I. Evidence of the Electron-driven evaporation in a solar flare

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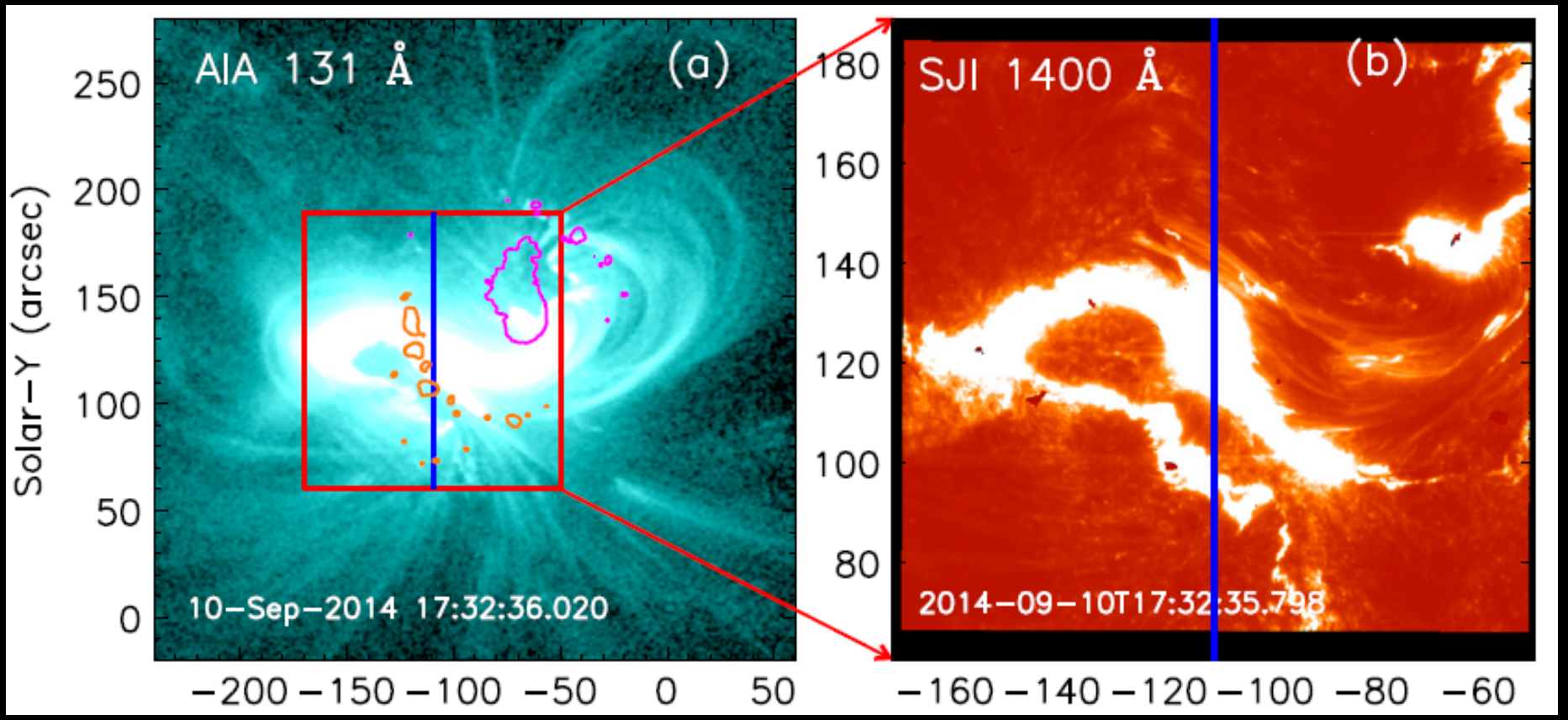
20140910 solar flare

