

Observations and possible interpretations of very long period intensity pulsations in solar coronal loops

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Motivation



AIA/SDO 193 Å

- There are long period intensity pulsations (several hours) in there (first study : Foullon et al. 2004)
- + They are common in solar coronal loops ! (Auchère et al. 2014)
- + New constraints for the heating of coronal loops ?

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- Fourier power spectrum for this time series







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- Pulsations observed in all 6 EUV bands





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Periodical changes in the thermal structure of loops Intensity pulsations linked to loops heating !

Cooling observations (1/4)



Time lag between the channels:

if intensity peaks first in the hotter spectral bands and then in the cooler spectral bands —> we observed cooling

Cooling observations (2/4)



Time lag between pairs of channels indicates that we observe cooling of the loop (Warren et al. 2002, Winebarger et al. 2003)

The heating phase does not impact the intensity curves : too weak density / too high temperature / impulsive heating

Cooling observations (3/4)



Time lag maps (peak cross correlation values)



 Cooling observed in all the active region, not just in the pulsating region !

A unique process of heating in the active region in a different mode in the pulsating region?

A different process of heating where we detected long period intensity pulsations ?

Conclusions and future investigations (1/2)

Conclusions

+ Automatic detection of long period intensity pulsations code with more than 3 years of AIA/SDO data :

- More than 2000 events in the 6 EUV bands
- Most events are visually associated with loops !
- Detailed study of one typical event

Physical properties extracted :

- + Intensity pulsations with long period in loops (2 to 16 hours)
- Pulsations in some loops and not in all loops
- + Oscillations in the thermal structure of loops
- + Cooling observed everywhere in the active region and in the pulsating loops
- Lag in the phase between footpoints and apex (about 2 hours)
- Froment et al. 2014 in prep

Conclusions and future investigations (2/2)

➡ To go further....

- Comparison of these observations with modeling results
- + Physical interpretations : mechanism of heating for the loops : quasi continuous or impulsive heating?



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