Observatory Data: a 170-year Sun-Earth Connection

The discovery of the sunspot cycle and the first results of the 'Magnetic Crusade' together made it clear that solar and geomagnetic activity are intimately related and that observing one is learning about the other [both ways]. Understanding of this magnificent relationship had to await more than a century of progress in both physics and observations, and only in the last few decades have we achieved the elucidation that in the middle of the 19th Century was so fervently hoped for: The lack of rapid progress so frustrated the observers [and their funding agencies] that many observatories were shut down or had operations severely curtailed, because as von Humboldt remarked in vol. 4 of his *Cosmos*: "they have yielded so little return in proportion to the labor that had gone into collecting the material".

The confirmation by spacecraft measurements of what workers in solar-terrestrial relations had so long suspected namely that a solar wind connects the magnetic regimes of the Sun and the Earth has finally brought about an understanding of one half of the relationship [activity] while the discovery of the ionosphere and measurements of solar ultraviolet and X-ray emissions have brought understanding of the other half [regular diurnal variation]. Today we have a quantitative understanding of these phenomena [although the microphysics is still debated] allowing us to model quantitatively the geomagnetic response to solar and interplanetary conditions. The immense complexity of geomagnetic variations becomes tractable by the introduction of suitable geomagnetic *indices* on a variety of time scales. Because different indices respond to different combinations of solar wind parameters we can invert the response and determine solar wind speed and density and interplanetary magnetic field strength from simple hourly mean values as far back as these are available. In addition, the understanding of the ionospheric response to solar Far UltraViolet, allows us to infer FUV in the past as well, with the possibility of checking [and correcting] the sunspot number and calculating the Total Solar Irradiance. As geomagnetic variations have been monitored for ~170 years with [for this purpose] constant calibration, we have a data set of immense value for understanding long-term changes in the Sun. As our understanding in future of these universal processes will allow us to extract from the data even deeper results that we today cannot even contemplate, we argue that all efforts must be expended to continue, preserve, and digitize these national and scientific treasure troves.

At the General Assembly of the International Union of Geodesy and Geophysics (IUGG) at Madrid on October 24th, 1924, the section on Terrestrial Magnetism and Electricity adopted the following resolution:

> "Because of the geographical position of Greenland and of the importance of continuous measurements of magnetism and electricity in the auroral regions for the study of terrestrial magnetism and electricity, it is highly desirable that a permanent observatory dedicated to these subjects be established at the most suitable location on the West coast of Greenland."

The then director of the Danish Meteorological Institute (DMI) *Dan la Cour* persuaded the Minister of the Interior, *C.N. Hauge*, to propose to the Danish Parliament that a permanent observatory be established at Godhavn, on the island of Disco on the West coast of Greenland. The project was approved in the spring of 1925 and on February 1st, 1926, the new observatory started operations.

We owe to the foresight of the founders of the observatory and to the ***wisdom of the Danish Government*** in funding the observatory continuously to this day (and hopefully beyond) the existence of a virtually unbroken series of high-quality magnetic measurements going back now more than three-quarters of a century. The original equipment has, of course, been upgraded to modern instruments, but the quality and the care in data reduction have stayed true to the high standards set by the early observers.

As we laud the wisdom of those individuals that made this possible, posterity may remember and lament the individuals who are about to scuttle and disrupt this magnificent achievement.

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