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Remote sensing-based monitoring of the water surfaces in the Neusiedler See – Seewinkel National Park

Henri Schauer, Stefan Schlaffer, Emanuel Büechi, and Wouter Dorigo
Vienna University of Technology, Department of Geodesy and Geoinformation, Austria (henri.schauer@geo.tuwien.ac.at)

Topic:

Wetlands provide important ecosystem services, e.g. for biodiversity and water resources. The salt pans in the *Neusiedler See – Seewinkel National Park* are a unique ecosystem for animal and plant species especially adapted to the extreme conditions prevailing in and around the salt pans. The conservation of the salt pans is largely based on the interplay with the water balance of the area and the influence of physical as well as anthropogenic factors. The large number of lakes, which are often only filled with water for a short time due to their shallow depth, makes monitoring by means of installed gauges more difficult. Remote sensing, on the other hand, is an important source of consistent information in space and time. In the *FEMOWinkel* project, which is funded within the framework of the Austrian *StartClim* 2021 program, long time series of multispectral satellite data are exploited for monitoring and data-driven modeling of water extent in the salt pans.

The water bodies are delineated based on image time series of the Landsat satellites, which have been providing data almost continuously since the 1980s. Cloud gaps will partly be filled with radar-based information provided by European Copernicus – Programme. The derived time series of water body extent and number are validated by comparison with aerial photographs and – where available – water levels. The salt pans are characterized with respect to their seasonal variability and their reaction to longer-term changes in water availability by comparison with ancillary data, e.g., surface and groundwater levels, climate data and other remote sensing products, such as soil moisture and vegetation indices. In the third step, a data-driven modeling of the lake extent is carried out using machine learning methods. We will also address the question of whether it is possible to predict the effects of dry or wet winters and springs on water body extent in the following summer using these methods.

Preliminary results of the time series analysis show a pronounced dynamic in the extent of the water bodies over the course of the study time. Periods, e.g., from 1990 to 1993 and 2001 to 2007, in which some of the lakes fell dry, alternated with wetter periods, e.g., from 1994 to 1999, in which the salt pans remained at least partially filled even in summer. These differences correlate with drought indicators such as the Standardised Precipitation-Evapotranspiration Index (SPEI). The remote sensing-based approach will make it possible to transfer the applied methods to other similar ecosystems located in steppe regions.