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Sensitivity of Global Modeling Initiative chemistry and transport model simulations of radon-222 and lead-210 to input meteorological data

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Abstract. We have used the Global Modeling Initiative chemistry and transport model to simulate the radionuclides radon-222 and lead-210 using three different sets of input meteorological information: 1. Output from the Goddard Space Flight Center Global Modeling and Assimilation Office GEOS-STRAT assimilation; 2. Output from the Goddard Institute for Space Studies GISS II' general circulation model; and 3. Output from the National Center for Atmospheric Research MACCM3 general circulation model. We intercompare these simulations with observations to determine the variability resulting from the different meteorological data used to drive the model, and to assess the agreement of the simulations with observations at the surface and in the upper troposphere/lower stratosphere region. The observational datasets we use are primarily climatologies developed from multiple years of observations. In the upper troposphere/lower stratosphere region, climatological distributions of lead-210 were constructed from ~25 years of aircraft and balloon observations compiled into the US Environmental Measurements Laboratory RANDAB database. Taken as a whole, no simulation stands out as superior to the others. However, the simulation driven by the NCAR MACCM3 meteorological data compares better with lead-210 observations in the upper troposphere/lower stratosphere region. Comparisons of simulations made with and without convection show that the role played by convective transport and scavenging in the three simulations differs substantially. These differences may have implications for evaluation of the importance of very short-lived halogen-containing species on stratospheric halogen budgets.

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