, MTC 01.03

11:15	Planetary Space Weather at <i>Mangano, V et al.</i> Mercury: correlations between Na exosphere and IMF	Invited Oral
11:30	Pushing the P-DBM to its limits <i>Del moro, D et al.</i>	Oral
11:45	Investigating interplanetary space weather events with spacecraft engineering <i>Lester, M et al.</i>	Oral
12:00	New results from Galileo's first flyby of Ganymede: <i>Collinson, G et al.</i>	Invited Oral

Reconnection driven flows
at the low-latitude
magnetopause boundary,
crossing the cusp, and icy
ionospheric escape

12:15 Space weathering at Ganymede *Carnielli, G et al.* Oral

12:30 Recurrent magnetic dipolarization process at Saturn: Cassini measurements *Yao, Z et al.* Oral

Posters

1 Monte Carlo simulations of atmospheric cascades in Saturn and Mars *Tezari, A et al.* p-Poster

2 Modelling radiation shielding effects for future manned spatial missions *Botek, E et al.* p-Poster

3 Proton Aurora on Mars *Ritter, B et al.* p-Poster

4 Comparative statistical analysis of magnetosheath turbulence/variability at Venus and Earth *Echim, M et al.* p-Poster

5 Auroral beads at Saturn and their relation to plasma instabilities: Cassini proximal orbits *Radioti, A et al.* p-Poster

6 Monitoring the passage of interplanetary coronal mass ejections and high-speed solar wind streams in the interplanetary medium: results from LISA Pathfinder and perspectives with future space interferometers *Grimani, C et al.* p-Poster

7 The PSWS Space Weather VOEvent alerts service of the CDPP *Gangloff, M et al.* p-Poster

Feedback from our users received for our 12 PSWS services

PSWS WP5 includes 12 services.

User and reviewer feedback received during the NA1 workshop, the ESWW, and for the papers submitted to the topical issue of Journal of Space Weather and Space Climate (<https://www.swsc-journal.org/component/content/article/11-news/270-topical-issue-planetary-space-weather-deadline>) for each of these services are summarized below (in parenthesis the institute responsible for the service):

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

The service is operational. The service is currently being integrated into the Space Situation Awareness Space Weather Service Network of the European Space Agency (<http://swe.ssa.esa.int/web/guest/cdpp-proptol-federated>). Catalogues of solar wind perturbations should be added. The service should be fed by new inputs coming from the Solar Orbiter and Parker Probe missions. Predictions based on STEREO input should be added to the service.

A2. Propagation Tool (GFI Informatique)

The service is operational and has been used in several publications, e.g., Witasse et al., Interplanetary coronal mass ejection observed at STEREO-A, Mars, comet 67P/Churyumov-Gerasimenko, Saturn, and New Horizons en route to Pluto: Comparison of its Forbush decreases at 1.4, 3.1, and 9.9 AU, Journal of Geophysical Research: Space Physics, Volume 122, Issue 8, pp. 7865-7890, 2017. The service has been integrated into the Space Situation Awareness Space Weather Service Network of the European Space Agency (<http://swe.ssa.esa.int/web/guest/cdpp-proptol-federated>). A reference paper describing the reliability of the service has been submitted to Journal of Space Weather and Space Climate by Benjamin Grison et al., Shock deceleration in interplanetary coronal mass ejections beyond Mercury's orbit Validation of the CDPP propagation tool. A second publication on the same subject is in preparation by Andrea Opitz et al.

A3. Meteor showers (OBSPARIS)

The service is operational and be queried in VESPA as an EPN-TAP service. A reference paper describing the service has been submitted to Journal of Space Weather and Space Climate by Baptiste Cecconi et al.

A4. Cometary tail crossings (UCL)

The service is not yet operational so unfortunately it cannot be tested yet. The service should be linked to database of cometary observations by amateurs.

B1. Lunar impacts (ABER)

The service is not yet operational but was presented to amateurs during the NA1 workshop at Pic du Midi on July 18, 2018. The service should also be linked to the HELIOTA project (<https://neliota.astro.noa.gr/>). A graphical user interface should be provided.

B2. Giant planet fireballs (EHU-UPV)

The service is operational and has demonstrated its interest to the amateur community in the past. Dedicated observing and analysis campaigns should be organized in relation to the Juno mission. A reference paper describing the service has been submitted to Journal of Space Weather and Space Climate by Ricardo Hueso et al., Detectability of possible space weather effects on Mars upper atmosphere and meteor impacts in Jupiter and Saturn with small telescopes

B3. Cometary tails (UCL)

The service is not yet operational so unfortunately it cannot be tested yet. The service should also be linked to the Solar Orbiter and Parker Probe missions.

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

The service is operational and has demonstrated its interest in the context of Mars. A reference paper describing the service has been submitted to Planetary and Space Sciences by Pierre-Louis Blelly et al., Transplanet: a web service dedicated to modeling of planetary ionospheres.

Reviewer comments: The work presented here is a clear large advance for the modelling community at different planets. Moreover, the new web tool is easy and clear to use, and this paper describes it very well. The proposed application example, walking the reader through the whole process and offering a discussion over the results exposing a simple real case analysis is an instructive format to present a software.

C2. Mars radiation environment (ABER)

The service is operational. A reference paper describing the service has been submitted to Journal of Space Weather and Space Climate by Jingnan Guo, Ready functions for calculating the Martian radiation environment.

C3. Giant planet magnetodiscs (UCL)

The service is operational. The service should link the model outputs to the Juno and JUICE trajectories if possible. A reference paper describing the service has been submitted to Journal of Space Weather and Space Climate by Nicholas Achilleos et al.

C4. Jupiter's thermosphere (UCL)

The service is prototyped but has not yet been tested. Unfortunately it is limited only to three outputs of the corresponding UCL model.

D. Alerts (OBSPARIS)

The service is operational and be queried in VESPA as an EPN-TAP service (<http://vespa.obspm.fr/planetary/data/epn/query/all/>). A reference paper describing the service has been submitted to Journal of Space Weather and Space Climate by Baptiste Cecconi et al.