Impact of morphological asymmetry in a sunspot group on the solar cycle prediction

*Haruhisa Iijima[1], Hideyuki Hotta[2], Shinsuke Imada[1]

1. Institute for Space-Earth Environmental Research, Nagoya University, 2. Faculty of Science, Chiba University

The spatial structure of leading sunspots is more coherent than that of following sunspots. This well-known characteristic of sunspots produces significant impact on the formation of polar magnetic field and cycle prediction. Using the surface flux transport model, we quantified the effect of this morphological asymmetry of sunspots on the polar field formation for the first time. We find that (1) the morphological asymmetry prevents the build-up of the polar magnetic field by orders of magnitude and (2) the model with the asymmetry shows better agreement in the temporal profile of the observed axial dipole strength. Considering the clear relation between the polar magnetic field and the cycle amplitude, our results suggest a strong impact of the morphological asymmetry on the solar cycle prediction.

Keywords: Sunspot, Solar Cycle Activity, Magnetic field

