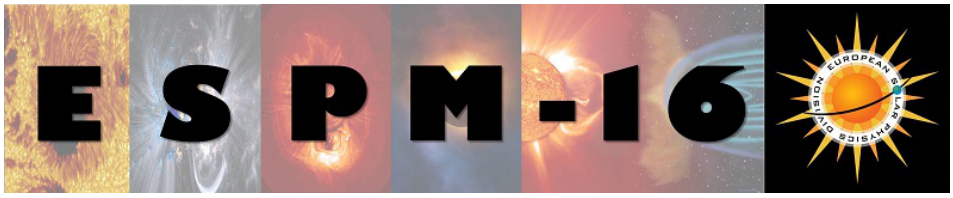

Contribution ID: **258** Type: **Talk**

Kink instability of jets in the solar atmosphere

Tuesday, 7 September 2021 16:15 (15 minutes)

We studied the kink instability of triangular jets sandwiched between magnetic tubes/slabs and its possible connection to observed properties of the jets in the solar atmosphere. A dispersion equation governing the kink perturbations is obtained through matching of analytical solutions at the jet boundaries. The equation is solved analytically and numerically for different parameters of jets and surrounding plasma. The analytical solution is accompanied by a numerical simulation of fully nonlinear MHD equations for a particular situation of solar type II spicules. MHD triangular jets are unstable to the dynamic kink instability depending on the Alfven Mach number (the ratio of flow to Alfven speeds) and the ratio of internal and external densities. Jets with an angle to the ambient magnetic field have much lower thresholds of instability than field-aligned flows. Growth times of the kink instability are estimated as 6-15 min for type I spicules and 5-60 s for type II spicules matching with their observed life times. Numerical simulation of full nonlinear equations shows that the transverse kink pulse locally destroys the jet in less than a minute in the conditions of type II spicules. Dynamic kink instability may lead to full breakdown of MHD flows and consequently to observed disappearance of spicules in the solar atmosphere.

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Session Classification: Plenary 4

Track Classification: Session 3 - Fundamental Plasma Processes in the Solar Atmosphere: Magnetic Reconnection, Waves, Emission, Particle Acceleration