Project Details

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Project Title:
Advanced Warning Methodologies for Solar Particle Event Radiation Exposures

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Summary:
Human exploration and development of space requires consideration of the risks associated with acute radiation exposure to humans and equipment. Previous work has shown large that Solar Particle Events (SPE) can deliver doses to critical human body organs in excess of 10 Gy at dose rates exceeding 1 Gy-h-1 over several hours. Restriction of operations, necessary to maintain astronaut exposures at or below acceptable levels for long duration, deep space missions, could adversely impact crewed space missions. Excessive doses to equipment such as electronic components can render them temporarily or permanently inoperative and could also imperil crewed missions. SPE dose-time profile forecasting models could provide advanced warning of mission-threatening situations to mission controllers and commanders. Current SPE forecasting methodologies consistently overestimate the occurrence of large SPE. While conservative from a radiological risk perspective, such overestimates can unnecessarily restrict operations. The proposed research will investigate innovative forecasting methodologies utilizing neural networks and Bayesian inference techniques, with the possibility of combining these methods. Preliminary investigations using these techniques individually have demonstrated the potential for accurately forecasting SPE dose-time profiles early in the evolution of an event, using dosimeter readings obtained in the early stages of the event. Objectives for this research include: (1) Added testing of exisiting neural network and Bayesian inference methods beyond preliminary work completed to date (2) Extension of neural network methods to provide dose versus time profile information (3) Extension of Bayesian inference methods to use dose rate data rather than dose data to make predictions (4) Investigation of the capabilities of an advanced warning system which combines a neural network and Bayesian inference methods.

Publication References:

no references