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Private Observations Improve MET Norway's Operational Weather Forecasts

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MET Norway recently introduced observations from Netatmo's network of private weather stations in the post-processing of near-surface temperature forecasts from the MetCoOp ensemble prediction system (MEPS), for the Nordic countries. These observations significantly improve temperature nowcasts, reducing the frequency of large forecast errors (those above 3°C) by a factor of 2 and reducing the mean absolute error by 30%.

The prevalence of low-cost, privately owned weather stations is rapidly increasing and in the Nordic countries they currently outnumber national stations by a factor of 40. Their inclusion in post-processing allows for more detailed and expansive correction of forecast errors than before. This is important as our weather portal (Yr; https://www.yr.no) provides forecasts for 11 million locations thereby creating an expectation and an opportunity to provide localized forecasts to our end-users.

Incorporating private weather observations into an operational system comes with a number of challenges. Firstly, operational systems must be robust to unreliable input data. An extensive data quality control system is used to filter out unrepresentative observations that are often caused by poor station placement. Secondly, post-processing methods must be chosen that can exploit information from a high-density network. We use an ensemble optimal interpolation method to merge private and conventional observations with output from MEPS where each data source is weighted by their certainty. This creates a gridded truth (analysis) on a 1x1 km grid that is then used to bias-correct the remaining lead times of the MEPS forecast. In this way, the analysis improvements also partly carry over to the short-term forecasts, especially for lead times up to 12 hours. The data quality control and post-processing tools used are open-source software and are available at https://github.com/metno.

In this presentation, we share our experiences with integrating private weather observation into our operational systems and evaluate the quality of the forecasts verified against independent observations from conventional stations.