

# Hinode Observation of Sun's Polar Regions over a solar cycle

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Observations of the magnetic fields in the Sun's polar regions are of crucial importance to understand the long-term variation of solar magnetism. As a consequence of the magnetic variation the three-dimensional structure of global solar corona and solar wind also show a drastic long-term variation and, as a result, fast solar wind emanates from the polar regions around solar minima. The first Hinode observation of the polar region reveals the fine structure of photospheric vector magnetic fields of the polar areas: the existence of many patchy magnetic concentrations with intrinsic field strengths of over 1 kG distributed across the entire polar region (Tsuneta et al. 2008) around the solar minimum. Following the first polar observation, the monitoring of the polar regions has been continued for 12 years. Since 2012, which was before the solar maximum of this cycle, the time variations in the distribution of the whole polar regions during the polarity reversal period have been monitored with periodic SP observations during a month at the proper timing (March for the south pole and September for the north pole). The monitoring revealed that the distributions of large magnetic patches show yearly variations associated with the solar activity cycle while small magnetic patches does not change. The polarity reversal of the northern polar region progressed prior to that of the south in the early stage of the this cycle: The decrease of large negative patched in the north polar region is earlier than the decrease of large positive patches in the southern polar region as similar to shown in the previous work (Shiota et al. 2012). As most of the negative magnetic patches in the north polar region had disappeared by 2013, the average magnetic field of the north polar region became nearly zero and had remained so until 2015. we can see significant increase in the large positive patches after 2016. On the other hand, the reversal process progressed so quickly. Now, the Sun comes the solar minimum state, the polarity reverse seems to complete in this cycle.

Keywords: Sun's polar region, solar magnetism