EPN2020-RI

EUROPLANET2020 Research Infrastructure

H2020-INFRAIA-2014-2015

Grant agreement no: 654208

Deliverable 5.4- 4th PSWS VA Review Board Report

Due date of deliverable: 30/06/2019

Actual submission date: 30/06/2019

Start date of project: 01 September 2015 Duration: 48 months

Responsible WP Leader: CNRS, Nicolas André

Project funded by the European Union's Horizon 2020 research and innovation programme		
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)	

Project Number	654208
Project Title	EPN2020 - RI
Project Duration	48 months: 01 September 2015 – 31 August 2019

Deliverable Number	D5.4
Contractual Delivery date	30.06.2019
Actual delivery date	30.06.2019
Title of Deliverable	4th PSWS VA Review Board Report
Contributing Work package (s)	WP5
Dissemination level	Public
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 fourth 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 help 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.

We have not been able to meet face to face with our reviewers but we have presented our developments during a Europlanet-sponsored NA1 workshop on Planetary environment modelling hosted at IRAP on May 20-22 (10 participants) and we have obtained their feedback from users on each of our services. We have also ingested our Heliopropa service into the Situation Awareness Space Weather Service Network of the European Space Agency and we have received feedback on it during the ingestion. We have also submitted papers about 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 independent reviewers. All papers but one (in revision) have been accepted to date.

The user and reviewer feedback on each of the newly operational services is presented in the next pages.

PSWS/NA1-Task 5 workshop on Planetary Environment Modelling,* IRAP, France*, 20-22/05/2019

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 model planetary environments and the heliosphere. The proposex workshop focused on the modelling of the magnetospheres of Mercury, Jupiter, Saturn, Ganymede and ice giants as well as the Moon-magnetosphere interactions at Jupiter' and Saturn' moons (Callisto, Europa, Enceladus, …). It gave the opportunity to present the latest results based on simulations and compare them to observations as well as to discuss how to use them for future mission planning (BepiColombo, JUICE, Clipper, Ice Giant missions). A large part of the workshop was devoted to the comparison between the various models and the publication of simulation runs/outpust in the Virtual Observatory.

SOC: N. André (*IRAP*)

LOC: N. André (*IRAP*)

Agenda:

Europlanet workshop on Planetary Environment Models

IRAP, Toulouse, France – Conference Room

9 avenue du colonel Roche 31028 Toulouse

20-22 May 2019

Monday, 20 May

Session 1. Mercury

Welcome	14:00-14:10
Round Table	14:10-14:20
Europlanet H2020 and H2024	14:20-14:30
Modolo – Mercury hybrid simulations	14:30-15:00
Fatemi - GPU-based hybrid model	15:00-15:30
Griton/Pantellini – Mercury MHD simulations	15:30-16:00
Aizawa – Single particle trajectory in MHD simulations	16:00-16:30
Ivanovski – MHD instabilities simulations	16:30-17:00
Amaya – PIC simulations	17:00-17:30
Mura – Mercury exosphere+single particle	17:30-18:00

Tuesday, 21 May

Session 2. Tools / simulations

CDPP Tools	09:30-10:00
Simulations in 3DView – tutorial	10:00-10:30
Griton - SHOTS+Own Experience with 3DView	10:30-11:00

Session 3. Galilean moons / Giant planets

Amaya – PIC simulations	11:00-11:30
Mura – Mercury exosphere+single particle	11:30-12:00
Modolo – Ganymede hybrid simulations	11:00-11:30
Holmstroëm – Callisto hybrid simulations	11:30-11:45
Fatemi – Ganymede hybrid simulations	11:45-12:00
Mura – Exospheres of Galilean moons	12:00-12:30
Oza – Ionospheres of Galilean moons	12:30-13:00
Lunch	13:00-14:00
Kotova – Ray tracing for Saturn's magnetosphere	14:00-14:30
Pantellini/Griton – Uranus magnetosphere	14:30-15:00

Session 4. Mars

Kotova – Particle trajectory in MHD	15:00-15:30
Modolo – Mars hybrid simulations	15:30-16:00
Holmstroem – Mars hybrid simulations	16:00-16:30
Discussion	16:30-17:00

Wednesday, 22 May

Session 4. Runs on request

Warm-up	09:30-10:00
Runs on request	10:00-10:30
Collaboration	10:30-11:30
Review of Action Items and Conclusions	11:30-12:00

Lunch 12:00-13:30

End of Meeting

Participants: Nicolas André (IRAP), Shahab Fatemi (IRF), Mats Holmstroem (IRF), Jorge Amaya (Leuven Univ.), Emmanuel Chané (Leuven Univ.), Filippo Pantellini (ObsParis), Ronan Modolo (LATMOS), Sae Aizawa (Tohoku Univ.), Lea Griton (IRAP), Michel Gangloff (IRAP), Laurent Beigbeder (GFI Informatique), Stavro Ivanovski (INAF), Alessandro Mura (INAF)

Feedback from our users received for our 12 PSWS services

PSWS WP5 includes 12 services.

