

(a) Full Sensor Map



(b) Detailed UASTP Map

Fig. 2. Map of sensors used in this study throughout the Tucson area. A more detailed map of the UA Science and Technology Park (UASTP) highlighted in (a) is shown in (b).

Research and Forecasting (WRF) model that are produced earlier in the day to determine the cloud motion vector at each time t . To make this determination, we find the most likely cloud base height and then use the wind speed and direction at this height as the cloud motion vector. Finally, we calculate the quantity of interest (power or irradiance) with this forecasted clearness and the clear-sky expectation. We repeat this procedure for each forecast horizon.

For this study, we generated forecasts every minute, and the forecasts include predictions for GHI at a given location out to 30 minutes in advance. An example of a single forecast, showing predicted GHI for the next 30 minutes, is shown in Fig. 4. A full day of 10-minute ahead forecasts is shown in Fig. 5.

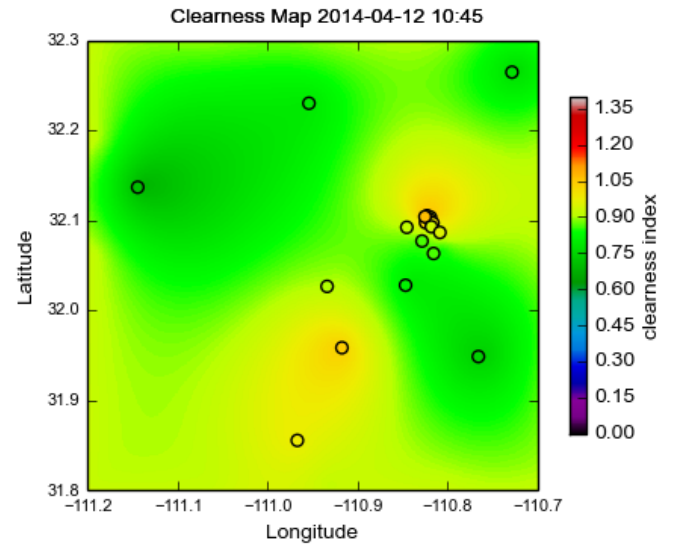


Fig. 3. Example interpolated clearness map.

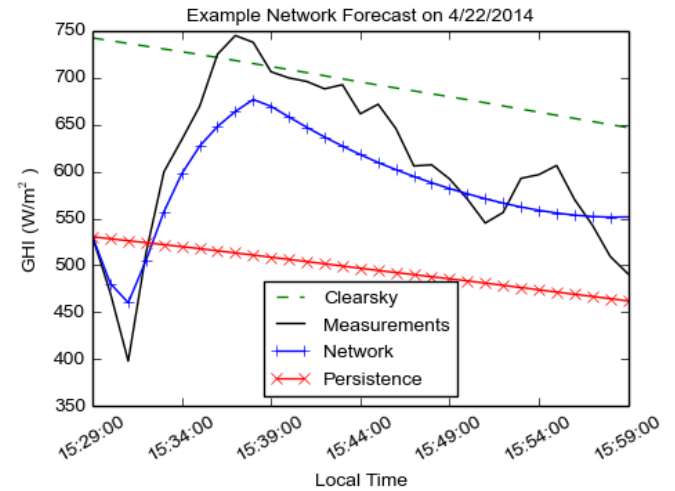


Fig. 4. Example forecasts made for a 30 minute period on 4/22/2014. The network forecast, clearness persistence forecast, clear-sky expectation, and measured data are shown. Forecasts shown are made at 15:29.

IV. ERROR STATISTICS

We now present error statistics for GHI forecasts made for 26 days in April. Of these days, 10 days had completely clear skies, 8 days were variable due to high, thin cirrus clouds, 2 days were overcast, and the remaining 6 days were highly variable, likely due to small cumulus clouds. Data used to calculate and evaluate the forecasts were binned into 1 minute averages. Forecasts were calculated and evaluated for each minute of the day for forecast horizons from 0 to 30 minutes. Forecast error metrics were calculated for each day and then averaged for the month. Only daylight hours were considered. In addition to evaluating our network forecasts, we also evaluate a clear-sky model and two persistence models: a clearness based persistence model that assumes the clearness