Neural Network Forecast of some Solar and Geomagnetic Indices during the 24th Solar Cycle

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The long-term solar cycle predictions rely on meager modeling of underlying physical foundation. Waiting for a full understanding of the solar cycle that would provide the basis of physical predictions methods we must rely on empirical ones. There are many forecasting techniques, all with ups and downs. We choose to attempt the forecasts of several indices of the 24th solar cycle using the neural network method although the method still suffer from basic problems such as data pre-processing, architecture selection and parameterization. For the sunspot relative number, R, June 2006 as the next minimum epoch with a value around 18 and, December 2009 as the next maximum epoch with a value of around 145 were obtained. Using the Ohl's method the predicted next R maximum is 138, not far from the previous forecast of 145. For the 2800 MHz solar radio flux, the next minimum epochs with an approximate value of 75, on May 2006, and the next maximum epoch with a value of about 195, on December 2009, were forecasted. The time phase of both minima and maxima agrees nicely which gives us hope in a good behavior of our approach. The forecasts of the geomagnetic indices were also done with the same pre-processing (pseudo-gaussian monthly smoothed mean) and the same neural net for the same forecast horizon. The *aa* forecast gives for late 2008 an absolute minimum value around 11 and the *Dst* forecast gives for mid 2008 a local maximum around 19. The opposite phase behavior of the two indices is clearly maintained over the forecast interval. The Ap and Kp are well correlated during the forecasted interval. However the forecasted next minimum does not resemble with the two previous ones. The high geomagnetic activity in the beginning as well as in the second part of 2005 yr is seen in forecasts.