

Extreme space weather event benchmarks for the US Space Weather Action Plan.

Rodney Viereck⁽¹⁾, Tim Fuller-Rowell^{*(2)}, Jeff Love⁽³⁾, Elsayed Talaat⁽⁴⁾, Doug Biesecker⁽¹⁾

1. NOAA Space Weather Prediction Center, Boulder CO
2. University of Colorado, CIRES, Boulder CO
3. US Geological Survey, Golden CO
4. NASA Headquarters, Washington DC

Abstract:

To help prepare the United States for possible extreme space weather, the U.S. Government developed several policy documents: Executive order 13744 – Coordinating Efforts to Prepare the Nation for Space Weather Events, the National Space Weather Strategy, and the National Space Weather Action Plan. These documents establish roles and responsibilities among Federal agencies and identify over 100 activities to enhance preparedness for possible space weather events and their effects on technologies and society. In order to estimate the impacts of extreme space weather, one must first provide an estimate of the extreme environmental conditions during such events. How big are the once-in-hundred or once-in-a-thousand year space weather events? Is there a theoretical maximum for a particular space weather phenomenon? The five types of space weather phenomena called out in the Action Plan are (1) Induced geo-electric fields, (2) Ionizing radiation, (3) ionosphere disturbances, (4) Solar radio bursts, and (5) Upper atmospheric expansion.

We will present the preliminary findings of these five benchmark efforts. The assessments provide estimates of the extremes in the drivers of these five areas for the 1-in-100 year and theoretical maxima. Then the analysis requires not only an estimate of the response of the system but also an estimate of the temporal and spatial extent of the areas that are impacted. We will discuss the assumptions that went into the analysis. We will provide an assessment of the uncertainties of these estimates which, in turn, can help guide future research in improving the estimation of extreme space weather.