

Anatomy of a slow wave in a coronal loop

Tom Van Doorselaere

t.van-doorselaere@warwick.ac.uk

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centre for fusion, space and astrophysics

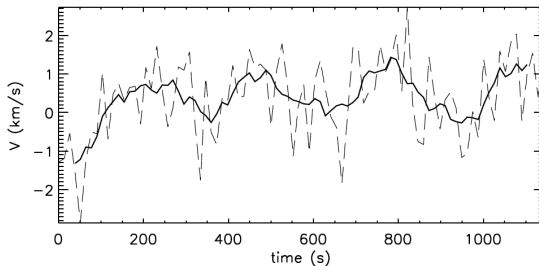
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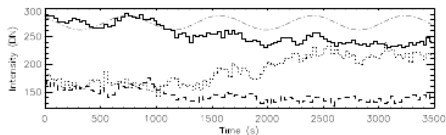
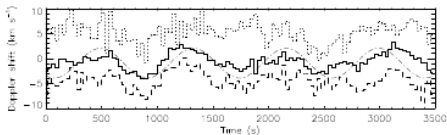
Hinode/EIS

- Van Doorselaere et al. (2008)
- Erdélyi & Taroyan (2008)
- Wang et al. (2009a,b)



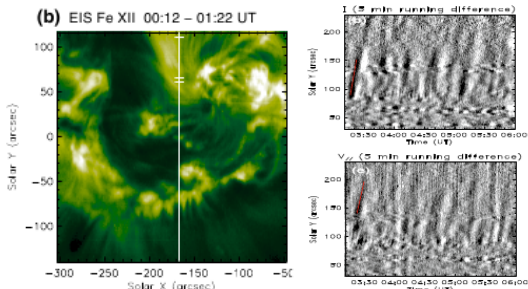
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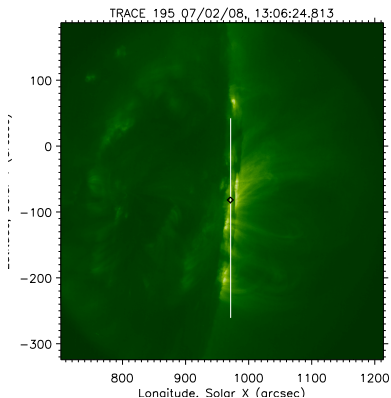


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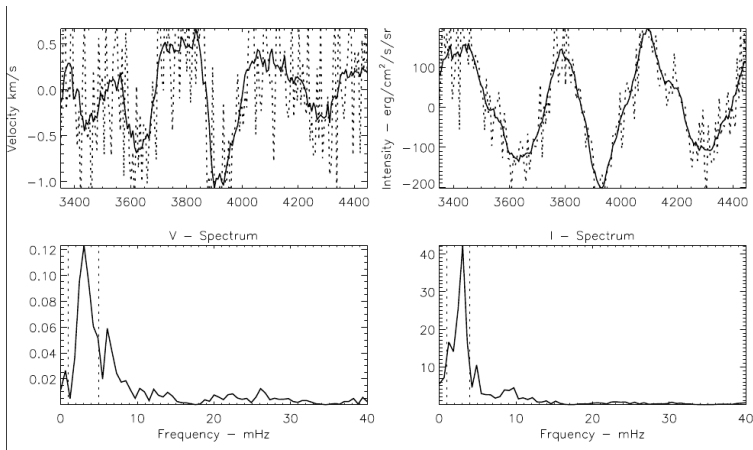
EIS observation



Overlay of EIS observing slit (vertical white line) on top of TRACE 195Å observation on the same day. The black diamond indicates the studied pixel.