SDO/AIA

IRIS



Fe_{XXI} — evaporation

C_I — condensation

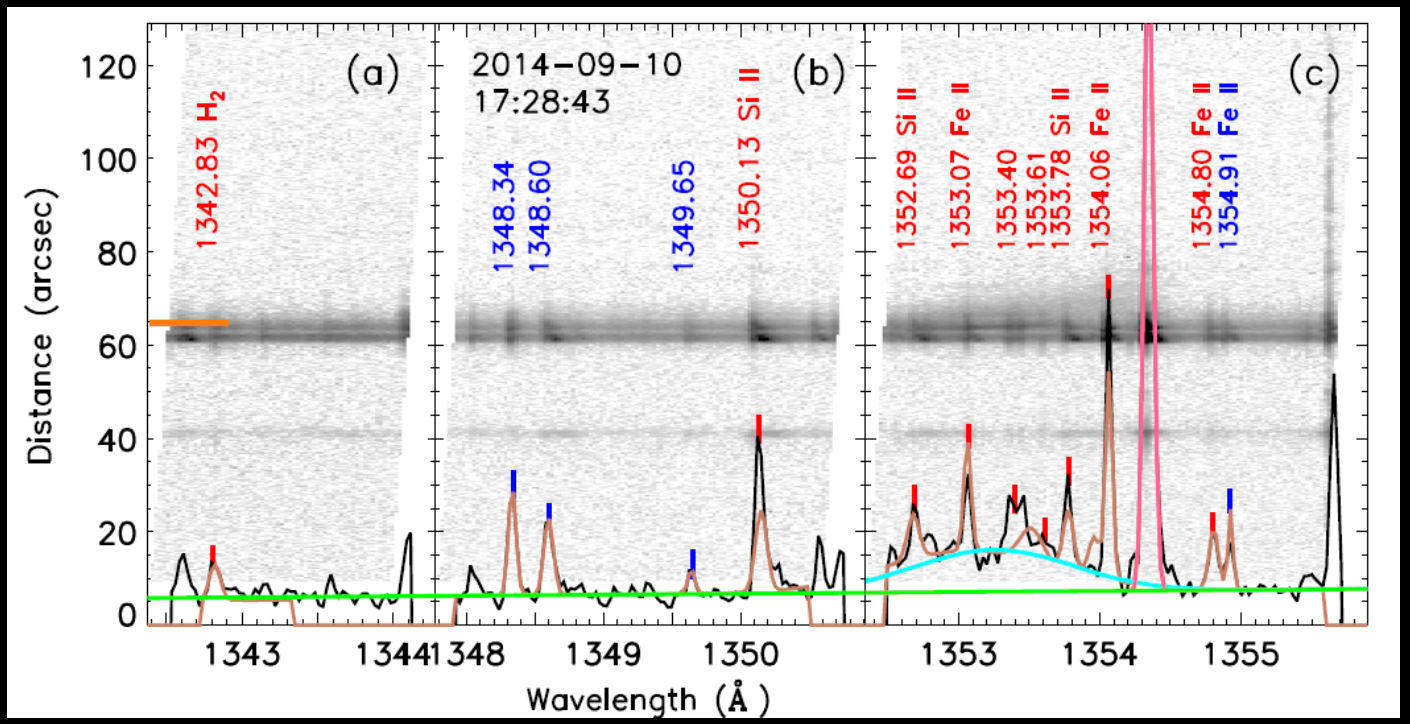


Table 1
The Parameters of 15 Emission Lines at Three *IRIS* Spectral Windows

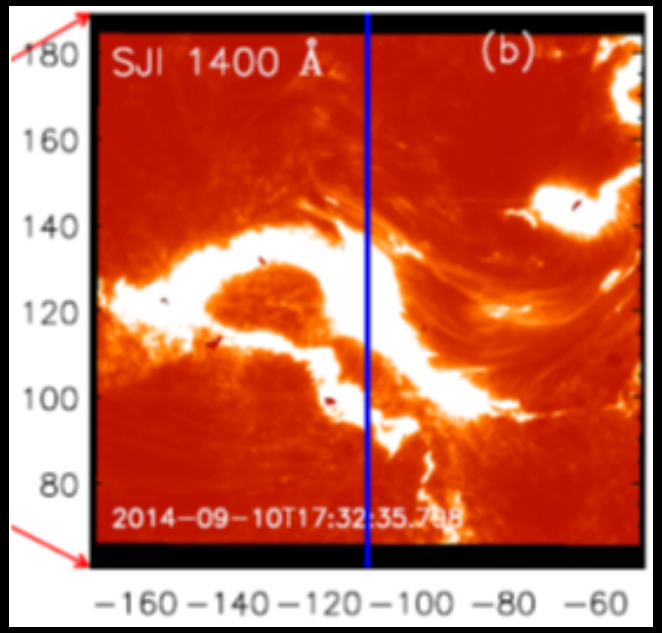
IRIS Window	Ion	Wavelength (Å)	Width (mÅ)	Intensity Tied to
	Si II	1352.69 ± 0.102	⩽260	Si II 1350.13
	Fe II	1353.07 ± 0.051	⩽88	Fe II 1354.80
	Unknown	1353.40 ± 0.061	⩽102	H_2 1342.83
	Unknown	1353.61 ± 0.061	⩽102	H_2 1342.83
"O I"	Si II	1353.78 ± 0.102	⩽260	Si II 1350.13
	Fe II	1354.06 ± 0.051	⩽88	Fe II 1354.80
	Fe XXI	1354.09 ± 1.28	⩾230	···
	C I	1354.29 ± 0.26	⩽130	···
	Fe II	1354.80 ± 0.051	⩽88	···
	Fe II	1354.91 ± 0.061	⩽102	···
	Si II	1350.13 ± 0.102	⩽260	···
	Unknown	1348.34 ± 0.067	⩽102	···
"Fe XII"	Unknown	1348.60 ± 0.067	⩽102	···
	Unknown	1349.65 ± 0.051	⩽77	···
"1343"	H_2	1342.83 ± 0.061	⩽102	

