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Periodic pulsations of coronal loops and coronal rain: a unified picture

Processing more than 13 years of observations at 19.5 nm with EIT/SOHO, we discoverd more than six hundred long-period (3-16 hr) pulsation events in coronal loops, some lasting for up to six days (Auchère et al. 2014). Froment et al. (2015) ran the same code on the six coronal bands of AIA from 2010 to 2016, and detected about 2000 cases in active regions. These numbers imply that every active region will undergo one of these events in its lifetime.
These pulsations have been interepreted by Froment et al. as a signature of a specific regime of thermal non-equilibrium (TNE) in which condensations start to develop but are wiped out before they can reach chromospheric temperatures. TNE implies that the loops undergoing pulsations are subject to quasi-steady footpoint heating. Since TNE is already the standard model of formation of coronal rain, we now have a growing body of evidence that this type of heating is more common in active regions than previously thought, even though the fundamental mechanism could still be anything from truly continuous wave dissipation to high-frequency nanoflares.
Numerical simulations (see the abstract by Froment et al. ) suggest that EUV pulsations and coronal rain are two manifestations of the same basic process of evaporation / condensation cycles. In that picture, coronal rain corresponds to the coolest part of the cycle in which the plasma reaches chromospheric temperatures, while the coronal pulsations correspond to the hot part of the cycle in which the plasma is at coronal temperatures. In some models, the condensations can be "complete" or "incomplete" depending on the minimum temperature, which means that in some cases one may have coronal pulsations without coronal rain.
If this unifying interpretation is indeed correct, three predictions can be made from the numerical simulations. First, one should detect in coronal or transition regions lines the periodic flows visible in the simulations even when the condesations are incomplete. This is the topic of the abstract by G. Pelouze et al. Second, coronal rain and coronal pulsations should in some cases be visible simultaneously. Third, one should be able to detect periodic coronal rain. These last two points are the subject of the present work.
We will present the first results of independent detections of coronal rain and coronal pulsations off-limb. The pulsations are detected off-limb in the 6 coronal bands of AIA using a variation of the algorithm used by Auchère et al. (2014) )and Froment et al. (2015). Coronal rain is detected using an optical flow algorithm in AIA 30.4 nm images.