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(Research Article)

Imaging and Spectral Multi layer Investigation of Solar Chromosphere and Transition Region Jets by *IRIS* Telescope Data

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Summary

Simultaneous observations of the Interface Region Imaging Spectrograph *(IRIS)* data, with a spatial resolution of less than one second consisting of ultraviolet (UV) spectra and images (SJI), make it possible to investigate solar chromosphere and transition region and provide valuable information about the dynamics of solar jets. *IRIS* combines numerical modeling, high resolution imaging, and UV spectroscopy. The interface region is the main place for the transfer of energy from the solar surface to the very hot corona. Of course, knowing the secret of energy transfer in the solar atmosphere is not the only goal of this mission, but also it examines the solar winds that is emitted from this area, which carry a rain of charged particles into space and also affect the Earth's climate. Information about the dynamic behavior of the physical phenomena of the solar atmosphere is obtained by studying the characteristics of spectral lines. For this purpose, it is necessary to obtain the information to identify and study spectral lines and how they are formed. The solar atmosphere is a plasma environment associated with a variety of transient events. Astrophysicists, especially in the field of solar dynamic physics, describe these events by magneto-hydrodynamics aspect. One of these phenomena is the bright spots of the solar atmosphere called jets. We identify and study the dynamics of a series of jets recorded on August 17, 2014, at Mg II k, C II and Si IV spectral lines corresponding to the 2796 Å, 1336 Å, and 1394 Å wavelengths, respectively. Jets are small-scale dynamic events that can be detected by non-Gaussian profiles of lines in the solar chromosphere and transition region. The production mechanism of these plasma jets is still being investigated. We use the temporal evolution analysis method to track the path of these structures and determine their apparent velocity. To calculate the Doppler velocity we perform Gaussian fitting at the same time on the spectral intensity profiles. The apparent velocity results show that these jets have quasi-periodic motions with speeds of approximately 10 to 110 kms^{-1}. Spectral investigation of these jets also shows the periodic behavior that is associated with increasing in blue and red wings at the three wavelengths as -65 to 40, 60 to 50, and 80 to 60 kms^{-1}, respectively. Simultaneous enhancements in the blue and red wings of the spectrum can be caused by two-directional upward currents caused by magnetic reconnection and amplified by waves with p-modes (compression modes). According to these results, it is suggested that the fluctuations in these events with increasing on one side of the spectrum and both sides of the wing are signs of spiral and rotational motions, respectively. The results of this research show that by using the data of the *IRIS* Telescope, it is possible to identify and extract the physical components of jets at different wavelengths and identify their dynamic behavior. These specifications will help us better understand the stratification of the solar atmosphere and how heat and matter are transferred to the sun's surface and the effects of such transitions on the Earth's atmosphere. The application of this study will be the goal of space research and i climate.

Keywords: Jets, *IRIS*, Chromosphere, Transition region, Spectral line.

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Si IV

(interface region imaging spectrograph)

[illegible]

[illegible] .../AIA [illegible]

[illegible] Mg II k [illegible] Mg II h [illegible]

[illegible] Si IV [illegible]

[illegible] IRIS [illegible]

[illegible] IRIS [illegible] http://iris.lmsal.com/search [illegible]

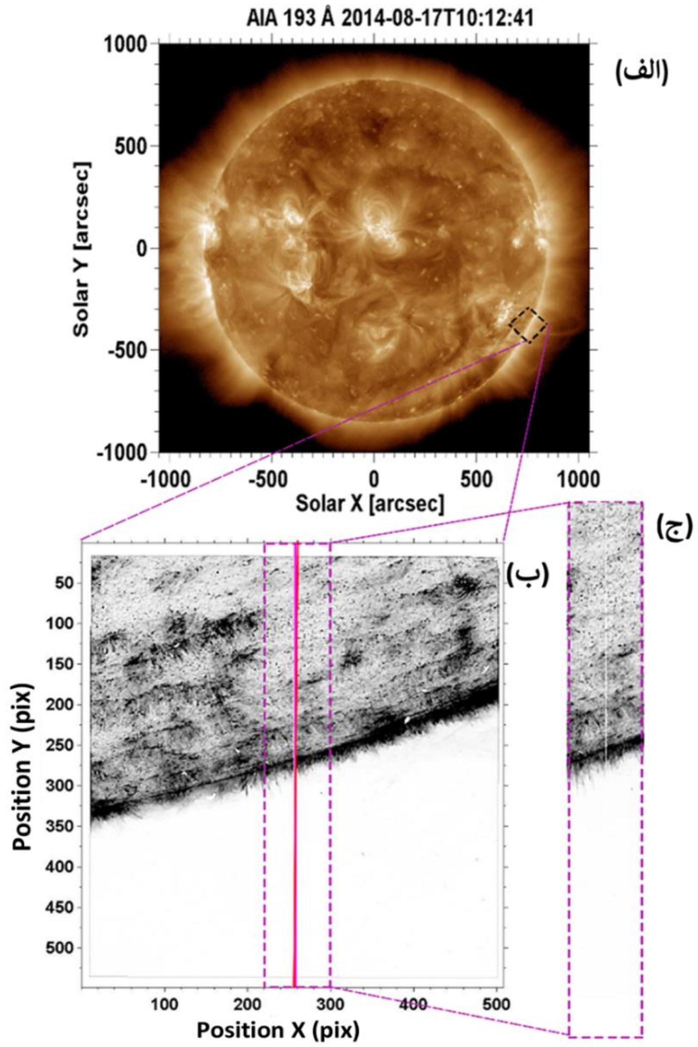
[illegible] DESID 3800253253 [illegible]

