Amr
Hamada
National Solar Observatory, Boulder, CO 80303, USA
Kiran Jain, National Solar Observatory, Boulder, CO 80303, USA
Hanna Strecker, Instituto de Astrofísica de Andalucía, CSIC, Granada 18008, Spain
Charles Lindsey, North West Research Associates, Boulder, CO 80301, USA
David Orozco Su'arez, Instituto de Astrofísica de Andalucía, CSIC, Granada 18008, Spain
Poster
Reliable space-weather forecasting requires continuous monitoring of solar active regions across the entire Sun. However, direct magnetic observations are limited to the Earth-facing hemisphere, leaving the far side of the Sun largely unobserved until active regions rotate into view. Helioseismic far-side mapping from the Global Oscillation Network Group (GONG) has enabled the detection of large active regions on the hidden hemisphere for more than two decades, but these detections have lacked the critical magnetic information needed for operational forecasting and heliospheric modeling. In this work we present a method for reconstructing polarity-resolved magnetograms of far-side active regions using GONG helioseismic phase-shift measurements. This approach identifies the bipolar magnetic structure by analyzing the spatial substructures within the helioseismic signal and locating the polarity inversion boundary through the longitudinal variance profile of the detected regions. The east–west polarity ordering is then determined using Hale’s polarity rule for the current solar cycle. This technique enables the first estimation of the magnetic polarity configuration of far-side active regions before they rotate onto the Earth-facing disk, providing new information that can be incorporated into global solar magnetic maps and coronal models. Such far-side magnetic estimates can improve boundary conditions for models used in forecasting solar-wind and other heliospheric parameters. The ability to infer the magnetic structure of emerging or decaying active regions days before they become visible offers potential benefits for space-weather situational awareness, including improved context for flare- and CME-producing regions and better initialization of operational models that depend on global photospheric magnetic maps. These results represent an important step toward achieving full-Sun magnetic mapping, a key capability for advancing operational space-weather forecasting.
Poster session day
Tuesday, April 28, 2026
Poster location
33
Meeting homepage
2026 Space Weather Workshop
Download to PDF