Chromospheric and Transition Region dynamics

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IRIS:
type II spicules are heated to at least TR temperatures

Pereira et al. 2014 ApJL 792
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sample of 54 spicules: 41 (76%) fade in Ca H
30 (56%) brighten in Si IV when Ca H fades

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30 (56%) brighten in Si IV when Ca H fades
24 (44%) are brighter in Si IV at top

On-disk we observe absorption features with same characteristics as off-limb type II spicules
RBEs are the disk-counterparts of type II spicules


Hα -60 km/s

RBEs are the disk-counterparts of type II spicules

$H\alpha$ Doppler Disk center Quiet Sun

RRE (Rapid Red-shifted Excursion)
RBE (Rapid Blue-shifted Excursion)

Ca II 8542
Ca II 8542 +16 km/s
Ca II 8542 ±16 km/s

3 kinds of motion:
• upflow
• swaying
• torsion

Hα Doppler Disk center Quiet Sun

Ca II 8542

RRE (Rapid Red-shifted Excursion)
RBE (Rapid Blue-shifted Excursion)
Transition Region response to type II spicules on-disk: network jets (see Tian et al. 2014 Science)
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IRIS network jets (see Tian et al. Science 2014)

De Pontieu et al. 2014 Science, Rouppe van der Voort et al. 2015 ApJL 799
Connection network jets and RBE/RREs

torsional motion and associated heating

De Pontieu et al. 2014 Science, Rouppe van der Voort et al. 2015 ApJL 799
Connection network jets and RBE/RREs

Hα ±35 km/s

Si IV 1394

Si IV 1394

SJII 1330

C II 1336

C II 1336

Rouppe van der Voort et al. 2015 ApJL 799

Friday, May 22, 15
RBE: Rapid Blue-shifted Excursion

Rouppe van der Voort et al. 2015 ApJL 799

Friday, May 22, 15
RRE: Rapid Red-shifted Excursion

Rouppe van der Voort et al. 2015 ApJL
parabolic trajectory for type II in Ca H? (33%)

Note: heating along the spicule length and higher velocities

parabolic trajectory for type II in Ca H?

*Note*: heating along the spicule length and higher velocities

Active region plage: dynamic fibrils (type I spicules)
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SST 04-Oct-2005

Hansteen et al. 2006, De Pontieu et al. 2007
Active region plage: dynamic fibrils (type I spicules)

Hansteen et al. 2006, De Pontieu et al. 2007
Active region plage: dynamic fibrils (type I spicules)

Hansteen et al. 2006, De Pontieu et al. 2007
Radiative MHD simulations show the formation of dynamic chromospheric features similar to DFs, driven by shocks caused by upward propagating waves in the chromosphere.

Hansteen et al. 2006, De Pontieu et al. 2007
observations vs simulations: x-t plots

Spicule-like features in simulations show parabolic paths similar to those observed in Dynamic Fibrils.

Hansteen et al. 2006, De Pontieu et al. 2007
Active region plage: dynamic fibrils (type I spicules)
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Transition Region response to dynamic fibrils:
Si IV brightening, blueshift and line broadening
caution when comparing spectra extended structures
Active region plage: dynamic fibrils (type I spicules)
large spatial raster

Si IV SJI 1400   Si IV 1403 intensity   Si IV 1403 Doppler   Si IV 1403 width

±20 km/s
8 - 15 km/s

Transition Region response to dynamic fibrils:
Si IV brightening, blueshift and line broadening
Transition region response of internetwork acoustic grains?
Transition region response of internetwork acoustic grains?

mostly continuum emission from 55Å bandpass filters
Conclusions

Clear Transition Region response in spicules:

• type II: heating along the spicule length
• type I / dynamic fibrils: only at top

Internetwork acoustic grains: (very) weak response in TR lines, IRIS SJI 1400 & 1330 emission mostly continuum