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CLIPER as a Reference Forecast in Verifying Visibility and Low Ceiling in TAF and TREND

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Low clouds and visibility conditions are the most important factors to the aviation due to high impact on the air traffic. Information for flight planning and landing are obtained from regular forecast products for airports such as Terminal aerodrome forecast (TAF) and TREND. These products are standardized across the globe and accurate forecasts are needed. Several common methods of TAF verification are proposed by Mahringer (2008), Harris (2000) and Sharpe (2016). These approaches arose due to some deficiencies of 'the operationally desirable accuracy of forecasts' (formally stated in Attachment B of ICAO Annex3). They are listed according to the weather elements, mostly contradicting the rules for TAF, found in the same document. Also, among forecasters there is a high agreement that it is very hard to meet this criteria especially for fog conditions (e.g. desirable accuracy of $\pm$200m up to 800m in at least 80% of cases). Moreover, these criteria are prone to hedging and they depend on climatology of particular airport across the world.

For the evaluation of any forecasting system, a reference forecasts are needed. Murphy (1992) suggested that a combination of climatology and persistence (acronym CLIPER) should be used. Through the years, the forecast skill had been measured with reference to the CLIPER in a variety of forecasts such as tropical cyclones motion and precipitation, El-Nino southern oscillation, polar ice prediction, thunderstorms occurrence and other. Here, we investigate how CLIPER could be used as a reference forecast in verifying the visibility and low ceiling in regular aviation short-term forecasts such as TAF and TREND. In order to implement it, the detailed climatological datasets are needed. As these variables have irregular distributions, the raw data are transformed to the equivalent normal deviates. After this, the forecast (deterministic or probabilistic) is based on first-order autoregression.
Several examples of CLIPER forecast for different climatologies reveal strengths of this simple system. However, deviation between accuracy desired by ICAO and the CLIPER accuracy is large, especially in fog conditions.