CHARACTERISTIC DEPENDENCE OF UMBRAL DOTS ON THEIR MAGNETIC STRUCTURE

Hiroko Watanabe, watanabe@kwasan.kyoto-u.ac.jp
Kyoto University, Kyoto, Japan
Reizaburo Kitai, kitai@kwasan.kyoto-u.ac.jp
Kyoto University, Kyoto, Japan
Kiyoshi Ichimoto, ichimoto@kwasan.kyoto-u.ac.jp
Kyoto University, Takayama, Gifu, Japan

Umbral dots (UDs) were observed in a stable sunspot in NOAA 10944 by the Hinode Solar Optical Telescope on 2007 March 1. The observation program consisted of blue continuum images and spectropolarimetric profiles of Fe I 630 nm line. An automatic detection algorithm for UD was applied to the 2 hr continuous blue continuum images, and using the obtained data, the lifetime, size, and proper motion of UD were calculated. The magnetic structure of the sunspot was derived through the inversion of the spectropolarimetric profiles. We calculated the correlations between UD’s parameters (size, lifetime, occurrence rate, proper motion) and magnetic fields (field strength, inclination, azimuth), and obtained the following results. (1) Both the lifetime and size of UD are almost constant regardless of the magnetic field strength at their emergence site. (2) The speed of UD increases as the field inclination angle at their emergence site gets larger. (3) The direction of movement of UD is nearly parallel to the direction of the horizontal component of magnetic field in the region with strongly inclined field, while UD in the region with weakly inclined field show virtually no proper motion. Our results describe the basic properties of magnetoconvection in sunspots.