Rest wavelength: 1354.29

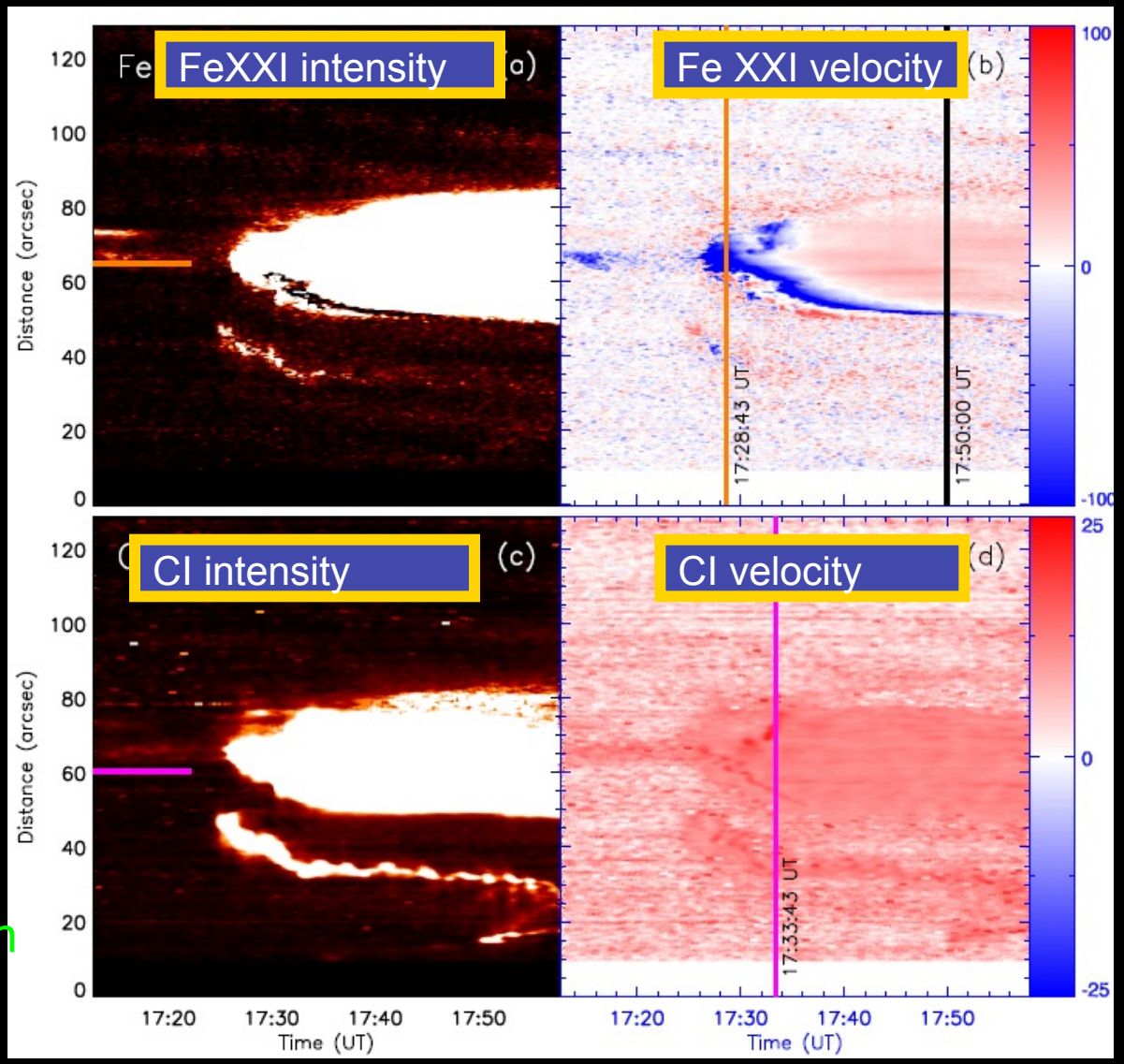
Our method:

