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Meteorological variables used in an analog method: comparison between ERA-40 and NCEP/NCAR re-analysis

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This presentation gives a brief overview of the exploratory analysis of meteorological variables extracted from two archives and used in a medium-term quantitative precipitation forecasts system. In this study, we consider the two following re-analysis: the 45-Year European Centre for Medium-Range Weather Forecasts (ECMWF) Re-Analysis (ERA-40) and the first National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) re-analysis. This study focuses on the four variables introduced in the precipitation forecasting method developed by Bontron (2004): the 1000 and 500 hPa geopotential heights, the 850 hPa relative humidity and the precipitable water. The study area covers most of Europe and a part of the northern Atlantic Ocean. The results show that fields of geopotential height and precipitable water are often closed, whereas strong discrepancies are observed for the relative humidity at 850 hPa level. A more detailed study of these differences allowed to detect unrealistic values of humidity in the ERA-40 re-analysis. A few values are lower than 0 % and several values are higher than 100 %, with a significant proportion of positive anomalies. For each anomaly in the ERA-40 archive, the corresponding value in the NCEP/NCAR archive is compared. However, no systematic error between the re-analysis has been detected, that inhibits a possible correction of unrealistic values in the ERA-40 using the concomitant values extracted from the NCEP/NCAR re-analysis. Moreover the relative humidity is calculated by the atmospheric model from the specific humidity. This variable may be recalculated

to verify that anomalies do not derive from the model calculation. Indeed, unrealistic values are also detected in specific humidity. Finally, to identify the probable source of this issue, data from both archives are finally compared to radio-sounding observations on the stations that are closest to area grid points. The main conclusion is that at the present time it is not possible to avoid such unrealistic values of 850 hPa relative humidity in the ERA-40 re-analysis. The ECMWF will soon provide a new re-analysis, which could not contain any anomaly.