Making use of errors in consumer weather data to derive advanced weather parameters

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Consumer weather stations are widely present in the current age of technology, with currently over 200.000 online stations online world-wide. These stations and their data do not come without problems as they are not maintained and checked by professional meteorologists. While error filtering is possible, we could also use the information within these structural errors.

This work highlights two out of many possible uses for such structural measurement errors. First, it is possible to derive night-time effective cloud cover maps based on cooling behavior. Second, it is possible to derive the wet-solid precipitation type distinction based on errors in community precipitation measurements.

The night-time cloud cover prediction is mainly based on the effect that most consumer stations are not placed in ventilated Stevenson screens and are more sensitive to changes in long wave radiation, caused by for example clear spells. We derive a machine learning model to nowcast effective cloud cover.

The wet-solid precipitation type is based on the 'shortcoming' that consumer precipitation measurement cups freeze over and fill up when exposed to solid precipitation. When combined with radar or satellite images, the precipitation type can accurately be deduced.

In the presentation, we provide a detailed explanation as well as several use cases and initial verification results.