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SPARC SOLARIS & HEPPA intercomparison activities: Recent developments in the modeling of EPP in chemistry climate and chemical transport models

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Significant progress has been made in the simulation of energetic particle precipitation (EPP) effects on the middle and upper atmosphere. Models now include a broader range of energetic particles, from auroral electrons with energies of a few keV to 20,000 MeV protons during Ground Level Enhancements. Model chemistry has been improved to better simulate the production of odd-hydrogen and odd-nitrogen (NOx) species and the subsequent catalytic loss of ozone. The long-term effects on the middle and lower atmosphere of this ozone loss have been studied in chemistry climate models. The realization that the dynamics of the winter polar stratosphere plays a vital role in transport of NOx from the mesosphere to the stratosphere has prompted the use of chemical transport models to study EPP effects on composition under a variety of dynamical conditions. All these studies have benefited from recent satellite observations that provide rigorous constraints on model predictions. This poster will review developments in EPP modeling, highlight recent successes and suggest areas where models still need improvement.