Increase in the amplitude of line-of-sight velocity of the small scale motion as the precursor of filament eruptions

*Daikichi SEKI[1], Hiroaki Isobe[1], Kenichi Otsuji[2], Kumi Hirose[2]

1. Graduate School of Advanced Integrated Studies in Human Survivability, Kyoto University, 2. Kwasan and Hida Observatories, Kyoto University

Filaments, the dense cooler plasmas in the solar corona, often become unstable and erupt into the interplanetary space as coronal mass ejections (CMEs). The CMEs may cause geomagnetic storms that result in various societal and economical impacts such as blackouts and satellite anomalies, so that it is important to predict when filament eruptions will occur. From the space weather point of view, monitoring filaments as the progenitor of CMEs has a following advantage that we can monitor not only flares from active regions but also the eruptions from quiet regions that may also cause severe geomagnetic storms. The aim of this study is to investigate the characteristics of eruptive filaments that can be used as the precursor of eruptions.

For this purpose, we analyzed the solar full disk images captured by Solar Dynamics Doppler Imager(SDDI) installed on Solar Magnetic Activity Research Telescope(SMART) at Hida Obser- vatory, Kyoto University. SDDI can obtain solar full disk images in 73 wavelengths between Hα center-9A and Hα center+9A per 0.25A with the time resolution of about 15 seconds. Therefore this instrument can observe unprecedented detailed line-of-sight velocities of filaments. Focusing on this feature, we calculated the filament's line-of sight velocities for each pixel of the images by utilizing Beckers' cloud model from before the eruption, and making histograms of the number of pixels and line-of-sight velocities for each pixel. As the result, we found an increase in the amplitude of line-of-sight velocity of the small scale motions in the filament about one hour before the onset of the eruption, i.e. the FWHM of the fitted gaussian increased. This result can be possibly used as the precursor of filament eruptions

Keywords: prominence, filament activation, line-of-sight velocity