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MHD waves in chromospheric fibrillar structures as observed with ALMA

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Atacama Large Millimeter/submillimeter Array (ALMA) Observations

date	project id	band	Cad. (s)	obs. time (UTC)	μ	T _{mean} (K)
2017-04-22	2016.1.00050.S	6	2	15:59:07–16:43:26	0.92	7746 \pm 859

Further specifics on dataset can be found in: Jafarzadeh et al. (2021) and Chintzoglou et al. (2020)



An unsharp mask algorithm and an adaptive histogram equalization procedure are used to identify and track long-lasting dark fibrils.

HMI Continuum	HMI Magnetogram	AIA 170 nm	AIA 160 nm	IRIS MgII SJI
ALMA 1.3 mm	IRIS Mg II k 279.61 nm	IRIS SI IV	AIA 30.4 nm	AIA 17.1 nm
AIA 19.3 nm	AIA 21.1 nm	AIA 33.5 nm	AIA 13.1 nm	34 arcsec R C S erc () ()

Magnetic field topology





Line-of-sight photospheric magnetic fields (Blos) from SDO/HMI with a factor of two larger FOV than that of ALMA. The range of Blos values has been indicated in the upper left corner. The ALMA's FOV is marked with the dashed square. Top view of field extrapolation of the surface magnetic field (from SDO/HMI) at the chromospheric heights(for the ALMA's FOV). The colours represent inclination, from vertical (blue) to horizontal (red). The figure is taken from Jafarzadeh et al. (2021).

Solar-Stellar ALMA Group





Oscillations along selected artificial slits



Saberi et al. in prep.

Wavelet Analysis



Saberi et al. in prep.



Statistics



Distributions of brightness temperature, transverse displacement, and width from wavelet analysis. The black histograms corresponds to data points weighted by power and red histograms corresponds to unweighted data points. The histograms are normalized to their maximum values.



- Identifying wave modes and characterize wave propagation by analysing correlations between oscillations of all parameters in any two consecutive slits along the fibrils.
- Estimating energy that can be carried out by transverse oscillations in the dark longlived fibrils.
- Exploiting the IRIS co-observations in a similar manner and comparing with those obtained with ALMA.





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