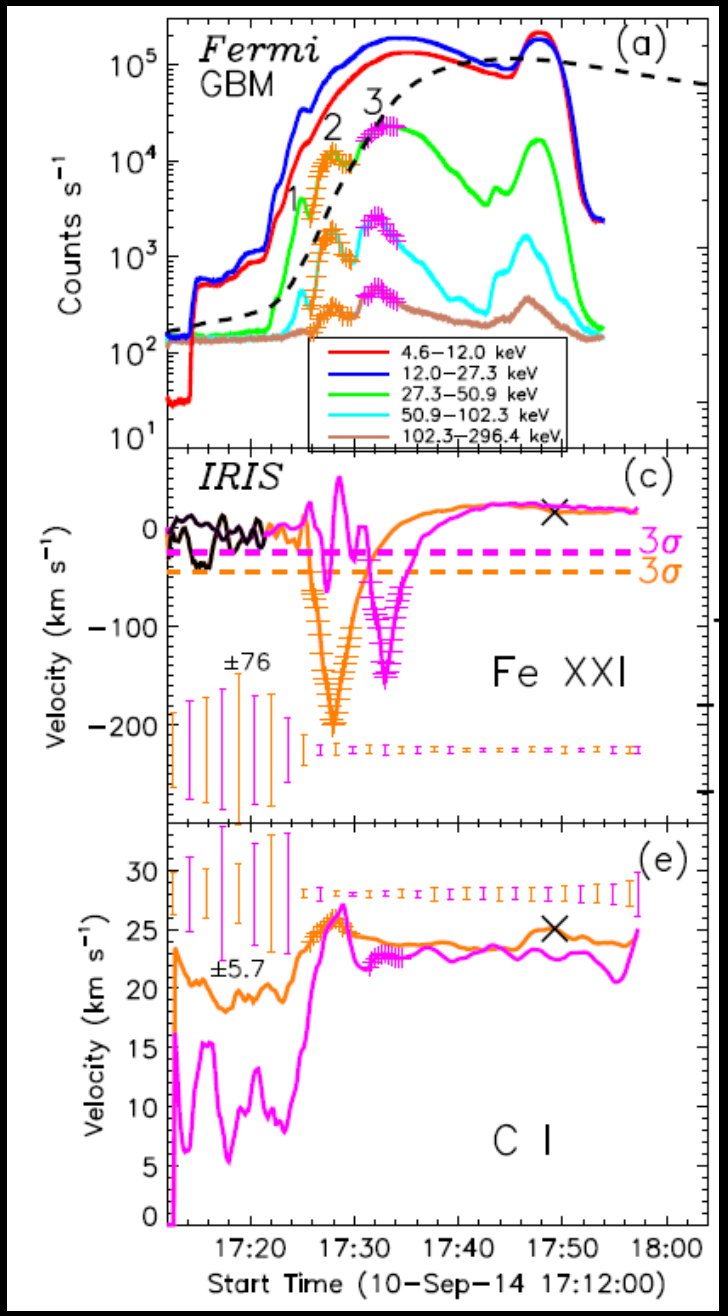
Multi-Gaussian fitting (total 15 lines simultaneously) including the coronal line of Fe_{XXI} and chromospheric line of C_I.

