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Revisiting the Carrington Event: Updated modeling of atmospheric effects[1] BRIAN THOMAS, KEITH ARKENBERG, BROCK SNYDER, Washburn University — The terrestrial effects of major solar events such as the Carrington white-light flare and subsequent geomagnetic storm of August-September 1859 are of considerable interest, especially in light of recent predictions that such extreme events will be more likely over the coming decades. Here we present results of modeling the atmospheric effects, especially production of odd nitrogen compounds and subsequent depletion of ozone, by solar protons associated with the Carrington event. This study combines approaches from two previous studies of the atmospheric effect of this event. We investigate changes in NOx compounds as well as depletion of O3 using a two-dimensional atmospheric chemistry and dynamics model. Atmospheric ionization is computed using a range-energy relation with four different proxy proton spectra associated with more recent well-known solar proton events. We find that changes in atmospheric constituents are in reasonable agreement with previous studies, but effects of the four proxy spectra used vary more widely than found by one of those studies. In particular, we find greater impact for harder proton spectra, given a constant total fluence. We report computed nitrate deposition values and compare to measured values in ice cores.

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