An MHD Study of Large-Amplitude Oscillations in Solar Filaments

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Abstract:

Quiescent filaments are usually affected by internal and/or external perturbations triggering oscillations of different kinds. In particular, external large-scale coronal waves can perturb remote quiescent filaments leading to large-amplitude oscillations. Observational reports have indicated that the activation time of oscillations coincides with the passage of a large-scale coronal wavefront through the filament, although the disturbing wave is not always easily detected. Aiming to contribute to understanding how –and to what extent– coronal waves are able to excite filament oscillations, in this poster we will present 2.5D MHD simulations of a filament floating in a gravitationally stratified corona disturbed by a coronal shock wave. The interaction results in a two-coupled-oscillation pattern of the filament, which is damped in a few cycles. A parametric study was carried out varying parameters of the scenario such as height, size, and mass of the filament. An oscillatory analysis reveals a general tendency for periods of oscillations, amplitudes, and damping times to increase with height, whereas larger filaments exhibit shorter periods and smaller amplitudes. An interesting results of the calculation of forces exerted on the filament shows that the main restoring force is the magnetic tension.

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References: Zurbriggen et al. 2021 (Sol. Phys, in press)

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