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Observational and numerical characterization of a wave-like front propagating along a coronal fan

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On 2011 July 6 EUV channels of AIA instrument onboard SDO detected a recurrent, arc-shaped intensity disturbance over an active region. The intensity disturbance fronts were observed to propagate along a coronal loop bundle rooted in a small area of the dark umbra of the sunspot. Neither signatures of flare activity nor of a coronal mass ejection event were observed in association with the phenomenon. Analysis of EUV wavelengths reveals that the fronts are accelerated in 171 Å and propagate with a projected, averaged plane-of-sky phase velocity of about 60 km/s while for the other coronal channels the values are about 40 km/s. All the channels exhibit a periodic recurrence with a period of about 3 minutes in the umbra and longer periods towards the penumbra. To shed light on the physical nature of the event, we perform 2D numerical simulations based on a simple symmetrical potential magnetic field configuration embedded in a gravitationally stratified atmosphere in hydrostatic equilibrium. We perturb the atmosphere using a driver located below the photosphere with a period of 3 min. We compare the kinematical properties of the event as observed at the different temperature regimes covered by the SDO/AIA images with the results from the numerical simulations. The speed values obtained from numerical simulations are similar to those estimated from observations for 171 Å. The analysis suggests that the accelerated profile seen on 171 Å is due to a projection effect and responds to the slow magnetoacoustic propagating wave scenario.

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