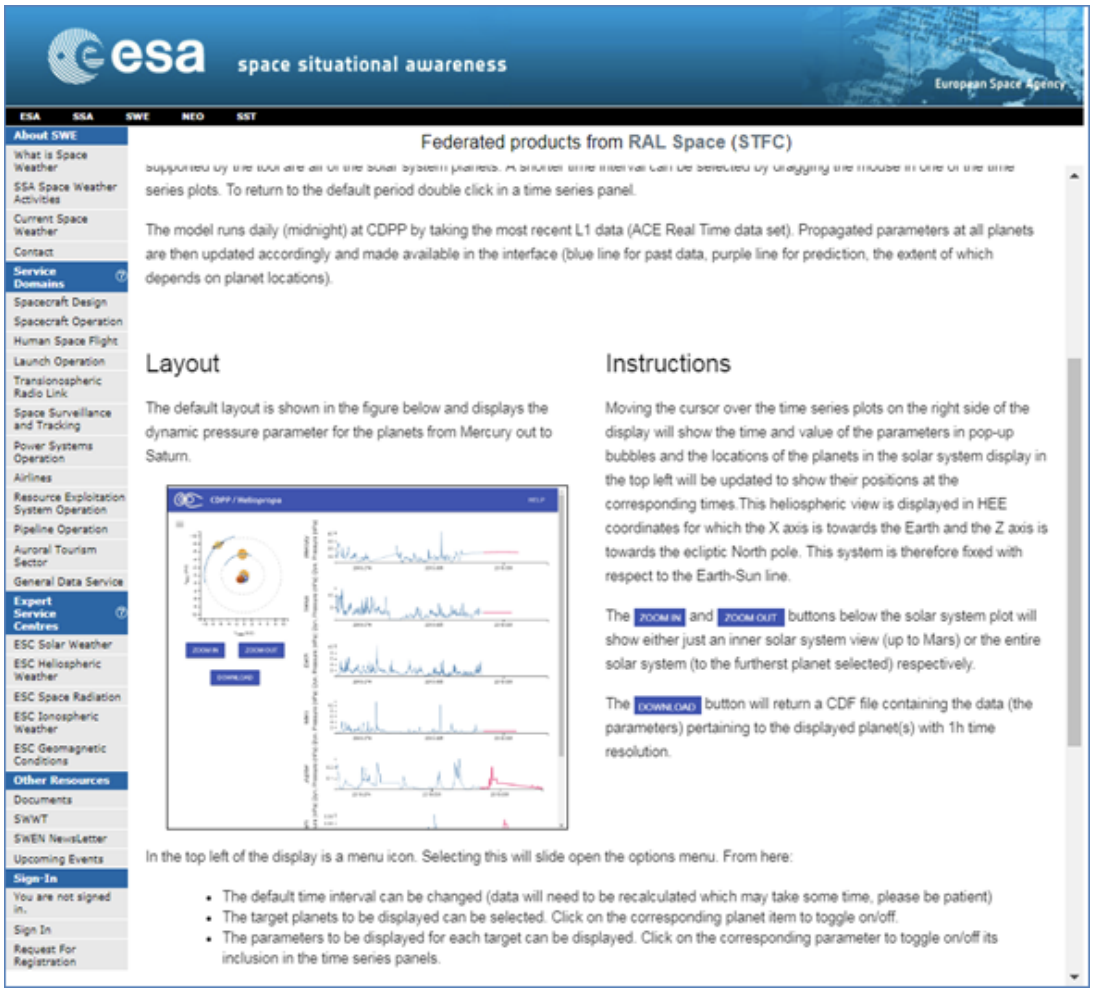
User and reviewer feedback received during the NA1 workshop, from the Situation Awareness Space Weather Service Network of the European Space Agency, as well as for the papers submitted to the topical issue of Journal of Space Weather and Space Climate (https://www.swsc-journal.org/component/content/article/11-news/270-topical-issue-planetary-space-weather-deadl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

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

http://heliopropa.irap.omp.eu/

The service is operational. The service has been successfully 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.

A few comments have been received during the acceptance tests by ESA SSA colleagues. They are available in the document SSA-SWE-HESC-ATR-H107b_Heliopropa_V1.0.docx, available on request.



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 accepted by Journal of Space Weather and Space Climate: Benjamin Grison et al., Shock deceleration in interplanetary coronal mass ejections beyond Mercury's orbit Validation of the CDPP propagation tool.

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)

http://www.mssl.ucl.ac.uk/comet_tail/

The service is operational since 01 June 2019 and has not been fully tested yet. The service should be linked to database of cometary observations by amateurs. Documentation should be

B1. Lunar impacts (ABER)

https://twitter.com/lunarnaut

The service is operational and 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 accepted by Journal of Space Weather and Space Climate: 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)

http://www.mssl.ucl.ac.uk/comet_tail/

The service is operational since 01 June 2019. 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 accepted by Planetary and Space Sciences: Pierre-Louis Blelly et al., Transplanet: a web service dedicated to modeling of planetary ionospheres.

C2. Mars radiation environment (ABER)

The service is operational. A reference paper describing the service has been accepted by Journal of Space Weather and Space Climate: 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 accepted by Journal of Space Weather and Space Climate: Nicholas Achilleos et al.

C4. Jupiter's thermosphere (UCL)

The service is a prototype that has yet to be tested. Unfortunately it is limited to only 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.