PRediction Of Geospace Radiation Environment and Solar wind parameterS 637302

3rd Project Review Meeting
December 5, 2017

by Skype

Minutes

Attendees

Andrej Rozkov (Project Officer, REA), Zerefsan Kaymaz (External reviewer, ITU Istanbul, Turkey), Robertus von Fay-Siebenburgen (Coordinator USFD), Simon Walker (Project manager USFD), Michael Balikhin (chair scientific steering committee USFD), Richard Boynton (USFD), Hua-Liang Wei (USFD), C. Heathcote (USFD), Tony Arber (UW), Keith Bennett (UW), Yuri Shprits (GFZ), Angelica Tibocha (GFZ), Mike Liemohn (UM), Bart van der Holst (UM), Vitaliy Yatsenko (SRI), Peter Wintoft (IRF), Magnus Wik (IRF), Juri Katkalov (IRF), Volodya Krasnoselskikh (CNRS/LPC2E), Natalia Ganushkina (FMI), Stepan Dubyagin (FMI).

Agenda

The agenda, as previously circulated, was adopted.

Introductions

Robertus, the PROGRESS Coordinator, welcomed everyone to the meeting. Andrej Rozkov, the Project Officer, and Zerefsan Kaymaz, the external reviewer, introduced themselves to the project. Andrej and Zerefsan outlined their aims for the meeting.

Work Package Reports

General Project Overview - Simon Walker, Robertus von Fay-Siebenburgen

The current status of the project and compliance to the schedule were presented. During the third reporting period

- Workplan

    - Yuri has changed affiliation from SkolTech to GFZ. Amendment 6 was completed to

terminate SkolTech. Amendment 12 was completed to enable GFZ to join the project and to amend the project schedule.

– Amendment 12 has been accepted. GFZ is now a beneficiary of the project.

– To allow GFZ to fully complete their parts of tasks within PROGRESS a seven month extension was granted.

– The schedule of tasks and deliverables was updated based on this extension.

- No ethical issues were identified

- No IPR issue were raised.

- Risks

  – No new risks were encountered during the current reporting period.

  – None have been identified for the project extension period.

- The use of resources has not changed from that specified in the Grant Agreement.

  – Approval was sought from the Project Officer to attend conferences and workshops not listed in the GA.

- Deliverables

  – The 4 deliverables due in this reporting period up to the date of the Review Meeting were submitted on time according to the schedule in the GA.

  – Following the second Review Meeting a number of deliverables required updates. These changes were made and the reports resubmitted according to the schedule set by the Project Officer and External Reviewer.

- The current schedule for Project Milestones has been met to some degree.

  MS1 100% Results available on web

  MS2 75% Model results available on web

MS3 90% Models are available on request

MS5 100% Models are available on request

- Dissemination

  - There have been 13 papers published in high impact, peer reviewed journals, within the third review period. In addition, a further 5 are currently either accepted of under review.

  - Total number of project publications 39. They are listed on the Project web site.

  - There were 30 oral/poster presentations at scientific conferences and the PROGRESS summer school.

  - Total conference/summer school presentations 98.

  - Participants were reminded to acknowledge funding from the Commission as this provides some justification for costs claimed.

  - PROGRESS organised a summer school to present its results to young scientists. The summer school, held in Mallorca, Spain, attracted 15 students from Europe and China.

  - Simon reported that some students had sent emails of thanks to the organisers and to request that the lecture notes be added to the web site. This has been completed.

  - Andrej requested that the project obtain feedback from the students regarding the summer school and their use of the knowledge gained from the lectures.
    Action: AI-RM3-1 Simon to obtain feedback from the students.

- Feedback

  - Following the second review meeting in Potsdam, feedback was received from our external reviewer. All points raised were answered. Deliverables were updated based on the Reviewers' comments.

WP 3: Forecast of the evolution of geomagnetic indices - Peter Wintoft, Magnus Wik, Simon Walker, Vitaliy Yatsenko

- IRF

  - The objectives of WP 3 and tasks were outlined.

