



Historical observations of the Aurora as indicator for solar wind – revisited catalogue for the Maunder Minimum

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An important part of space climate is the solar wind, whose short-term and secular variations (including Grand Maxima and Grand Minima) are traced by geomagnetic disturbances observed as aurorae. If we are now entering a new Grand Minimum, studies of the Maunder Minimum would be of special interest.

However, many catalogues of historical aurorae suffer from various problems and shortcomings: (i) East Asian records are often available only in later compilations (out of context), (ii) original source texts from Europe are often not given (it is time-consuming to find the original), (iii) observational reports from Europe are mostly in Latin, (iv) in particular in the 17th century, there are double entries due to confusion between Julian and Gregorian calendar. Clear criteria to distinguish aurorae from other meteorological and astronomical phenomena are often missing.

Reports on, e.g., war armies or dragons on sky at night can refer to auroral features or lunar halo effects. To discriminate them from each other, context, contemporary terminology and interpretation, current weather, local circumstances, timing (twilight?), lunar phase, etc. are helpful.

We show that many of the published presumable aurorae in the Maunder Minimum are non-auroral in origin. Even in the collection of sightings of aurora borealis in the area of Hungary by Réthly & Berkes (1963), considered the most homogeneous sample in and around the Maunder Minimum, almost all reports during its deep phase are most certainly halo displays including elaborated narratives. Halo effects were very popular in the Early Modern Period with its apocalyptic zeitgeist during and following religious processes (reformation aftermath).

Aurorae have the advantage that they are a more direct proxy for the solar wind than, e.g., sunspots, and that they would allow a reconstruction of the geo-magnetic field independant from archaeological and geophysical samples; in contrast to aurorae, solar activity reconstructions with radiocarbon samples suffer from inhomogeneities due to human intervention (e.g. Suess effect) and depend on the reconstructed geo-magnetic field.

A critically selected aurora catalogue will provide an independant and complimentary dataset (in addition to sunspots and radioisotopes), to study the variability of solar wind and, in general, solar activity over short and long time-scales including the onset, depth, and duration of the Maunder Minimum.