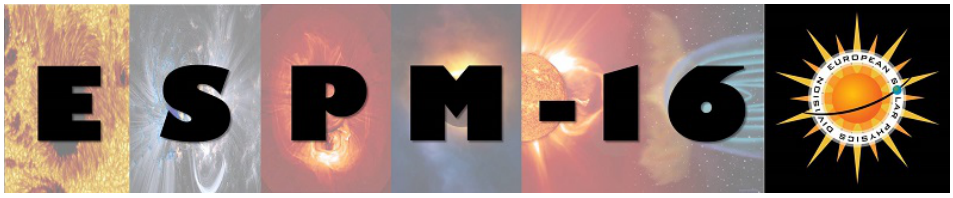

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Magnetic fields and turbulent velocities in a limb solar flare by hydrogen, helium and ionized calcium lines

Wednesday, 8 September 2021 09:13 (13 minutes)

We present simultaneous magnetic field measurements for the limb solar flare of 1981 July 17 using of the Ca II K, Hδ, He I 4471.5 Å and Hβ lines (Yakovkin et al., 2021; https://doi.org/10.1016/j.asr.2021.03.036). For two moments during the flare, which differ in time by 16 min, we analyzed Stokes $I \pm V$ and V profiles of these lines from observations made on the Echelle spectrograph of the horizontal solar telescope of the Astronomical Observatory of Taras Shevchenko National University of Kiev. For heights of 10−18 Mm above the level of the photosphere, we found that (a) very strong kG magnetic fields (up to about 3 kG) existed at both moments of the flare, (b) the locations with strongest fields, in general, do not coincide for different spectral lines, (c) the polarities of the magnetic field for different spectral lines are in most cases identical, but sometimes they do not coincide. The data obtained indicate a significant inhomogeneity of the magnetic field in the flaring corona and the probable presence of the conditions necessary for magnetic reconnection of field lines. A new indication of the existence of superstrong magnetic fields (> 5 kG) follows from a comparison of the kinetic temperatures and turbulent velocities in the flare (Yakovkin & Lozitsky, 2020; https://doi.org/10.18524/1810-4215.2020.33.216453). From analysis of Stokes I profiles, we found a tendency to anti-correlation between temperature and turbulent velocity. Perhaps, this unlikely tendency presents masked presence of very strong magnetic fields of 7−8 kG range.

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