# USING HMI-SDO FOR LIMB SEISMOLOGY



#### SUMMARY

#### HMI INSTRUMENT LIMB MEASUREMENTS

THEORICAL PREDICTIONS

ANALYSIS

RESULTS

CONCLUSIONS



### $LDF(r,\theta) = [1 - \alpha(\theta)] [r - \beta(\theta)]MLDF$



### THEORICAL PREDICTIONS

 For Intensity perturbations in the visible continuum, p and g modes of low degree can produce large variations of intensity on the very limb of solar disk. (Toutain, Berthomieu & Provost 1999, A&A 344 1999; Toner & Jefferies 1999, AJ 518 L127; Toutain & Gouttebroze 1992, A&A 268, 309)

#### (Toutain, Berthomieu & Provost 1999, A&A 344 1999)



Fig. 2. Schematic shape of a star perturbed by a l=2 g mode (dashed line). When the star is perturbed, each fluid element located on the line of sight at equilibrium is replaced by a fluid element located on the same spherical shell. Here for example the fluid elements located at M<sub>0</sub> and N<sub>0</sub> on the equilibrium surface are replaced by those located at M and N respectively.



Theoretical continuum intensity signal for an I=1, m = 0, and n = 1 g-mode. (Toner & Jefferies 1999, AJ 518 L127)

#### ANALYSIS

3 years worth of data for 12 different instrument configuration (July 2012-July2015).

45 s cadence

256 LDFs per image

Date were double FFT to obtain spatial and temporal frequencies.



















Emilio et al. 2015, Apj 798, 48.













## CONCLUSIONS

Individual p modes can be measured in limb data as variation in brightness and displacement.

Those modes extended as ridges up to 9,000  $\mu$ Hz

There is power leakage among modes with different m.

In brightness measurements low p modes in the limb may have a large amplitude.

These measurements can be used to improve our understand of solar atmosphere.

No g modes were found in this work.

![](_page_23_Picture_0.jpeg)

MERCI !