[포SE-38] Prediction of the 24th Solar Maximum Based on the Principal Component-and-Autoregression method

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Everybody wants to see the future, but nobody does for sure. Reliably forecasting the solar activity in the near future looks like an easy task, but in fact still remains one of difficult problems in the solar-terrestrial research. We have sought for good univariate methods that can predict future smoothed sunspot numbers reasonably well based on past smoothed sunspot number data only. Here we consider a specific method we call principal component-and-autoregression (PCAR) method. The variation of sunspot number during a period of finite duration (past) before an epoch (present) is modeled by a linear combination of a small number of dominant principal components, and this model is extended to the period (future) beyond the epoch using the autoregressive model of finite order. From the application of this method, we find that the 24th solar maximum is likely to occur near the end of the year 2013 (and there is a possibility that it occurs earlier near the start of 2013), and to have a peak sunspot number of about 86, indicating that the activity of the 24th cycle will be weaker than the average. We will discuss how much this estimate is reliable.

[포SE-39] Evolution of the Magnetosphere in Response to a Sudden Ring Current Injection

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The dynamical evolution of the Earth's magnetosphere loaded with a transiently enhanced ring current is studied by numerical magnetohydrodynamic (MHD) simulation. Two cases with different values of the primitive ring current are considered. In one case, the initial ring current is strong enough to create a magnetic island in the magnetosphere. The magnetic island readily reconnects with the earth-connected ambient field and is destroyed as the system approaches a steady equilibrium. In the other case, the initial ring current is not so strong, and the initial magnetic field configuration bears no magnetic island, but a wake of bent field lines, which is smoothed out through the relaxing evolution of the magnetosphere. The relaxation time of the magnetosphere is found to be about five to six minutes, over which the ring current is reduced to about a quarter of its initial value. Before reaching a steady state, the magnetosphere is found to undergo an overshooting expansion and a subsequent contraction. Fast and slow magnetosonic waves are identified to play an important role in the relaxation toward equilibrium.