  - The Kp and Dst models from Lund, described in Deliverable 3.4, have continued to be developed.

  - Magnus outlined the work performed within Task 3.5 and Deliverable 3.5. Since this deliverable was submitted more work on verification has been performed.
    Action: AI-RM3-2 Magnus to amend D3.5 and resubmit.

  - Work on Task 3.6 is progressing. The Kp model results are available as plots online. Forecasts for Kp, Dst, and AE will be added to the REST service at IRF.

  - The models for geomagnetic indices developed by IRF within the framework of PROGRESS will also be available via the ESA SSA web portal.

- USFD

  - D3.4 showed results from two NARMAX models derived by USFD for the forecast of Kp. Both models encountered problems when forecasting high Kp values. This is due to the fact that high Kp events are very sparse in the training data.

  - A new model, implementing a balancing of the input data sets has been developed and the new results are able to capture high Kp events.

- SRI

  - Vitaliy outlined the work of SRI in developing four different modelling frameworks (Robust NARMAX, Robust Bilinear, Polynomial, and Lyapunov Exponent model) for the forecast of geomagnetic indices.

  - Next stage is to perform a comparative validation with other models, both those developed within PROGRESS and other models available on the web. The results of

this comparison will form an Annex to deliverables D3.4 and D3.5 since this is the easiest way to add this information.

Action: AI-RM3-3 Vitaliy to create an Annex to Deliverables 3.4 and 3.5 describing the results of their comparative study which compares their models to those developed at IRF, USFD, and others.

– SRI are planning to play a role in the creation of a Space Weather Centre for the Ukraine. The SRI models for forecasting geomagnetic indices will be available online.

WP 7: Fusion of forecast tools - Simon Walker

WP 7 is aimed at merging the results of the various scientific work packages to form a coherent view and forecast of the radiation belt electron fluxes.

- The first results from PROGRESS have been added to the PROGRESS web site.

    – Plots of forecasts of Kp and Dst from IRF (WP 3).

    – Plots of forecasts of Kp from USFD (WP 3).

    – Forecasts of electron fluxes at geostationary orbit generated by the Sheffield NAR-MAX models (WP 6)

    – A comparison of IMPTAM low energy flux predictions for GEO with measurements from the GOES 13 satellite, and IMPTAM electron distributions from midnight MLT.

    – A comparison of VERB high energy electron flux predictions with measurements from the Van Allen Probes MagEIS and GOES electron sensors.

    – Access to the statistical wave models for chorus, hiss, and magnetosonic waves (WP 4)

- New developments include

    – A panel to provide an overview of the current levels of geomagnetic activity, the solar wind parameters, and electron fluxes at geostationary orbit. Forecast values from the

USFD Kp and electron flux models have already been added. Solar wind data from SWIFT are now available to be included. Users may click on the parameter names to get plots of particular parameters.

– A tool to show the fluxes of electrons (resulting from the VERB-NARMAX coupled model WP 6) along a user selected orbit. Orbits are defined using the NORAD TLE data sets and propagated using the SGP4 algorithm. The fluxes at the satellite locations are extracted and presented to the user.

– Example output plots were shown.

Action: AI-RM3-4 Simon to liaise with members of the Stakeholder Advisory Board as to the best products to generate.

WP 6: Forecast of the radiation belt environment - Richard Boynton, Simon Walker and Yuri Shprits

- USFD

  – Richard showed a comparison of the USFD electron flux models at geostationary orbit and measurements from GOES 13 for the various energy detectors onboard GOES 13. The models currently display daily fluxes with no spatial structure.

  – Current work is to create a set of models with MLT dependence to capture spatial variations. The main problem is the sparsity of data to use to build the models. First results show a fairly good correspondence between 2 hour ahead forecasts and measurements from GOES 13 and 15. Model performance will improve significantly once the LANL data sets are made available.

