

Evolution of anemone ARs and space weather research

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To make clear the mechanisms of active phenomena seen on the solar surface is crucially important for the space weather research, since they are the sources of the interplanetary disturbances. On the other hand, individual solar events can rarely be identified in interplanetary space disturbances and/or geomagnetic storms, because their evolution and interaction with the surrounding magnetic structure are very complicated. Therefore, following the evolution of an active solar phenomenon that becomes a source of the interplanetary disturbance, in detail, from the solar surface to the earth's magnetosphere is a key to solve the question.

Active regions (ARs) that emerge in a coronal hole (CH) or other unipolar regions sometimes show *sea-anemone* like appearance (Shibata et al. 1994). This type of ARs is sometimes called anemone ARs. In emerging, the ARs interact (reconnect) with the ambient coronal field, and magnetic loops are arranged radially with one of the emerged spots. Eruptive activities of anemone ARs are usually low (Asai et al. 2008), and often confined to small-scale activities inside CHs that appears to be SXR bright points. CHs are, on the other hand, related with fast solar wind because of their open magnetic field, and therefore, themselves have been another important factor for space weather studies. While large geomagnetic storms are caused by earth-directed coronal mass ejections (CMEs) (see e.g., Gosling et al. 1990), weaker storms are associated with high-speed streams from CHs (see e.g., Sheeley, Harvey, & Feldman 1976). It has been, furthermore, reported that many fast Halo CMEs are associated with CHs (Verma 1998; Liu & Hayashi 2006; Liu 2007).

In this paper we report coronal features of such anemone ARs. We also report an active region NOAA 10798 which generated 2 M-class flares, and high speed CMEs on 2005 August 22, which produced a large magnetic storm ($Dst = -216$ nT) on 2005 August 24. Then, we discuss the importance of anemone ARs on the space weather research.