

## Development of WASAVIES (Warning System of AVIation Exposure to SEP): System Overview

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When solar energetic particles (SEP) are incident to the atmosphere, they can induce air showers by generating varieties of secondary particles. Such secondary particles can reach deep into the atmosphere, and enhance the level of radiation doses, which can be a hazard of aircrews. In order to precisely estimate the radiation doses during large SEP events, we are developing a warning system of aviation exposure to SEP, WASAVIES. In the system, the time profile of anisotropic SEP spectrum incident to the Earth are estimated from the latest knowledge of space weather information [1,2], such as basic parameters of flare and coronal mass ejections (CME). The enhancement of the radiation doses at flight altitudes during the event is then calculated from the incident SEP fluxes in combination with a database developed based on air shower simulation performed by the PHITS code [3]. The WASAVIES has been tested and verified by making a comparison between the measured and calculated count rates of several neutron monitors during past GLE (ground level enhancement) events. The final goal of our project is to predict the enhancement of radiation doses due to SEP exposure within 6 hours from the GLE onset.

[1] Kataoka et al. JpGU2013

[2] Kubo et al. JpGU2013

[3] <http://phits.jaea.go.jp/>

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