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The solar particle event on 10-13 September 2017 – Spectral reconstruction and calculation of the radiation exposure in aviation and space

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The solar energetic particle event on 10 September 2017 and on the following days was the strongest event in recent years. It was recorded as Ground Level Enhancement 72 by Neutron Monitors Stations on the Earth and measured by a number of instruments in space. One aspect of such a space weather event is the potentially increased radiation exposure in aviation and space. Numerical simulations can help estimate the elevated dose rates during the event; a critical aspect in these simulations is the description of the primary particle spectrum. In this work, we present 1 hour averaged proton spectra during the event derived from GOES measurements and described by two different analytic functions. The derived proton spectra are used to calculate the radiation exposure in aviation and different space scenarios: low-Earth orbit, interplanetary space, and Mars surface and the results are discussed in the context of available experimental data. While the results indicate that in most of these scenarios in aviation and space the event was of little relevance compared to the total exposure from galactic cosmic radiation, the skin dose in a lightly shielded environment in interplanetary space may have reached about 30% to 60% of the NASA 30-day dose limit.