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Evaluating the forecasting skill of the near-Earth solar wind using a space weather monitor at L5.

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There is a considerable amount of interest from space agencies about sending a space weather monitor to Lagrangian point 5 (L5). The aim of such a mission would be to enable the forecasting of the near-Earth solar wind and transient features embedded within in, such as coronal mass ejections and corotating interaction regions, from taking measurements at L5. Here, we use data from the STEREO and ACE missions to find times when there are two spacecraft 60 degrees apart to simulate this L5 to L1 scenario. When mapping the solar wind data, we take into account the different orbits of the spacecraft and the varying solar wind speed. We find that the predicted and observed solar wind data are in generally very good agreement for each of the periods. Using skill scores derived from meteorological forecasting, we find that it is possible predict the solar wind much more effectively from L5 than using a persistence forecast based on one solar rotation before, with positive skill scores found for almost all events in a number of important solar wind parameters. The skill improves further for all time periods when removing coronal mass ejections which cannot be predicted in this method. We also show that there is predictability in the cross helicity, a parameter used to display the presence of Alfvén waves in the solar wind.