

Radiological Assessment of Martian and Terrestrial Surface during Young Sun

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For a terrestrial planetary system, during the initiation period of planetary formation, the activity of a young Sun is extremely important in order to comprehend the atmospheric behavior of the planet. Relatively lower luminosity associated with lower surface temperature of the young Sun brings the planets a cooler surface environment. Terrestrial and Martian surfaces become icy cold in this environment without considering extensive GHG formation. Within such environments, the dose from SEP from a young Sun might play an important role in primordial atmospheric composition.

Here, we propose a reasonable radiological assessment of the possible exposure intensity in SEP from a young Sun, by evaluating the possible magnitude and frequency of early solar flares by using possible star spot area, derived from their rotational period. We evaluated annual and maximum flare energy in different cases of solar spot areas for 3 %, 5 %, and 10 % of solar surfaces. The maximum dose at the Martian TOA reaches 5.86 k Gy (265 Sv) when the solar spot area reaches 10 % of the solar surface. Such higher radiation dose may have influenced significantly atmospheric composition of Early Mars and Young Earth.

Keywords: Young Sun, Solar Flare, Radiological Condition