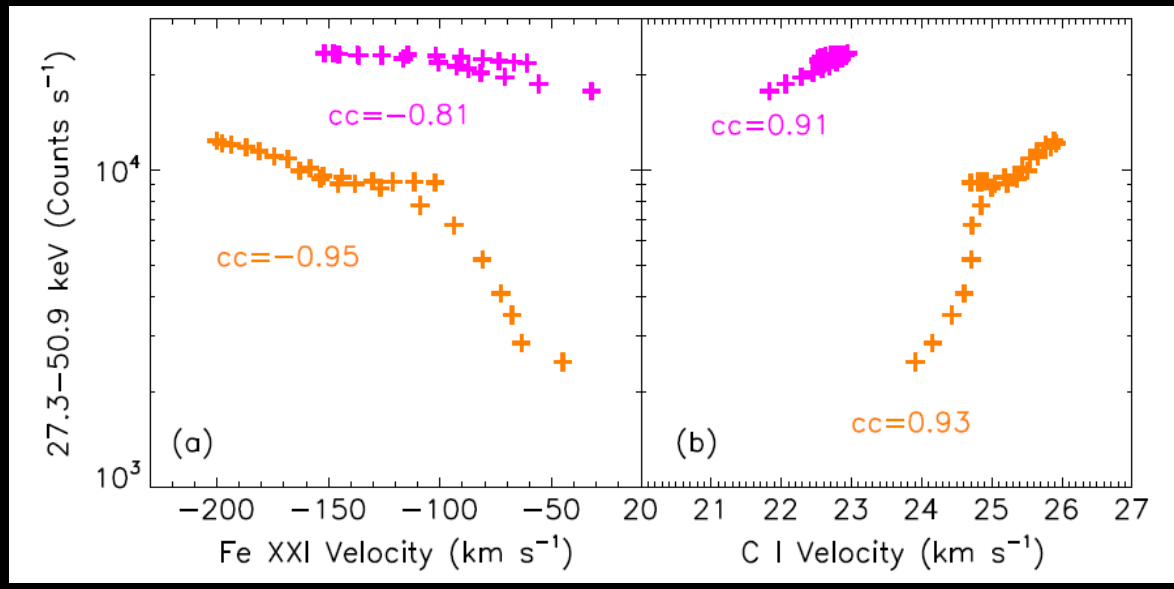
Impulsive Evaporation



1.Impulsive evaporation
2. Outsides of ribbon
3. Evaporation---cooling down





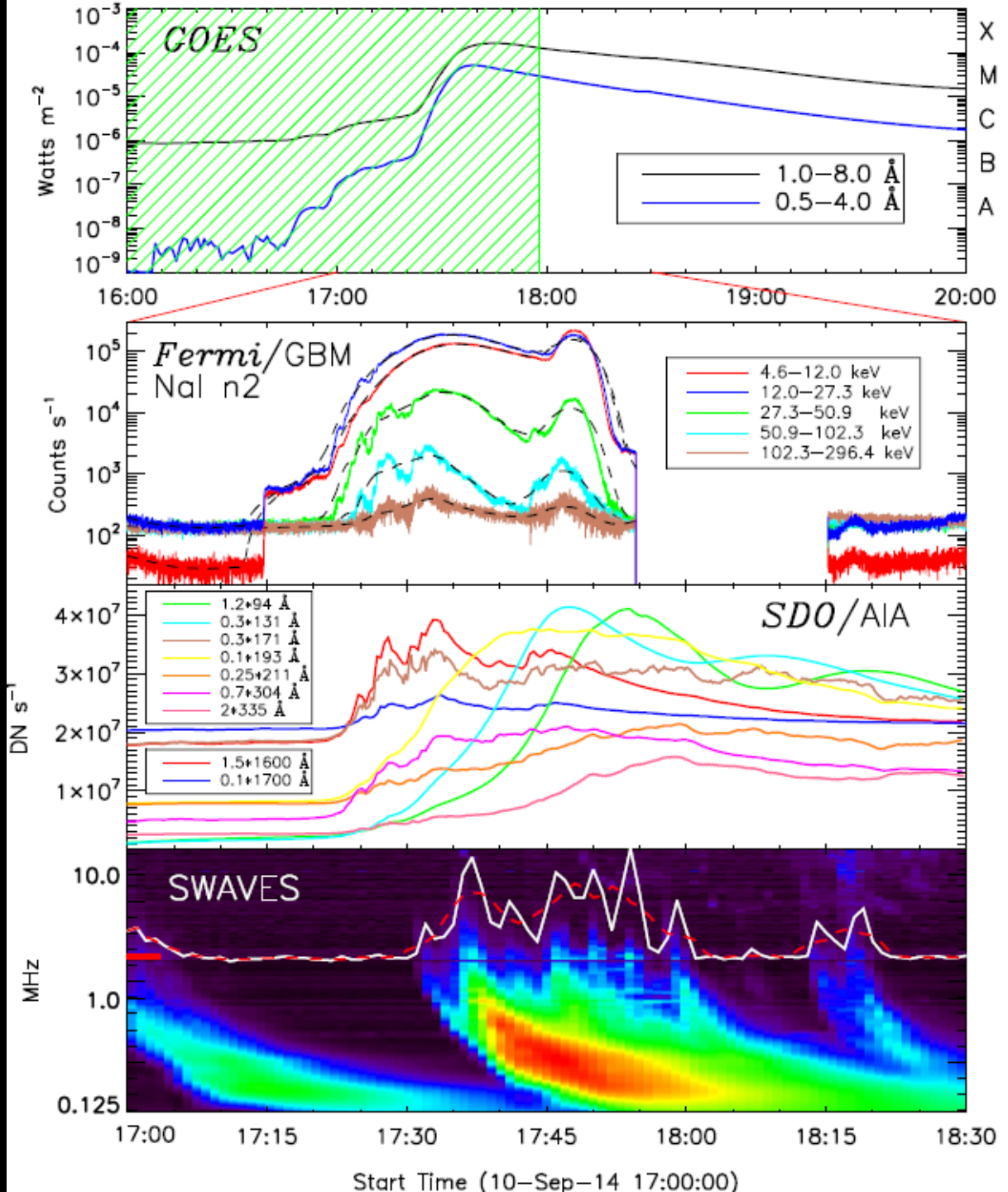


We find that the negative correlation between HXR emissions and FeXXI Doppler shifts and positive correlation between CI Doppler shifts indicating the nonthermal electron-driven evaporation in this flare.

