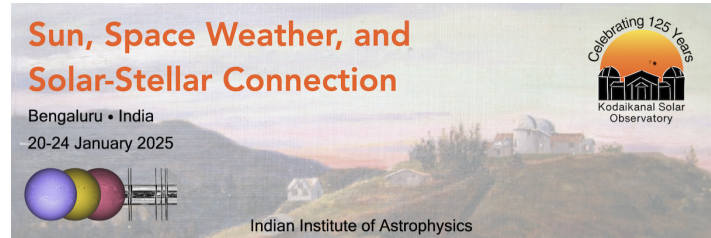


Solar High Resolution Imaging with the 76 cm Telescope of the Vainu Bappu Observatory

Sridharan Rengaswamy, Sagayanathan K, Ramachandran A & Saraswathi Kalyani Subramanian, Indian Institute of Astrophysics, Bengaluru, India.



Objective

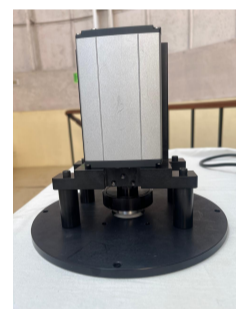
To achieve high angular resolution imaging of solar atmospheric features using masked aperture speckle imaging



30-inch telescope of the Vainu Bappu Observatory, Kavalur, Tamil Nadu, India



Annular mask at the telescope entrance:
Outer diameter: 738 mm
Inner diameter: 728 mm
Width of the annulus: 10 mm

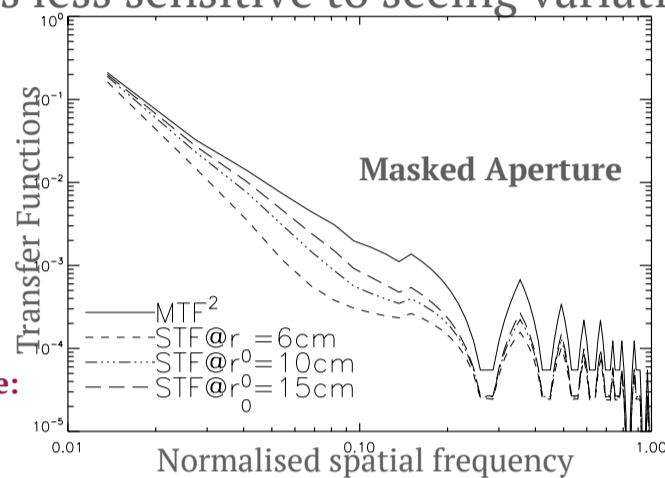


Re-imaging unit with Andor Zyla 5.5 camera. Cassegrain focus image was re-imaged with a magnification of about 1.92.

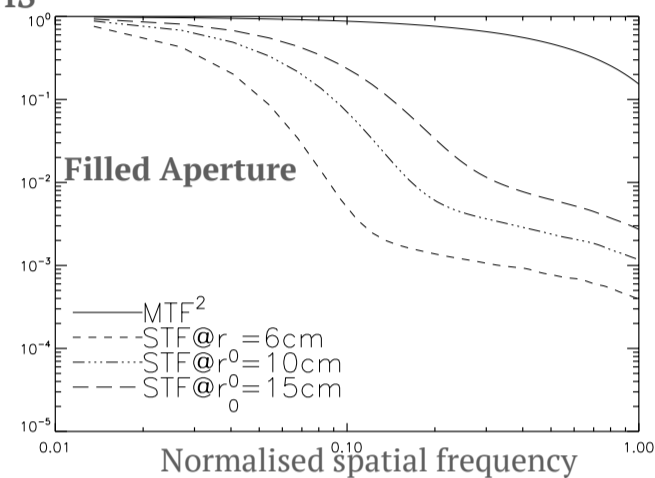


Aperture masking: Why?

1. Reduces the heat flux
2. Enables modification of the telescope Modulation Transfer Function (MTF)
3. Speckle transfer function becomes less sensitive to seeing variations



Simulated speckle transfer functions of annular aperture exhibit relatively less variations with the seeing.



Simulated speckle transfer functions of filled aperture exhibit large variations with the seeing.

