Geophysical Research Abstracts
Vol. 19, EGU2017-7224, 2017
EGU General Assembly 2017

Solar activity as driver for the Dark Age Grand Solar Minimum

Ralph Neuhäuser (1) and Dagmar Neuhäuser (2)

(1) University Jena, Astrophysics, Jena, Germany (rne@astro.uni-jena.de), (2) independant scholar, Schillbachstr. 42, 07745 Jena, Germany (dagmarneuhaeuser@yahoo.de)

We will discuss the role of solar activity for the temperature variability from AD 550 to 840, roughly the last three centuries of the Dark Ages. This time range includes the so-called Dark Age Grand Solar Minimum, whose deep part is dated to about AD 650 to 700, which is seen in increased radiocarbon, but decreased aurora observations (and a lack of naked-eye sunspot sightings).
We present historical reports on aurorae from all human cultures with written reports including East Asia, Near East (Arabia), and Europe. To classify such reports correctly, clear criteria are needed, which are also discussed. We compare our catalog of historical aurorae (and sunspots) as well as C-14 data, i.e. solar activity proxies, with temperature reconstructions (PAGES).
After increased solar activity until around AD 600, we see a dearth of aurorae and increased radiocarbon production in particular in the second half of the 7th century, i.e. a typical Grand Solar Minimum.
Then, after about AD 690 (the maximum in radiocarbon, the end of the Dark Age Grand Minimum), we see increased auroral activity, decreasing radiocarbon, and increasing temperature until about AD 775.
At around AD 775, we see the well-known strong C-14 variability (solar activity drop), then immediately another dearth of aurorae plus high C-14, indicating another solar activity minimum. This is consistent with a temperature depression from about AD 775 on into the beginning of the 9th century. Very high solar activity is then seen in the first four decades with four aurora clusters and three simultaneous sunspot clusters, and low C-14, again also increasing temperature. The period of increasing solar activity marks the end of the so-called Dark Ages: While auroral activity increases since about AD 793, temperature starts to increase quite exactly at AD 800. We can reconstruct the Schwabe cycles with aurorae and C-14 data.
In summary, we can see a clear correspondence of the variability of solar activity proxies and surface temperature reconstructions. This indicates that solar activity is an important climate driver.