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Variations of Dose Rate Observed by MSL/RAD in Transit to Mars

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The Radiation Assessment Detector (RAD), on board Mars Science Laboratory's (MSL) rover Curiosity, measured the radiation dose rate during the 253-day cruise phase to Mars, along with a broad spectrum of energetic particles. RAD carried out the first radiation measurements inside a spacecraft from Earth to Mars. It observed not only the impulsive enhancement of dose rate during Solar Particle Events (SPE) but also a gradual evolution of the Galactic Cosmic Ray (GCR) -induced radiation dose rate. The primary GCR flux rate is modulated by the solar magnetic field, which correlates with long-term solar activities and heliospheric rotation. The correlation between solar modulation and the dose rate measured by RAD has been analyzed, and the results have been used to estimate the dose and dose equivalent rates under different solar modulation conditions. Such estimations could form the basis for a reliable model of the radiation environment related to future human missions to Mars.