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Damping length of slow magneto-acoustic waves in the coronal loops observed by SDO

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Abstract

Slow magneto-acoustic waves are often observed in polar plumes and active region fan loops. The observed periodicities of these waves are in the range of 1- 40 minutes. Mainly, the ratio of damping time to the oscillation period is less than 2 (equal to the ratio damping length to the wave length), which corresponds to the strong damping regime. In general, slow magneto-acoustic waves can be damped with different dissipation mechanisms. Previously, the effect of thermal conduction like compressive viscosity, optical thin radiation, density stratification, and non-uniform magnetic field on the damping of slow magneto acoustic wave was investigated.

Theoretical studies indicate that the observed damping length of slow waves must be depended to the frequency of oscillation. In this paper, damping length and frequency-dependent damping length in propagating slow magneto-acoustic waves has been studied by AIA/SDO images in the 171 and 193 A0. The results of this analysis indicate that the frequencies range of intensity oscillation is 0.5 to 16.7 mHz (1 to 33 minutes), and power spectral densities of intensity oscillation are dominated for 1, 2.2 3.6 and 4.6 mHz. The average damping length of intensity oscillation was obtained 38.1, 35.4, 32.7 and 29.5 Mm for 1, 2.2, 3.6 and 4.6 mHz oscillation respectively. Also, the damping length of 2.2, 3.6 and 4.6 mHz oscillation was decreased about 7%, 13.5% and 22.2% compared to the damping length of 1 mHz.The order of magnitude of the damping lengths that obtained from this analysis are in agreement with previous findings by the authors and the result of the theoretical dispersion of relations of MHD waves, but the frequency-dependent damping length is much less than the theoretical prediction.

Keywords: dependent, damping length , sun, corona, sun, oscillations, frequency

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