  – Simon briefly outlined the work done for the USFD part of Task 6.3, using the USFD electron flux models to drive VERB.

- GFZ

  – Yuri provided an overview of his latest, published scientific results on the dynamics

of high energy electron populations within the radiation belts and the specific role of EMIC waves in the pitch angle scattering of ultra-relativistic electrons. These measurements are reproducible provided EMIC waves scattering processes are included within VERB.are and the updates made to the VERB code.

- It was pointed out that deliverable D6.3 (due February 2018) currently follows D5.3 (due January 2018). However, this time period between deliverables is insufficient to allow GFZ to properly work on this problem. Therefore it was proposed to postpone D6.3 until May 2018. Both Zerefsan and Andrej agreed with this idea.

  Action: AI-RM3-5 Simon to find how to change date of submission for deliverable D6.3 to May 2018

WP 2: Propagation of the solar wind from the Sun to L1 - Tony Arber, Bart van der Holst, Mike Liemohn

- UW

  - The AWSoM code contains a some "free" parameters whose values require optimising for best results. Tony reported on the procedures used at UW to optimise these parameters and perform an Uncertainty Quantification.

  - The data from the AWSoM/WIFT model are now available on the web. These data, available in HGR and GSM coordinates provide a forecast for the solar wind conditions up to three days ahead. Forecasts will be produced twice a week, limited by the processing power required by AWSoM.

  - It is hoped to keep providing these forecasts (maybe less often) until the end of the project.

- UM

  - Bart outlined the current methodologies used within AWSoM to provide characterise the solar wind out to 21 R_s.

- Currently, a method is under development to allow the inclusion of observed CMEs within AWSoM. CMEs are modelled as a Gibson-Low Flux rope whose input parameters (location, orientation, field strength, size, and helicity) will be derived from observations. First results show good comparisons with measurements from the SOHO instruments LASCO C2, LASCO C3, and STEREO A COR2. Time shifting of the results show agreement with the magnetic signatures at 1 AU but not the exact arrival times.

WP 4: Statistical wave models and quasi-linear diffusion coefficients - Volodya Krasnoselskikh

This work package was completed at the end on the second reporting period.

WP 5: Low energy electron models - Natalia Ganushkina, Angelica Tibocha

- GFZ

  - Angelica reported on the currently ongoingTask 5.3 to use the results of the IMPTAM model for low (keV) electrons in the radiation belts as a seed population for the VERB model for high energy (MeV) electrons.

  - An event study has been performed for the St. Patricks Day storm 2013. IMPTAM fluxes were used to define the PSD at L*=6.6 and the VERB lower energy boundary.

  - The results were compared with measurements from the GOES satellites. General intensifications of the electron fluxes in the ring current and radiation belts were well reproduced by this initial simulation.

- FMI

  - Natalia presented the ongoing work, improvements, and validation of results of the IMPTAM model.

- For Task 5.3, IMPTAM has been used to model the low energy electron fluxes (15-50 keV) during the 2013 St. Patricks Day storm. The results were validated by comparison with measurements from AMC 12. These data were passed on to GZF to be used to set the boundary conditions for VERB simulations of the fluxes of high energy electrons mentioned above.

- IMPTAM is currently used as a pastcast/nowcast model. Work is being performed to develop a trial version of IMPTAM for the forecast of electron fluxes. This utilises the recently available results from the AWSoM/SWIFT model (WP 2) which provides forecasts of the solar wind parameters at L1. IMPTAM also required forecasts of geomagnetic indices. These will soon be available in real time from IRF.

Summary of Project Officer/External Reviewer

Zerefsan Kaymaz and Andrej Rozkov then gave the project their impressions on the Project's achievements. Overall, they reported that they were generally happy with the way in which the project was proceeding.

Zerefsan did point out that she thought that the advertising of the PROGESS Summer School could have been broader since she failed to see any notifications from the email lists to which she subscribes.

Within the next month the project should receive detailed reports from the external reviewer and project officer.