Magnetic moment of solar plasma and the Kelvin force: -The driving force of plasma up-flow -

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Thermal plasma in the solar atmosphere is magnetized (diamagnetic). The magnetic moment does not disappear by collisions because complete gyration is not a necessary condition to have magnetic moment. Magnetized fluid is subjected to Kelvin force in non-uniform magnetic field. Generally, magnetic field strength decreases upwards in the solar atmosphere, hence the Kelvin force is directed upwards along the field. This force is not included in the fluid treatment of MHD. By adding the Kelvin force to the MHD equation of motion, we can expect temperature dependent plasma flows along the field which are reported by many observations. The temperature dependence of the flow speed is explained by temperature dependence of magnetic moment. From the observed parameters, we can infer physical parameters in the solar atmosphere such as scale length of the magnetic field strength and the friction force acting on the flowing plasma. In case of closed magnetic field lines, loop-top concentration of hot plasma is expected which is frequently observed.