



Contribution ID: 160

Type: Poster

Constraining active latitudes from Sun-as-a-star helioseismic travel times

The eleven-year solar activity cycle is known to affect solar acoustic oscillations; higher activity is correlated with an increase in mode frequencies and a decrease in their lifetimes. Activity related frequency shifts have also been observed in other stars, but are difficult to measure mode by mode. Measurements seismic travel times provide an alternate method which is robust to noise (Vasilyev & Gizon 2024, A&A 682). In this work we build a simple forward model to interpret such measurements for the Sun in terms of magnetic activity versus time and latitude. We derive kernels that capture the sensitivity of the travel-times to surface activity at different latitudes. Linear inversions from synthetic and VIRGO data help demonstrate the viability of this method.

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Session Classification: Coffee break and poster session 1

Track Classification: Solar interior, sub-surface flows and long-term variability