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'Rainy' circulation types of COST 733 classifications in Estonia

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Hundreds of classifications of atmospheric circulation were created by COST 733 Action using tens of different classification methods. Usually, some prior information on how those classifications describe 'regular' meteorological variables, like air temperature and precipitation, is needed to decide which classifications may be suitable for analysing more complex environmental variables. Unfortunately, COST 733 Action does not give such information on the circulation type (CT) level.
Here, 47 classifications from the COST 733 cat. 2.0 domain 05 (Baltic Sea region) were analysed to distinguish 'rainy' CT-s in case of Estonia. For this purpose, daily precipitation data from three Estonian meteorological stations – Jõhvi, Ristna and Võru were compared to classifications including nine CT-s and representing the optimisation method family (methods CAP, CKM, NNW, PXK, SAN and SOM). The period of analysis was 1960-2001, i.e. 15,341 days.
The following parameters were calculated: frequency of CT-s (f, %); ratio between the total amounts of precipitation (in total 28,102.5 mm in case of the Jõhvi station, period 1960-2001) and total amount of precipitation occurred in each of the CT-s (p, %); Performance Index (PI), introduced by Zhang et al. (1997), represents the ratio between daily average precipitation rates of CT-s and the long term daily average total precipitation. Also, the probability of precipitation occurrence (P %) and the average amount of precipitation was calculated for each CT. The average amount of precipitation was calculated for each day on which the CT occurred (Re, mm), and for the total occurrence days of CT-s with precipitation (Rp, mm).
The results reveal that PI performed rather well as the tool of first approximation of the 'rainy'- 'non-rainy' circulation type. Still, a simpler approach is to compare f to the value of p – if the value of p exceeds that of f, the CT may be defined as 'rainy'.
Still, a more complex picture was revealed when the values of p, f, P and Rp were analysed together. In that case, several typical patterns, which occurred in most of the analysed classifications, were revealed. The first typical 'rainy' pattern is CT with a high rate of f (13-19%) and p (up to 30%). Also, the value of Rp is high (up to 5 mm as the long term average amount of precipitation in Estonia is ca 3 mm), but P is relatively low (63-70% as the 60% is the precipitation probability for Estonia). The second pattern has low rates of f (ca 5%) and Rp (2-3 mm), but high values of p (up to 20%) and P (ca 91%). In addition, there are 2-3 CT-s in each classification that are considered as 'rainy' types, but have more moderate values. It should also be mentioned that 'non-rainy' types are still relatively 'rainy' – the value of P in those CT-s is about 30-40%. I.e. there is a precipitation event on at least one of the three 'non-rainy' CT days.

Reference:
Zhang X, Wang XL, Corte-Real J. 1997. On the relationships between daily circulation patterns and precipitation in Portugal. Journal of Geophysical Research 102: 13495– 13507