Probability forecast for geomagnetic storm occurrences and its verification

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An operational model for the forecast of geomagnetic storm occurrences should be expressed in probabilistic terms. The forecast probability is given in the form of a frequency distribution, which is likely described by the solar cycle-dependent Poisson distribution *Po(n)* [Tsubouchi and Omura, 2007]. The parameter which determines the specific Poisson distribution is an average frequency *n* within a unit interval (in this study, three-month is taken into account as a unit). The parameter *n* is strongly time-dependent, especially evident between the active and quiet phases in a solar cycle. Thus, the performance of the present forecast model depends on how appropriately *n* is estimated from a prior information at the time of forecast. In the present study, we will show a few different models of the estimation for *n*, each of which is further evaluated in their 'forecast performance' for the calibration by comparing with the past observation. For verifying the model performance quantitatively, standard measures such as the accuracy, reliability, and resolution of the model outcome are calculated, which are often used in the meteorological 'weather forecast' assessment. The properties of the forecast quality clarifies the advantage/weakness of each model. Preliminary results suggest that the forecast during solar active periods shows relatively accurate performance with positive skill, whereas the one during quiet periods exhibits inaccurate results. Ideas for future improvements will also be discussed.