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Mutual analysis of original and reanalysed temperature series

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Reanalysis products are used extensively in climate research, as they offer gridded time-series over large areas and without gaps. We were interested in question how much of variability of real measured data remained in reanalysed time-series. This question is very important in the investigation of extreme events. A scheme how to use a fitted statistical model for that purpose is introduced in a process of comparing the variability of measured and reanalysed daily air temperature series from Estonia. We used two sets of reanalysis: ERA-40 with 1 degree resolution and a regional reanalysis Baltan65+ with 11 km resolution, together with measured temperatures in Tartu meteorological station.

The fitted IMA(0,1,1) model can be formally divided into a sum of white noise plus random walk. This enables us to use standard deviation of the separated white noise component to describe the variability range of the temperature anomaly series in respect to their mean seasonal cycle. A scheme how to use the varying frequency of outliers from that range to estimate climate variability and change is introduced.