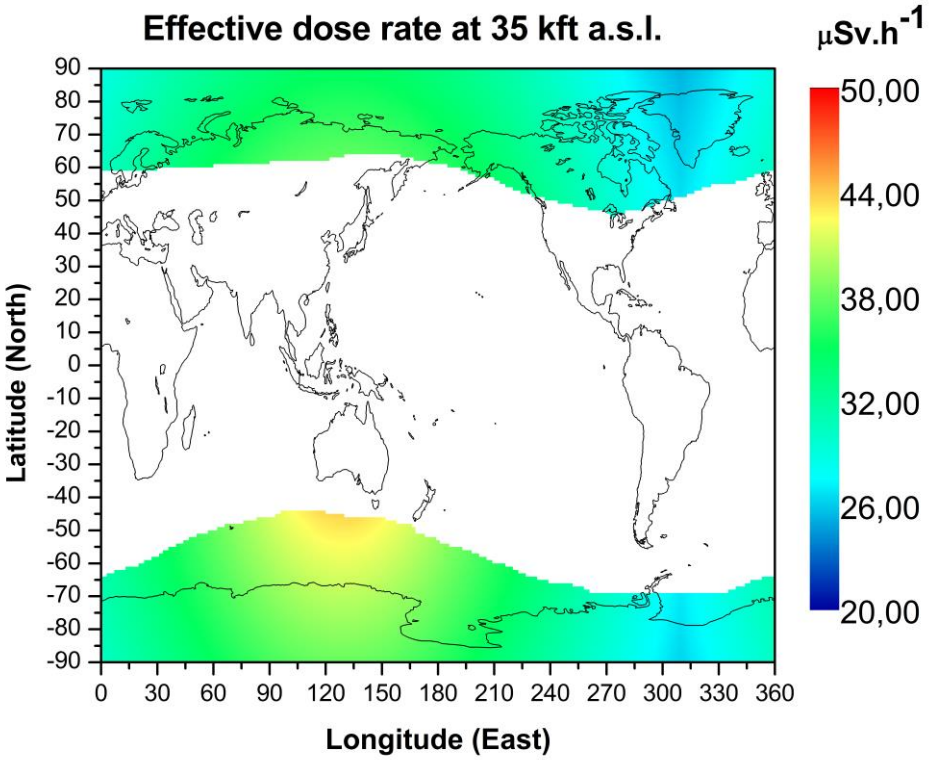
A new web service of radiation doses on trans-polar airline routes due to solar particle storms launched by ReSoLVE Centre of Excellence in an international collaboration

Energetic eruptions of the Sun, such as solar flares and coronal mass ejections, may cause solar particle storms, which produce a large amount of charged energetic particles to the near-Earth environment. Solar particle storms pose a hazard to the modern society, especially to space-borne technology. On Earth we are protected by the atmosphere from the harmful effects of such storms. However, particles may occasionally have sufficient energy and intensity to produce notable effects in the atmosphere, even at the altitude of trans-polar airline routes. Then passengers and crew may receive radiation doses significantly above the background level (see Figure). Since the exposure of flying personnel to cosmic radiation is regarded as an occupational health problem (International Commission on Radiological Protection, 1991), it should be monitored. While the background radiation is routinely monitored nowadays, assessing the radiation doses of solar particle storms poses a challenge because of their random occurrence and large variability.

The ReSoLVE Centre of Excellence (http://www.spaceclimate.fi/resolve/) of the Academy of Finland won a grant of the VarSITI Program of ICSU Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) to develop a web service and database of major solar particle storms, also known as ground-level enhancements (GLE). The new database has now been launched at
http://gle.oulu.fi/#/dose
The new database provides, for each observed GLE event, information on the properties of solar energetic particles and their estimated radiation doses at the polar cruise altitude of 35 kft (about 10700 m). This gives a quick estimate of the radiation effect caused by all major GLE events during the last decades.



Map of radiation dose at 35 kft altitude in the polar region (color scale on the right, cf. the average recommended upper dose for public which is ~0.11 μSv/h) during the solar particle storm of 13 December, 2006, which is 30-50 μSv (corresponding to a 2-3-week normal dose) during one hour. During severe events, the annual recommended dose can be reached or even exceeded during one flight. (Adopted from Mishev & Usoskin, JSWSC, 5, A10, 2015).