SAUSAGE OSCILLATIONS IN TWISTED AND ANNULAR MAGNETIC FLUX TUBES WITH FLOWS

A. Satya Narayanan[1], C. Saichand[*], A. Anjali[*]

[1]Corresponding Author
*Indian Academy Internship Student
Indian Institute of Astrophysics, Koramangala, Bangalore - 560 034, India
e-mail: satya@iiap.res.in

Abstract: MHD waves play an important role in the transfer of energy from the different layers of the Sun. They also play a crucial role in heating of the solar corona. There are many types of MHD waves, namely, the Alfven modes, the Fast and Slow Magnetoacoustic modes for an uniform plasma which is compressible. However, in nature, the plasma is not homogeneous. For example, in the case of the solar corona, there are loop structures (called the coronal loops) which are manifestations of inhomogeneous plasma, caused by gradients in the magnetic fields. Magnetic structures present in the plasma, give rise to additional modes such as kink, sausage and flute modes, in addition to the surface and body waves.

In this study, we consider the basic equations of an ideal MHD plasma, with uniform flows, which is compressible, without dissipation. Two types of geometries are considered. The effect of uniform flows on sausage oscillations are studied for (1) uniformly twisted magnetic tubes and (2) magnetic annuli. Assuming wavelike solutions, the linearized equations of motion are simplified to yield a single wave equation for the displacement ». The boundary conditions, namely, the continuity of the displacement and total pressure (gas pressure + magnetic pressure) across the interfaces of the twisted tube and the annuli are imposed to derive the dispersion relation governing the sausage oscillations. The dispersion relation for the fully compressible case is rather complicated. To begin with, we resort to the study on the effect of uniform flows in twisted tubes and the annulus for an incompressibe fluid. The fully compressible case will be taken up later.

References:

1. B. K. Carter and R. Erdelyi, Astronomy and Astrophysics, 475, 323 - 331 (2007)
2. R. Erdelyi and V. Fedun, Solar Phys., 263, 63 - 85 (2010)
3. R. Erdelyi,: B. N. Dwivedi and U. Narain (eds.) Physics of Sun and Its Atmosphere, 61- 108,. World Scientific, Singapore (2008)
4. A. Satya Narayanan, An Introduction to Waves and Oscillations in the Sun, Springer, New York (2013).