

Development of WASAVIES (Warning System of AVIation Exposure to SEP): Science Modeling

Ryuho Kataoka^{1*}, Tatsuhiko Sato², Yuki Kubo³, Daikou Shiota⁴, Seiji Yashiro⁵, Takao Kuwabara⁶, Hiroshi Yasuda⁷

¹Tokyo Tech, ²JAEA, ³NICT, ⁴RIKEN, ⁵CUA, ⁶Delaware University, ⁷NIRS

The prediction of solar energetic particles (SEP) is important to mitigate the space weather hazard toward increasing solar activities, and is also an ultimate problem for physics-based modelers because of the hybrid nature of MHD fluid and particles. We are developing a forecast system called Warning System of AVIation Exposure to Solar energetic particles (WASAVIES). The trigger of WASAVIES is the automated detection of ground level enhancement (GLE) onset by multiple ground-based neutron monitors [Kuwabara et al., Space Weather, 2006]. We then obtain basic parameters of flare and coronal mass ejections (CME) as input parameters for focused transport of SEP [Kubo et al., JpGU2013]. Realistic inner heliosphere is also dynamically reconstructed at the same time [Shiota et al., JpGU2013], and additional control parameters (e.g., mean free path of SEP) are evaluated for solving the focused transport of SEP. Tracing the SEP particles in a Tsyanenko model, we obtain the time-varying proton rigidity spectra at the top of atmosphere, and the aviation route doses based on the predicted dose-rate are finally evaluated by air shower simulations [Sato et al., JpGU2013]. We show first results and discuss the limitation of the science modeling and possible further development.

Keywords: solar energetic particles, cosmic rays, radiation dose, interplanetary magnetic field, coronal mass ejections