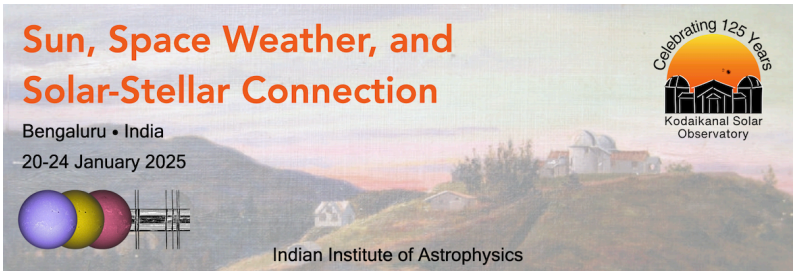

Contribution ID: **152** Type: **Contributed talk**

Investigation of Umbral Wave Dynamics in the Chromospheric Resonator through Multi-Height Observations

Tuesday, January 21, 2025 2:10 PM (15 minutes)

The Sun's dynamic atmosphere is rich in magnetohydrodynamic (MHD) waves, particularly in regions of intense magnetic activity like sunspots, where these waves are most pronounced and powerful. These waves in sunspots may play a crucial role in providing energy for plasma heating and contribute to the early stages of solar wind formation, and they can also serve as valuable diagnostic tools for studying sunspots. We investigate wave propagation patterns in the chromosphere of a large sunspot using high-resolution, multi-wavelength optical data from the Goode Solar Telescope (GST) at Big Bear Solar Observatory. Our analysis focuses on intensity oscillations at various points in the Hα line profile, as well as the Doppler velocity of the Hα line. By applying wavelet analysis, we identify the periodicity of these oscillations. Statistical analysis reveals a prevalent 3-minute oscillation across all Hα line measurements. To show the phase relationships between different Ha channels, we conduct phase difference analysis, estimating the phase difference between intensity in different bandpasses (such as Hα line core, Hα±0.2Å, Hα±0.4Å, Hα±0.6Å, Hα±0.8Å, and Hα±1Å) and Doppler velocity of Hα line. We found that the umbra waves exhibit a pattern of slow wave in forms of upward propagating wave, standing wave and a mixture of both. The observed phase relationships suggest that these umbral waves are confined within a non-ideal acoustic resonator.

Contribution Type

Theme

Solar Magnetism in High-Resolution

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Session Classification: Waves in the Solar Atmosphere