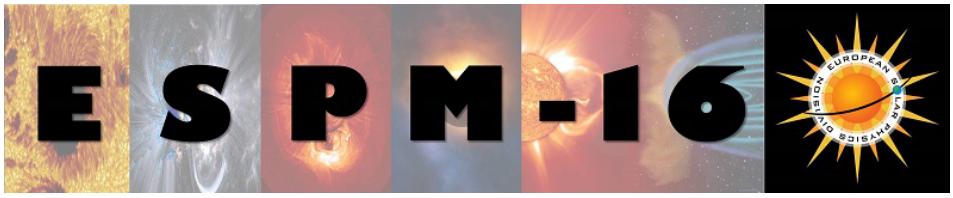

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Performance of solar far-side active regions neural detection

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Far-side helioseismology is a technique used to detect activity signatures in the far hemisphere of the Sun, based on near-side wave field interpretation. We evaluated the performance of a new neural network approach, developed to improve the sensitivity of the seismic maps to the presence of far-side active regions, and thoroughly compared it with the standard method commonly applied to predict far-side active regions from seismic measurements, using STEREO extreme ultraviolet observations of the far hemisphere as a proxy of activity.

We have confirmed the improved sensitivity of the neural network to the presence of far-side active regions. Approximately 96% of the active regions identified by the standard method with strength above the threshold commonly employed by previous analyses are related to locations with enhanced extreme ultraviolet emission. For the same percentage of false positives, the neural network can provide a 47% increase in the number of far-side active region detections confirmed by their extreme ultraviolet brightness. Weaker active regions can be detected by relaxing the threshold in their seismic signature. For almost all the range of thresholds, the neural network delivers a higher number of confirmed detections and a lower rate of false positives.

The neural network is a promising approach to improve the interpretation of the seismic maps provided by local helioseismic techniques, which can lead to improvements in space weather forecasting.

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