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Error evolution for direct solar radiation predicted by the ECMWF global atmospheric model over Australia

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Prediction of direct solar radiation enables more efficient production of energy from concentrating solar power plants. We assess the quality of the direct solar radiation forecast by the European Centre for Medium-Range Weather Forecasts (ECMWF) global numerical weather prediction model up to five days ahead. The predicted direct solar radiation (or direct beam) is assessed for 2006 using four solar monitoring stations over Australia, each affected by diverse climatic features. The mean correlation is above 0.6 for three of the stations. The direct beam forecast is benchmarked against the global radiation forecast and its related observation. Despite the direct beam being by definition smaller in magnitude than the global radiation, its mean root-mean-square difference (RMSD) is on average 20-30% larger than that for global radiation. Similarly the mean correlation for the direct beam is smaller than that for the global radiation by about 10-30%. In terms of error evolution over the five-day lead time, the linear trends for RMSDs and correlations indicate that the error growth is larger for the direct beam than for global radiation. A stratification of the RMSD and correlation indicate a strong dependency on cloud cover. Similar differences also emerge from the regional locations considered, which are characterized by varying cloud cover distributions.