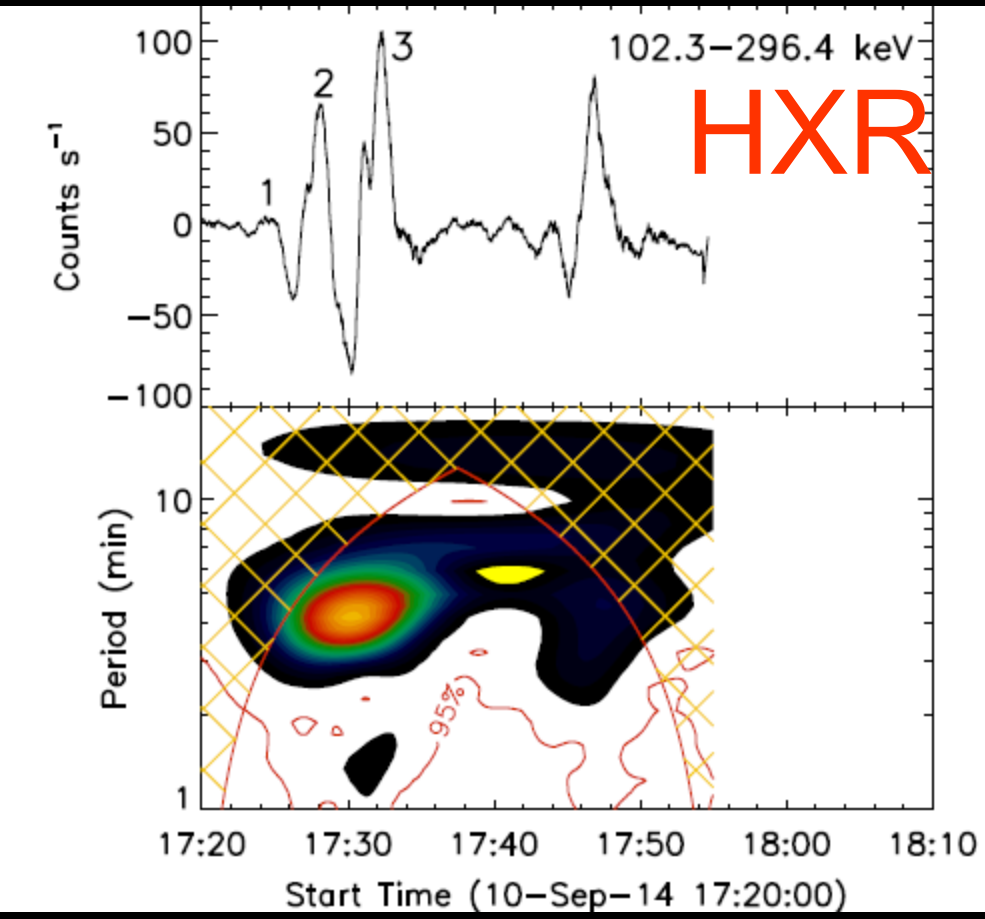
(Li, Ning, Zhang 2015)

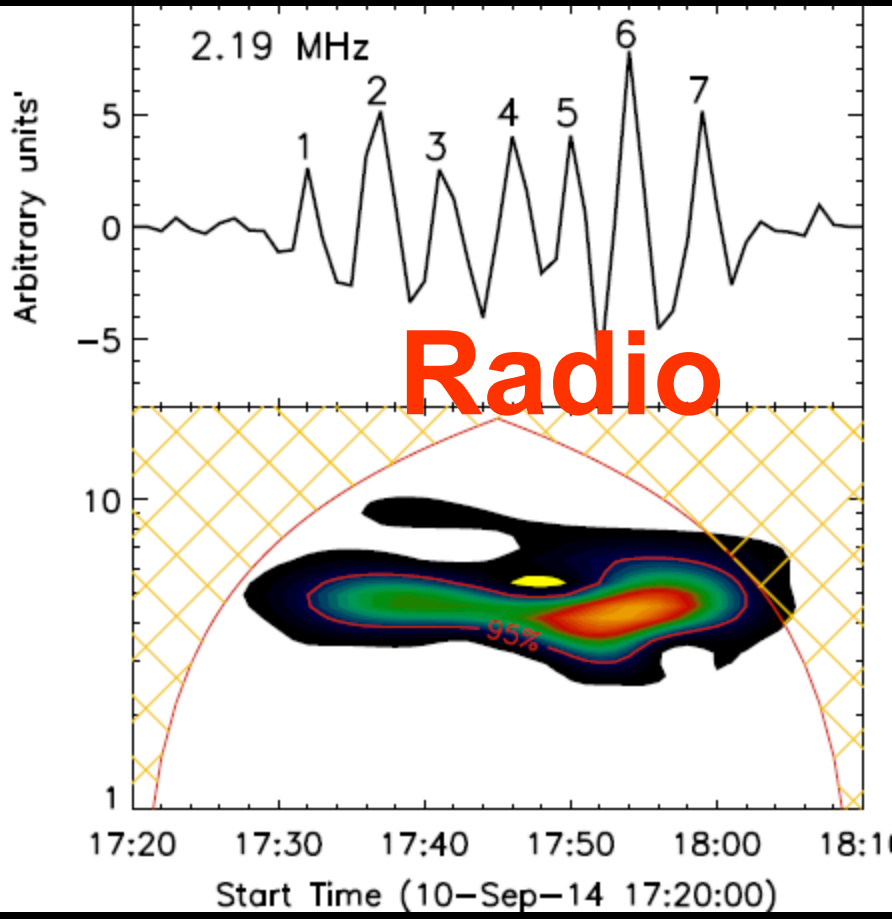
II. Spectral and Imaging observations of Quasi-periodic pulsations

