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Three dimensional coronal magnetic field structure in polar region

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Abstract. Polar coronal hole is though to be open field region where the solar wind is originated. The solar wind has a bimodal structure; high speed in high latitude and low speed in low latitude. Coronal magnetic field structure is a key physical factor to understand the solar wind acceleration and heating of coronal plasma. Recently Tsuneta et al. (2008) reported scattered patchy structures of vertical magnetic field with intensity as strong as $\geq$ 1 kG (kG patches) in the south polar region observed with the Stokes Polarimeter (SP) of the Solar Optical Telescope (SOT) aboard the *Hinode*. This discovery may change our current understanding of magnetic structures in the polar region of the Sun, and suggests us to revisit the relation between the magnetic structure and the acceleration of solar wind.
Three dimensional coronal magnetic field is reconstructed with extremely high degree potential field source surface (PFSS) model using the vector magnetic field map obtained with SOT/*Hinode* and MDI/SOHO synoptic map. The model shows that polar open magnetic field lines which are rooted to the kG patches observed with SOT and that they have canopy structures at the bottom of the corona.
Alfvén speed along the open field lines are calculated with a standard hydrostatic atmosphere model. The examination of the spatial variation in the Alfvén speed implies that Alfvén speed along the open field lines emanating from the edge of canopies rooted to kG patches are efficient guides for the Alfvén wave propagation to the corona more than those emanating from the canopy centers. Using the field configuration, we also discuss how the geometries of the field lines associated with a single kG patch affect the dissipation of Alfvén wave as a mechanism for the coronal heating and the acceleration of the solar wind.