

Comparing Past and Current Super storms: How Large was the 1859 Event?

JAMES L. GREEN¹, SCOTT A. BOARDSEN², and E. W. CLIVER³

¹NASA/Goddard Space Flight Center, Greenbelt, MD, U.S.A.

²L3 Government Services, Lanham, MD, U.S.A.

³Space Vehicles Directorate, AFRL, Hanscom AFB, MA, U.S.A.

We have compiled rank order lists of the various measures of solar-induced disturbance for events from 1859 to the present. The parameters considered included: magnetic crochet amplitude, solar energetic proton fluence, Sun-Earth disturbance transit time, geomagnetic storm intensity, and low-latitude auroral extent. Taken together, the top-ranking events in each of the disturbance categories comprise a set of benchmarks for extreme space weather activity. While the 1859 event has close rivals or superiors in each of the above categories of space weather activity, it is the only documented event of the last ~150 years that ranks at or near the top on all of the lists. A closer look at the 1859 super storm should provide some measure of the upper bounds of a super storm.

The great geomagnetic storm of 1859 extended over a period from August 28 through to September 3. In addition to the scientific measurements that were published, primarily in the *American Journal of Science*, newspapers of that era provided an untapped wealth of first hand observations giving time and location along with reports of the auroral forms and colors. Low latitude auroral events were big news for both small local and metropolitan newspapers. If the weather was clear during an auroral display, you could almost guarantee a story in the local news the next day or even a few days later. The evolution of the aurora over the great storm period will be shown and is accomplished by combining the observations from many available sources (scientific observations, newspaper accounts, ship logs, and national weather services reports) in 30-minute intervals. A significant portion of the world's 140,000 miles of telegraph lines were adversely effected, many of which were unusable for a number of hours. At its height, the aurora was described as a blood or deep crimson red that was so bright that one could read a newspaper by its light. The extent of the aurora borealis was so great that observations had been reported by sailors on ships in the Gulf of Panama.