Remote Sensing-based Long-term Monitoring of Salt Pans in the Neusiedler See - Seewinkel National Park (FEMOWinkel)

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INTRODUCTION

Wetlands provide important ecosystem services in terms of maintaining biodiversity and the water balance of an area. Examples include habitat functions for fauna and flora, regulating runoff, evaporation and groundwater recharge, as well as cultural services (e.g. for tourism). The, more than 30, salt pans in the Neusiedler See – Seewinkel National Park are part of such a complex hydrological regime.

Remote sensing by satellite is offering an important source of consistent information about this unique ecosystem. The FEMOWinkel-project, which is funded as part of the Austrian StartClim 2021 program, is aimed at understanding: What changes have these paintings been subject to from 1984 until 2022? And how will their evolution continue? The broad developments in this region can be put to use as hints:

- Decline in salt-pan numbers (1855: 139; 2022: 30 – 50 (cf. Horvath et al. 2019))
- Deterioration of ecological status
- Impact of climate change and other anthropogenic drivers

<table>
<thead>
<tr>
<th>Salt Pan Characteristics</th>
<th>type 1A</th>
<th>type 1B</th>
<th>type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water availability</td>
<td>Perennial</td>
<td>Perennial</td>
<td>Summer-dry</td>
</tr>
<tr>
<td>Water balance</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Water level</td>
<td>Astatic</td>
<td>Astatic</td>
<td>Static</td>
</tr>
<tr>
<td>Natural occurrence</td>
<td>Non-existent</td>
<td>Non-existent</td>
<td>Common</td>
</tr>
</tbody>
</table>

T1: Different types of salt pans (cf. Krachler et al. 2012.)

OBJECTIVES & RESEARCH APPROACH

In the scope of this project, long time series of multispectral satellite data covering 38 years are to be exploited for finding spatiotemporal patterns of the salt pans extent.

P1: Preparation
- Derivation of lake time-series
- Auxiliary-data (e.g. ERA-5 Land, eHyd, WP Burgenland)

P2: Monitoring
- Classification & characterisation of individual salt pans

P3: Data-driven modelling
- Modelling of water level (ground-truth)
- Modelling & forecasting of Lake Surface Area (LSA)

P2: Map of study area

Lake Surface Area (LSA): is an important variable when trying to quantitatively understand surface waters. It can be measured from space with satellites like Landsat - 5/8 or Sentinel – 2. (cf. Pekel et al. 2016)

PRELIMINARY RESULTS & OUTLOOK

Preliminary results of the time series analysis up to 2021 show a pronounced dynamic in the expansion of the lakes over the course of the study time. These differences correlate with drought indicators such as the Standardised Precipitation-Evapotranspiration Index (SPEI). However, not all lakes reacted equally to the water availability in the area. Additionally, modelling shows good performance in predicting lake surface area (LSA), when using up to 24 hydrological and climatological predictors.

Further results give insights into the dynamics of the lakes in the future and contribute to the transferability of the developed methods to similar other study areas in steppe regions.

LITERATURE

