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Isotopic composition of precipitation during different atmospheric circulation patterns

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Precipitation generating processes depend on atmospheric circulation patterns and consequently it is expected that its water stable isotopic composition of hydrogen and oxygen is related to them. Precipitation generated at similar atmospheric circulation patterns should have similar empirical distribution of δ^2H and δ^{18}O values. There are several approaches in which atmospheric circulation patterns are classified as elementary air circulation mechanisms – ECM; in our approach we have applied Dzerdzeevskii classification. Two types of models of relation between ECM and isotopic composition of precipitation are proposed; first is based on the linear combination of δ^2H and δ^{18}O values with precipitation amount weighted average (Brenčič et al., 2015) and the second new one is based on the multiple regression approach. Both approaches make possible also to estimate empirical distributions' dispersion parameters. Application of the models is illustrated on the precipitation records from Ljubljana and Portorož GNIP stations, Slovenia. Estimated values of the parameters for empirical distributions of δ^2H and δ^{18}O of each ECM subtype have shown that calculated estimates are reasonable.

Brenčič, M., Kononova, N.K., Vreča, P., 2015: Relation between isotopic composition of precipitation and atmospheric circulation patterns. Journal of Hydrology 529, 1422-1432: doi: 10.1016/j.jhydrol.2015.08.040