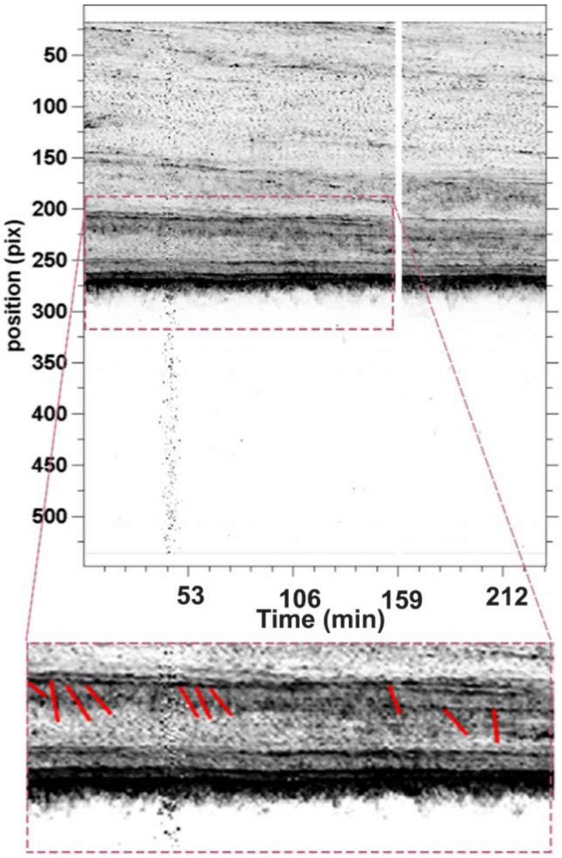
Mg [illegible] (SJI Raw Images) SJI [illegible]

[illegible] Si IV [illegible] Mg II [illegible] II k [illegible]

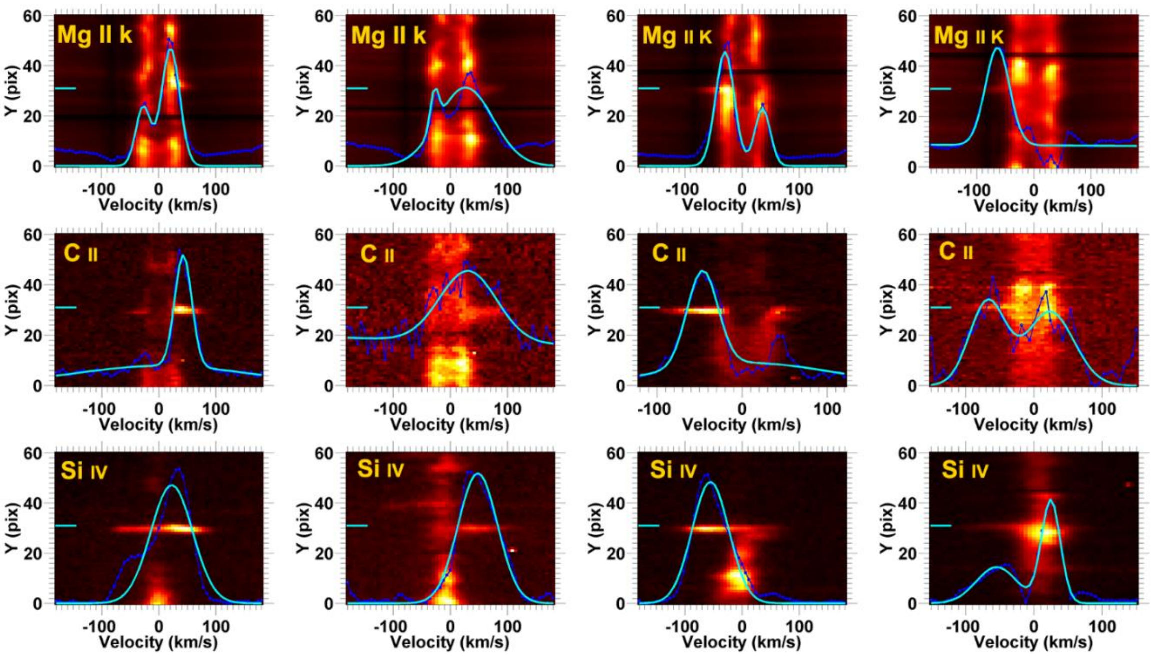
[illegible] Mg II k [illegible]

