Magnetic field and waves in solar prominences

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The magnetic field of solar prominences is an important ingredient that governs their presence, structure and destabilization process. A number of studies on the magnetic field have been conducted by spectro-polarimetric observations, but the field direction and strength of prominences are still discrepant among the studies partly due to the ambiguity inherent in the Stokes inversion. In this study, we performed spectro-polarimetric observations of about ten prominences on the solar limb including both quiescent and active region prominences in He I 10830 A using the Domeless Solar Telescope at Hida Observatory. Using the HAZEL code, magnetic fields of each prominence were derived, and it is found that the field strengths of quiescent prominences are less than 40 G, which is consistent with previous studies, while the field strengths of active region prominences are less than 120 G, which is inconsistent with some of the previous studies which estimated field strengths of on-disk active region filaments as 400 - 800 G. To determine the field direction which suffers from the 90 deg. ambiguity in the Hanle diagnosis, we focus on the Alfvenic wave propagating across the prominences, i.e., if it is detected, the direction of the propagation will directly infer the direction of the magnetic field. Motivated by this idea we investigated more than 100 prominences on the solar limb using fulldisk H-alpha images taken by Solar Dynamics Doppler Imager at Hida Observatory. It is found that the waves with a period of about 4min propagating with a coronal Alfven speed across the prominences are quite common for side-view prominences, and their propagation direction is mostly horizontal with respect to the solar limb rather than vertical. The fact that the waves are observed only in Doppler signal but not in intensity suggests the incompressive, or Alfvenic, nature of the waves. This finding supports the horizontal field configuration for majority of the prominences.