Testing the Reliability of Far-side Active Region Predictions from Helioseismology using STEREO Far-side

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We test the reliability of helioseismic far-side active region predictions, made using Dopplergrams from both the Helioseismic and Magnetic Imager (HMI) aboard the Solar Dynamics Observatory (SDO) and the Global Oscillation Network Group (GONG), by comparison with far-side observation of solar activity from the Solar TERrestrial Relations Observatory (STEREO). Both GONG and HMI produce seismic Carrington maps showing strong magnetic field regions, labeling predictions of far-side active regions that have a probability ≥ 70%. By visual comparison of these prediction maps with STEREO extreme ultraviolet (EUV) Carrington maps, we determine whether or not solar activity, as evidenced as brightness in EUV, is observed at the predicted locations. We analyzed 9 months of data from 2011 and 2012. For both GONG and HMI, we find that for approximately 90% of the active region predictions, activity/brightness is observed in EUV at the predicted location. We also investigated the success of GONG and HMI at predicting large active regions before they appear at the east limb as viewed from Earth. Of the 27 identified large east-limb active regions in the 9 months of data analyzed, GONG predicted 15 (55%) at least once within the week prior to Earth-side appearance and HMI predicted 13 (48%). Based on the STEREO far-side EUV observations, we suggest that 9 of the 27 active regions were probably too weak to be predicted while on the far side. Overall, we conclude that HMI and GONG have comparable reliability using the current data processing procedures.