Si [illegible] Mg II [illegible]

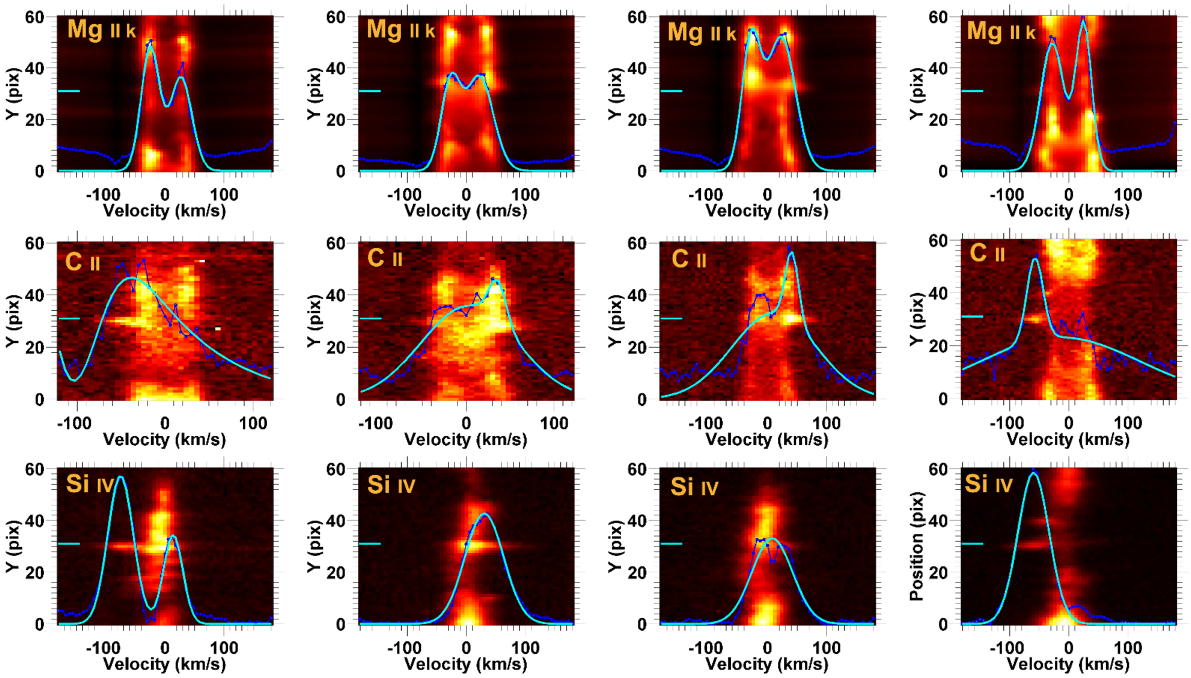

AIA 193 Å 2014-08-17T10:12:41
(الف)
Solar Y [arcsec]
Solar X [arcsec]
1000
500
0
-500
-1000
(ب)
(ج)
Position Y (pix)
Position X (pix)
50
100
150
200
250
300
350
400
450
500



position (pix)
Time (min)



Mg II k
C II
Si IV
Y (pix)
Velocity (km/s)


Mg II k
Mg II k
Mg II k
Mg II k
C II
C II
C II
C II
Si IV
Si IV
Si IV
Si IV
Y (pix)
Position (pix)
Velocity (km/s)
-100
0
100
0
20
40
60

[illegible]

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