Poster

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Comparison between time-distance and ring-diagram helioseismology measurements of subsurface convective flows

Kaori Nagashima[1], Thomas L. Duvall Jr. [1], Aaron C. Birch[1], Laurent Gizon[1,2]

[1] *Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany*

[2] *Institut für Astrophysik, Georg-August-Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany*

Helioseismology enables us to probe the solar interior using the acoustic oscillation signals observed on the solar surface. Here we focus on two methods: time-distance and ring-diagram analysis. In time-distance analysis, the travel times of the acoustic waves are measured from the surface oscillation signals and used to infer the flows in the subsurface region where the acoustic waves propagate. On the other hand, in ring-diagram analysis, shifts of the acoustic-wave eigenfrequencies in each targeted area are measured and used to infer the flows under the area.

We aim to find the cause of the orders-of-magnitude discrepancy between the two measurements of the deep convective flow energy: the deep-focusing time-distance analysis (Hanasoge et al. 2012) and the ring-diagram analysis (Greer et al. 2015) measurements. For that, we directly compare the two methods with each other using the identical observational datasets from the Helioseismic and Magnetic Imager (HMI) on board Solar Dynamics Observatory. We also compare them with the HMI ring-diagram pipeline products (Bogart et al. 2011).

We confirm that the intermediate products from both (HMI pipeline and Greer's) ring-diagram analyses as well as the deep-focusing time-distance analysis give the similar-order-of-magnitude estimates of the subsurface flow. This indicates that the huge discrepancy between the final estimates of the deep convective flow given by the time-distance (Hanasoge et al. 2012) and ring-diagram (Greer et al. 2015) analyses likely result from the later stages of the

analyses, such as inversion processes.