Dynamics of flaring loop system in ascending phase of the M2.1 class flare

E. Philishvili, B. M. Shergelashvili, T. V. Zaqarashvili, V. Kukhianidze, G. Ramishvili, M. Khodachenko, S. Poedts, and P. De Causmaecker

Abstract

The dynamics of the flaring loops in active region (AR) 11429 are studied. The observed dynamics consist of several evolution stages of the flaring loop system during the ascending phase of the registered M-class flare. The dynamical properties can also be classified by different types of magnetic reconnection, related plasma ejection and aperiodic flows, quasi-periodic oscillatory motions, and rapid temperature and density changes, among others.

We have studied the characteristic location, motion, and periodicity properties of the flaring loops by examining space-time diagrams and intensity variation analysis along the coronal magnetic loops using AIA intensity and HMI magnetogram images (from the Solar Dynamics Observatory).

We detected bright plasma blobs along the coronal loop during, the intensity variations of which clearly show quasi-periodic behavior. We also determined the periods of these oscillations. Two different interpretations are presented for the observed dynamics. Firstly, the oscillations are interpreted as the manifestation of non-fundamental harmonics of longitudinal standing acoustic oscillations driven by the thermodynamically nonequilibrium background (with time variable density and temperature). The second possible interpretation we provide is that the observed bright blobs could be a signature of a strongly twisted coronal loop that is kink unstable.

We also detected set of transient flows with the average velocity of 90 km/sec. According to our findings, we interpret these events as the results of thermally and hydrodynamically unstable sources