



Long-term variations in the external ingredients of the geomagnetic field

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The aa index, designed to describe the geomagnetic activity at global scale has been shown to have increased in the 20th century by about 65%. In terms of 11-year running averages there is a long-term similarity between aa, R (the sunspot number), x, y, z, r (geomagnetic indices designed to characterize the solar quiet daily variation), and S (the solar irradiance). We show that the variation depicted by 11-year running averages of aa and R (and by consequence also of the other parameters mentioned) results from the superposition of Hale and Gleissberg cycles signatures in the corresponding time series. Other geomagnetic activity indices (IDV, IHV) are considered as well. The relationship between the solar activity and various aspects of the variability of the geomagnetic field implies that at both the 22-year scale and the Gleissberg cycle scale, the coronal source field (as reflected by general heliospheric conditions at 1 AU - IMF strength, solar wind speed and density, described in turn by the aa index of geomagnetic activity, and/or as reflected by the IMF strength at 1 AU, described in turn by the IDV index), the photospheric magnetic field (as reflected by the R index), and the solar radiative output (as reflected by x, y, z, r, and S) have a similar behavior, being subject to similar long-term variations caused by processes developing in the Sun.