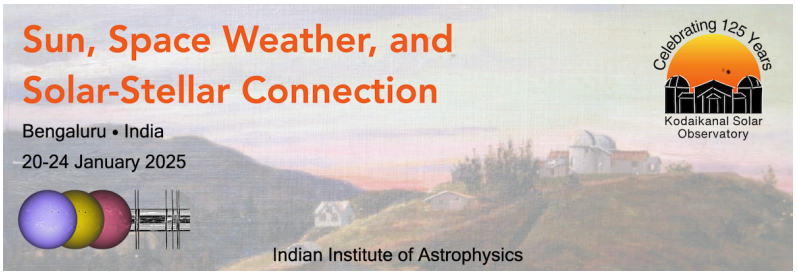

Contribution ID: **129** Type: **Contributed talk**

Geostrophic Nature of Flows Around Active Regions and Changes in the Near-surface Shear Layer of the Sun

Monday, January 20, 2025 4:55 PM (15 minutes)

Using solar-cycle long measurements of meridional and zonal flows in the near-surface shear layer (NSSL) of the Sun, we study temporal variations in them and their connections to active regions. We find that inflows towards active regions are part of a local circulation with an outflow away from active regions at depths around 0.97 $R_\odot$, which is also the location where the deviations in the radial gradient of rotation change sign. These results, together with a reverse pattern observed
during solar minimum period, point to the geostrophic nature of large-scale flows across latitudes as primary cause of the observed depth profile of changes in rotation gradient within the NSSL. We also find that the observed changes due to active regions only marginally change the amplitude of zonal flow and hence are not likely its driving force. Close agreements between the depth profiles of changes in rotation gradient and in meridional flows measured from very different global and
local helioseismic techniques, respectively, provide an important validation for the measurement procedures, especially for the latter.

Contribution Type

Theme

Solar Magnetism over Long-Time Scales

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