



Mathematical methodology for meteorological drought risk assessment

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One of the aim of the DriDanube project is the drought risk assessment and the main responsible partner of this activity is the Hungarian Meteorological Service.

However, there is no commonly accepted procedure for this purpose therefore it was necessary to review and prepare the methodology that can be applied for drought risk assessment in this project. According to the recommended principle, “risks are the combination of the consequences of an event or hazard and the associated likelihood of its occurrence” or the risk is the product of the hazard impact and the probability of occurrence. Since it is a qualitative phrasing only therefore it is necessary to formulate the problem according to the mathematical statistical conventions.

Using this statistical formulation, the meteorological drought events can be characterized by certain loss functions (hazard impact) that depend on the relevant meteorological variables. Then according to the mathematical statistics, the meteorological drought risk can be defined as the expected value of the loss function. Consequently, the risk of meteorological drought events depends on the loss function and the probability distribution of the meteorological variables describing drought.

However there was another methodological problem i.e. there does not exist reliable meteorological drought loss values to estimate the loss function. For solving this problem we used the crop yield values and some drought indices (e.g. SPI) for drought identification. Then the drought loss function was derived from the crop yield function using drought index.

The final result of this developed mathematical methodology can be summarized such as the drought risk is the product of the probability of drought and the differences of the conditional expectations of yield given the events no drought and drought. The estimation procedure for this theoretical drought risk will be also presented.

Acknowledgement: This presentation was supported by Hungarian Meteorological Society and the DriDanube project. DriDanube is an Interreg Danube Transnational Programme (DTP) project.