[포SE-37] Merging and Splitting of Coronal Holes through a Solar Cycle

Minhwan Jang[1,2], G.S. Choe[2,1], Sunhak Hong[2,3], and Tom Woods[4]
[1]Department of Astronomy and Space Science, Kyung Hee University, [2]School of Space Research, Kyung Hee University, [3]National Radio Research Agency, Korea Communications Commission, [4]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, U.S.A.

A statistical study of coronal hole merging and splitting has been performed through Solar Cycle 23. The NOAA/SESC solar synoptic maps are examined to identify inarguably clear events of coronal hole merging and splitting. The numbers of merging events and splitting events are more or less comparable regardless of the phase in the solar cycle. The number of both events, however, definitely shows the phase dependence in the solar cycle. It apparently has a minimum at the solar minimum whereas its maximum is located in the declining phase of the sunspot activity, about a year after the second peak in Solar Cycle 23. There are more events of merging and splitting in the descending phase than in the ascending phase. Interestingly, no event is found at the local minimum between the two peaks of the sunspot activity. This trend can be compared with the variation of the average magnetic field strength and the radial field component in the solar wind through the solar cycle. In Ulysses observations, both of these quantities have a minimum at the solar minimum while their maximum is located in the descending phase, a while after the second peak of the sunspot activity. At the local minimum between the two peaks in the solar cycle, the field strength and the radial component both have a shallow local minimum or an inflection point. At the moment, the physical reason for these resembling tendencies is difficult to understand with existing theories. Seeing that merging and splitting of coronal holes are possible by passage of opposite polarity magnetic structures, we may suggest that the energizing activities in the solar surface such as motions of flux tubes are not exactly in phase with sunspot generation, but are more active some time after the sunspot maximum.