Magnetoseismic Study of Active Regions

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Abstract

The interpretation of acoustic waves surrounding active regions has been a difficult task since the influence of magnetic field on the incident waves is not fully understood. As a result, structure and dynamics of active regions beneath the surface show significant uncertainties. Recent numerical simulations confirm that the atmosphere above the photosphere modifies the seismic observables at the surface. Thus the key to improve helioseismic interpretation beneath the active regions requires a synergy between models and helioseismic inferences from observations. In this context, using data from Helioseismic Magnetic Imager and Atmospheric Imaging Assembly on board the Solar Dynamics Observatory, we characterize the spatio-temporal power distribution around active regions as a function of the height in the solar atmosphere. Specifically, we focus on the power enhancements seen around active regions as a function of wave frequencies, strength, inclination of magnetic field and observation height as well as the relative phases of the observables and their cross-coherence functions. We expect that these effects will help in comprehending the interaction of acoustic waves with magnetic field and provide better measurements of sub-surface flows