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Seismic Forecasting of Solar Activity

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Computational seismic holography, applied to Solar Oscillations Investigation - Michelson Doppler Imager (SOI-MDI) data from *SOHO*, has recently given us the first images of an active region on the far side of the Sun (Lindsey & Braun 2000). The advent of phase-coherent seismic imaging is now allowing us quite literally to look into the solar interior from a local perspective, indeed to see through the solar interior acoustically to its far surface. Solar activity is critical to near-Earth space weather. A great deal of effort has been invested towards the prediction of flares and CMEs, based on the formidable presence of active regions on the near solar surface. Active regions can emerge rapidly from beneath the photosphere or appear on the east limb with relatively little warning. Because of this, the ability to anticipate the appearances of active regions will contribute substantially to forecasts of space weather on time scales of more than about a day. In collaboration with Dr. Phil Scherrer and the MDI team at Stanford University we are currently deriving far-side images from the lower resolution "medium-ℓ" SOI-MDI Dopplergrams, which are obtained continuously through the year and arrive at MDI headquarters within 24 hours of their acquisition by the *SOHO* spacecraft. We are therefore already capable of locating large far-side active regions and predicting their appearance on the east solar limb to within a few hours more than a week in advance. In addition, ground-based networks such as GONG will soon have the capability for "real-time helioseismology", and will be routinely monitoring the far surface of the Sun, and perhaps beneath the near surface, for emerging solar activity.

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References

Lindsey, C. and Braun, D. C. 2000, Science, 287,1799