- Quasi-periodic pulsations

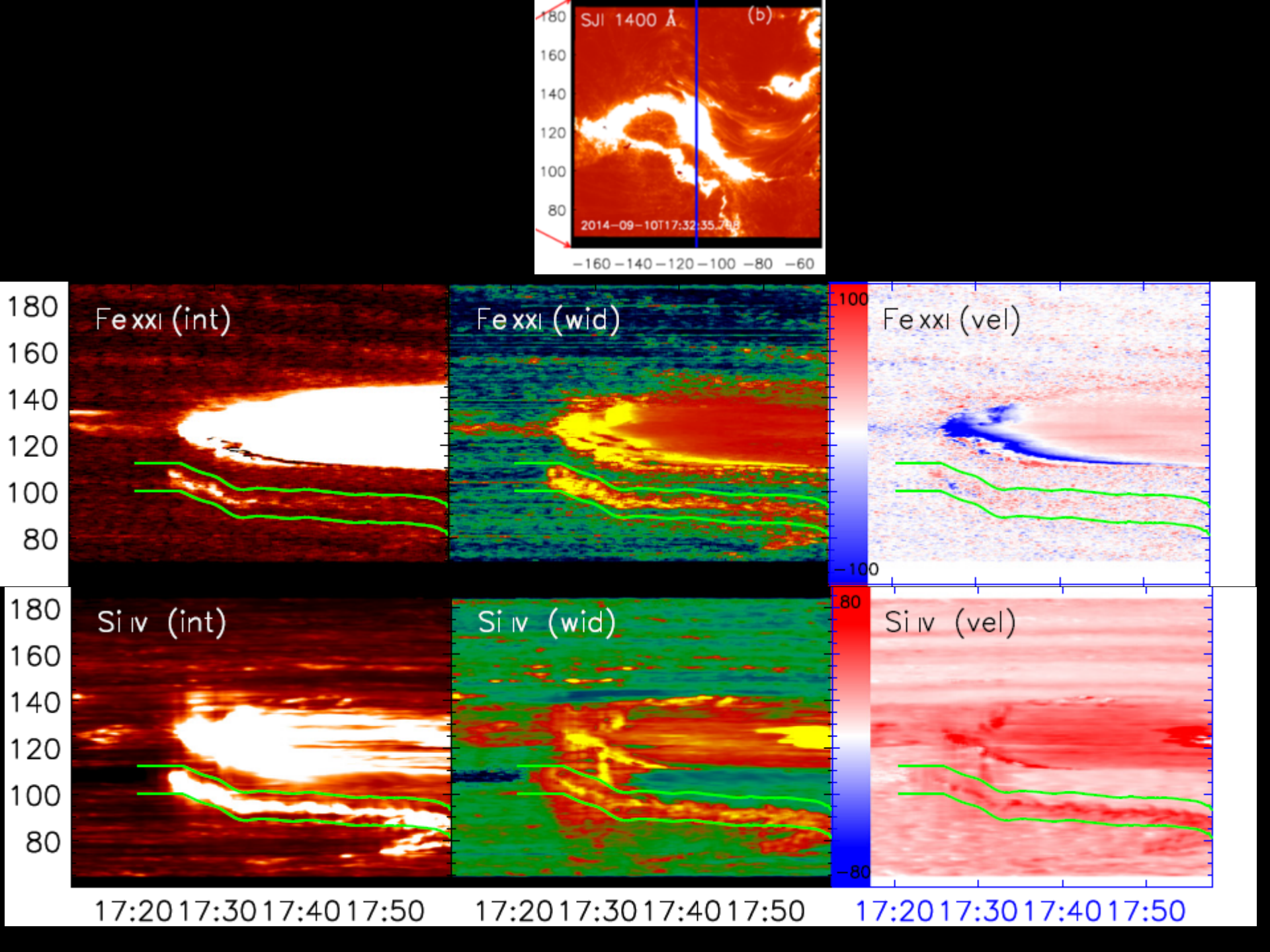


Four-minutes oscillations



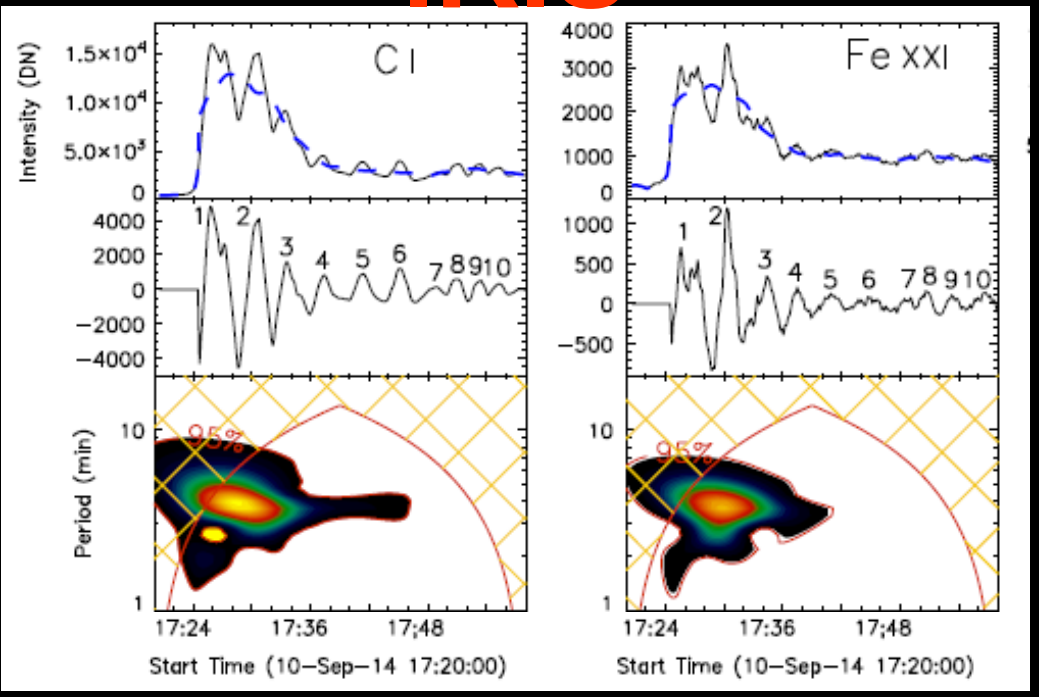


HXR(3 peaks) and radio(7 peaks) observations

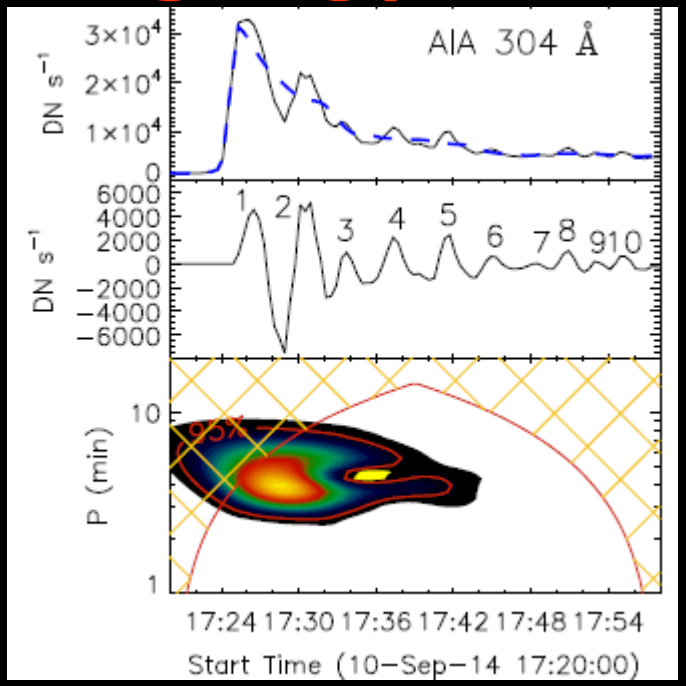

SJI 1400 Å
(b)
2014-09-10T17:32:35.768
180
160
140
120
100
80
−160 −140 −120 −100 −80 −60
Fe XXI (int)
Fe XXI (wid)
Fe XXI (vel)
100
−100
Si IV (int)
Si IV (wid)
Si IV (vel)
80
−80
17:20 17:30 17:40 17:50
17:20 17:30 17:40 17:50
17:20 17:30 17:40 17:50

Four-minutes oscillations

IRIS



SDO/AIA



- IRIS and SDO observations, about 10 peaks

This (20140910) flare exhibits four-minutes oscillations on its one ribbon detected from the HXR, EUV (spectral line) and radio emissions.

(Li, Ning, Zhang 2015)

thank you !