European Centre
for Medium-Range
Weather Forecasts

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Brier: precipitation

Events usually defined for the verification of probabilistic forecasts are defined as anomalies with reference to a 10-year model climatology (1984-1993). This climatology is often referred to as the long-term climatology as opposed to the sample climatology which is simply the collation of the events occurring during the period considered for verification. In order to have an evaluation that is not affected by representativity (scale) effects, results are shown with the model analysis at the same scale as the EPS forecast. For precipitation, the accumulation by the model over 24-h following the analysis is taken as the reference. It can therefore be argued that the verification results produced are more a diagnostic of the EPS performance than a verification of the value of the forecasts from the user's point of view. Verification of the EPS with direct reference to the observations is, however, part of the quarterly report issued to the EPS Contact Points in Member States.

The Brier Score (BS) is a measure of the distance between forecast probabilities and the verifying observations (which, as any deterministic system, takes only 0 or 1 as values). For a single event, it can be written as:

$$\overline{BS = (p - o)^2}$$

As any probabilistic score, however, the BS only becomes significant when results are averaged over a large sample of independent events. Then its values range from zero (perfect, deterministic forecast) to 1 (consistently wrong, deterministic forecast). The BS can be split into the sample climate uncertainty, the forecast reliability (BS_REL), and the forecast resolution (BS_RSL): uncertainty varies from 0 to 0.25 and indicates how close to 50% the occurrence of the event was during the sample period (uncertainty is 0.25 when the event is split equally into occurrence and non-occurrence); reliability tells

how close the frequencies of observed occurrences are from the forecasted probabilities (on average, when an event is forecasted with probability p, it should occur with the same frequency p); resolution tells how informative the probabilistic forecast is; it varies from zero for a system for which all forecasted probabilities verify with the same frequency of occurrence to the sample uncertainty for a system for which the frequency of verifying occurrences takes only values 0 or 100% (such a system resolves perfectly the forecast between occurring and non-occurring events).

From these components, skill scores can be derived:

- the Brier Skill Score (BSS) is computed by reference to the BS of a probabilistic forecast that would consistently forecast the climate distribution:

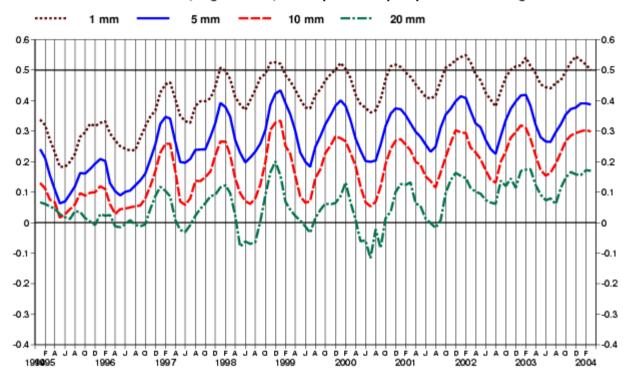$$BSS = (1 - \frac{\overline{BS}}{BS_{\infty}})$$

- the Resolution Skill Score (BSS_RSL) is the ratio of resolution by uncertainty;
- the Reliability Skill Score is defined as:

$$BSS\_REL = (1 - \frac{\overline{BS\_REL}}{BS_{\infty}})$$

Probability forecast verification against an (3-M. moving sample)
Brier skill score (long term clim) fc step 96 24h-precipitation exceeding

Legend: 1 mm · · · · · · 5 mm ——— 10 mm – – – 20 mm –·–·–