**NA1 expert exchange report of Jingnan Guo's visit to
Aberystwyth University in Oct 2017**

Jingnan Guo, 20/Oct/2017

Jingnan Guo (e-mail: guo@physik.uni-kiel.de) from the University of Kiel in
Germany has visited Manuel Grande (e-mail: m.grande@aber.ac.uk) and his group
at the Physics Department, Aberystwyth University, UK from 16th to 20th October
2017.

The purpose of the visit is to discuss about the feasibility of implementing a Martian
radiation model as an add-on for a deliverable of the europlanet project.

We have discussed extensively about if and how we could utilize the results of the
Martian atmospheric radiation model which has been used to calculate the
shielding and secondary generations from high energetic solar particle events
(SPEs) entering the March atmosphere, as described in Guo et al 2017.

Specifically, the current Martian atmospheric model has been developed into a
matrix approach that can quickly be folded with any kind of input GCR/SPE spectra
(composed of either protons or helium ions) to calculate the secondary spectra of
different particle species on the surface of Mars. This approach is novel, verified
and very efficient, much faster than full GEANT4 or PLANETOCOSMICS.

Besides, statistical results based on the application of this approach to a large
number of historical events have resulted in some convenient and empirical
correlations and functions that can be used directly for calculating the surface
radiation dose rate, simplifying the whole procedure of a full PLANETOCOSMICS
simulation into an easy multiplication of the spectra (power-law shaped) parameters
with some predefined empirical correlation factors. Such correlation factors will be
used as the base for the online prototype tool of the Martian radiation model.
Moreover, such an in-depth study will also be summarized into a possible joint-
publication between me (Jingnan Guo) and relevant contributers (Manuel Grande
and so on) from the University of Aberystwyth.

Last but not least, during the visit, I have given a seminar talk in the space physics
devision and introduced the work that has been carried out in the last few years
using MSL/RAD data and modeling approaches with different aspects to study the
space weather and radiation environment at Mars.