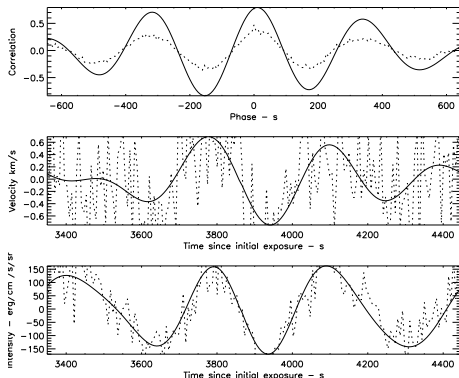
- Hinode/EIS observations on 07/02/2008
- active region on the limb
- 4 spectral windows
- 1" slit
- cadence time 6.4s

Velocity and intensity in FeXII 195Å



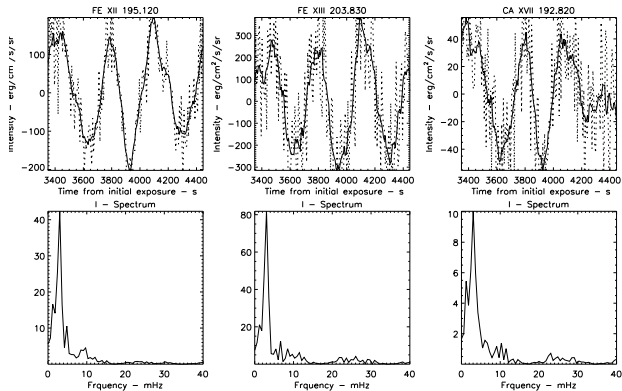
Left: Velocity + periodogram, Right: Intensity + periodogram
Period: period 314 ± 84 s, period 344 ± 61 s

Correlation between intensity and velocity



Good correlation between the velocity and intensity perturbations leads to an interpretation in terms of running slow waves. This is compatible with the orientation of the observed loop and earlier detections of this mode.

Intensity oscillations in other lines

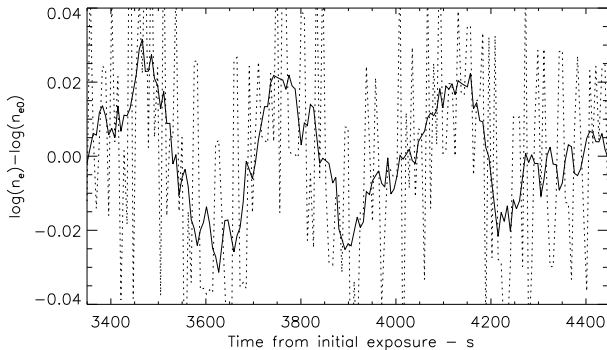


Top panels: Intensity in different spectral windows (FeXII 195Å, FeXIII 203Å, CaXVII 192Å), Bottom panels: periodogram of intensity signal

→ Use for spectroscopy with CHIANTI (Dere et al. 1997)

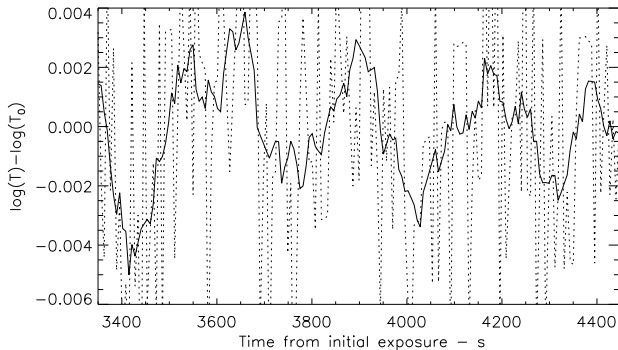
Density

Use CHIANTI to derive the electron density from the line ratio of the FeXIII spectral lines at 202Å and 203Å.



Temperature

Use CHIANTI to derive the electron temperature from the line ratio of the FeXII 195Å and FeXIII 202Å spectral lines.

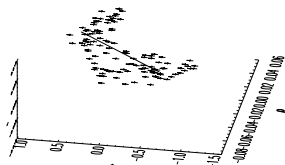
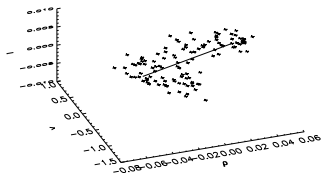


Seismology

From linear theory for 1D sound waves we know:

$$\rho'/\rho_0 = v_{\text{LOS}}/C_{\text{LOS}} \quad (1)$$

$$T'/T_0 = (\gamma - 1)\rho'/\rho_0 \quad (2)$$



Scatterplot and principle component analysis allows for seismological estimate of C_{LOS} and γ :

$$C_{\text{LOS}} = 14\text{km/s} \quad \alpha = 85^\circ \quad \gamma = 0.9$$

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- To do: error analysis