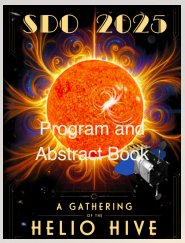

AAS/SPD Metcalf Travel Award Report

SDO 2025 Science Workshop: A Gathering of the Helio-hive!

February 17-21 2025, Boulder, CO, USA

Angel Martinez is a Ph.D. candidate at Monash University in Australia, where he works under the supervision of Dr. Alina Donea. His primary research focus is on local helioseismology, specifically understanding how acoustic waves propagate in shallow subphotospheric regions influenced by magnetic fields. Using advanced mathematical models and computational acoustic holography, he investigates the seismic responses from solar flares in the vicinity of Active Regions, making use of data from the Helioseismic and Magnetic Imager (HMI) on the Solar Dynamics Observatory (SDO).

Talk: Recovering the amplitudes of solar quake waves using the showerglass effect

Angel Martinez Cifuentes,
Alina Donea

Solar flares, the most energetic and impulsive events in the solar atmosphere, generate seismic waves within the Sun's interior, commonly referred to as "sunquakes". By examining the patterns of surface ripples, we gain insights into the structure and dynamics of their seismic sources and their interaction with the surrounding environment.

However, in active regions, magnetic fields influence the propagation of these waves, adding more complexity to the analysis of their characteristics.

In this study, we propose a refined approach of the showerglass effect (Lindsey & Braun 2004, "The Acoustic Showerglass. I. Photospheric Magnetic Fields") designed to assess the influence of magnetic field structures on seismic wave observations. Our method quantifies the impact of magnetic fields by analyzing correlations between the surface Doppler field and both the ingression and egression of waves in the Solar Standard Model. By applying this correction method, we achieve a more accurate determination of the seismic properties of the sources driving solar seismicity. We validate the effectiveness of our pipeline by analyzing two distinct Active Regions using data from the Solar Dynamics Observatory. Our findings demonstrate that this correction technique enables the generation of more precise maps of seismic sources. This improvement advances the detection and characterization of solar flare activity.

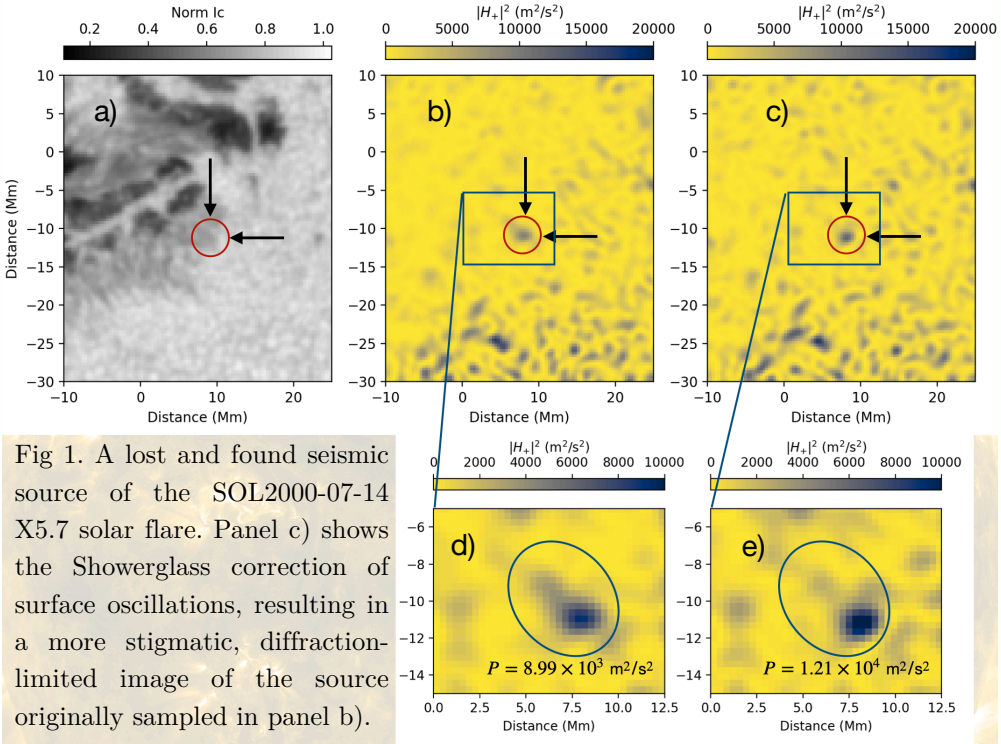

Fig 1. A lost and found seismic source of the SOL2000-07-14 X5.7 solar flare. Panel c) shows the Showerglass correction of surface oscillations, resulting in a more stigmatic, diffraction-limited image of the source originally sampled in panel b).

I want to express my most sincere thanks to the American Astronomical Society and the Solar Physics Division for the Metcalf Travel Award. The award represented an opportunity to show my current work as a Metcalf Lecturer at the SDO 2025 Science Workshop, an honor that I deeply appreciate. It also allowed me to engage in quality discussions with fellow researchers, thus promoting collaborations and expanding my research network.