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Water balance analysis for efficient water allocation in agriculture. A case study: Balta Brailei, Romania

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Balta Brailei is one of the largest agriculture area in the Danube floodplain, located in SE of Romania. An impressive irrigation system, that covered about 53.500 ha and transferred water from the Danube River, was carried out in the period 1960-1980. Even if the water resources for agriculture in this area cover in most of the cases the volumes required by irrigation water users, the irrigation infrastructure issues as the position of the pumping stations against the river levels hinder the use of the water during low flows periods. An efficient optimization of water allocation in agriculture could avoid periods with water deficit in the irrigation systems. Hydrological processes are essentials in describing the mass and energy exchanges in the atmosphere-plant-soil system. Furthermore, the hydrological regime in this area is very dynamic with many feedback mechanisms between the various parts of the surface and subsurface water regimes. Agricultural crops depend on capillary rise from the shallow groundwater table and irrigation. For an effective optimization of irrigation water in Balta Brailei, we propose to analyse the water balance taking into consideration the water movement into the root zone and the influence of the Danube river, irrigation channel system and the shallow aquifer by combining the soil water balance model CRITERIA and GMS hydrogeological model. CRITERIA model is used for simulating water movement into the soil, while GMS model is used for simulating the shallow groundwater level variation. The understanding of the complex feedbacks between atmosphere, crops and the various parts of the surface and subsurface water regimes in the Balta Brailei will bring more insights for predicting crop water need and water resources for irrigation and it will represent the basis for implementing Moses Platform in this specific area. Moses Platform is a GIS based system devoted to water procurement and management agencies to facilitate planning of irrigation water resources. This work is financed by the European Union's H2020 research and innovation programme under grant agreement No 642258 (Moses Project).