Observational Data

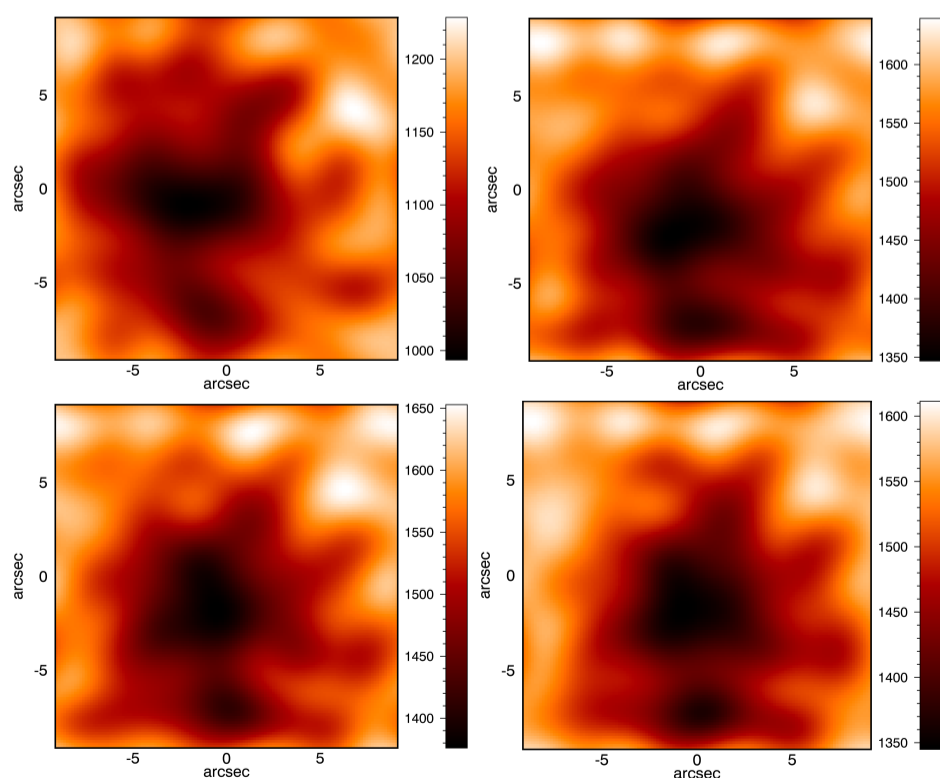
Several bursts of short exposure images (3 ms) of a sunspot were recorded at about 40 frames per second

Field-of-view: ~ 26 arc-sec (circular)

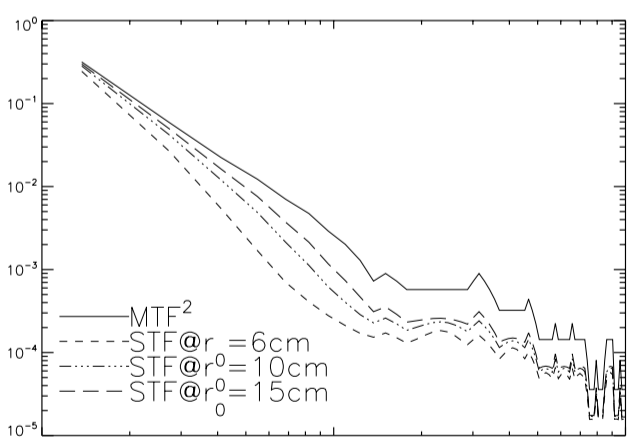
Filter: Continuum filter of 3.5 nm bandwidth centered at H-Alpha wavelength. + ND filters

Pixel scale: 0.1423 arc-sec/pixel

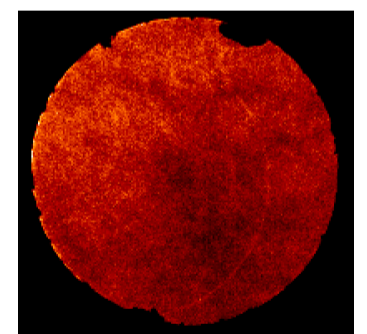
Binning: 4x4



Seeing-limited, average images of the sunspot obtained from 4 bursts



Simulated speckle transfer functions of modified annular aperture



Raw-image frame from a burst. The circle indicates the image of the field-stop kept at the Cassegrain focus

Current status & Future

1. Width of the annulus will be increased by 6 mm.
2. Speckle image reconstruction under progress
3. Re-imaging without magnification
4. Observations at longer (>656 nm) wavelengths

Acknowledgements

1. All members of VBO workshop and IIA Bangalore workshop
2. Observing assistants at VBO. Totan Chand (photonics division, IIA)

Contact: sridharan.r@iiap.res.in