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Modelling HNO_3 and N_2O enhancements due to Solar Proton Events

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Solar Proton Events perturb middle atmospheric chemistry and are interesting natural experiments that allow us to test and improve our understanding of atmospheric chemistry, our observational capabilities, and numerical models. Models now reproduce NOx, HOx and related ozone chemistry relatively well. However, instruments such as MIPAS on the ENVISAT satellite now measure SPE-induced changes for a large variety of other species, and for several of them, e.g. HNO_3 and N_2O, discrepancies between measurements and some models have been found. Here, we present model results for stratospheric HNO_3 and mesospheric N_2O using the atmospheric chemistry general circulation model EMAC (ECHAM5/MESSy) and the atmospheric chemistry box model CAABA (Chemistry of the Atmosphere As a Box model Application). For HNO_3, a simple parameterization is introduced which is coupled to the standard SPE-induced HOx/NOx production parameterization. For N_2O, a modification of the standard NOx production scheme, where 0.85 NOx molecules instead of 1.25 are produced per ion pair, is suggested and shown to yield results that match MIPAS measurements.