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

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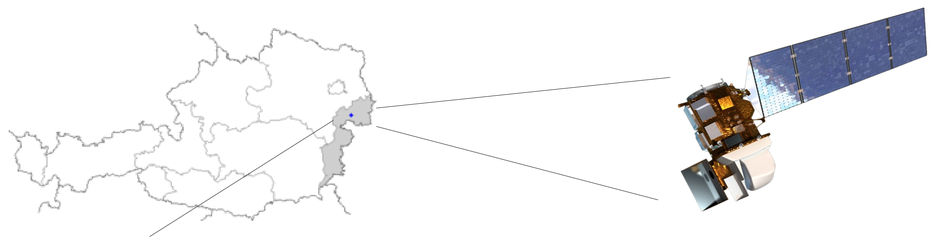


INTRODUCTION

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 paints 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

Salt Pan Characteristics	Type 1A	Type 1B	Type 2
Water availability	Perennial	Perennial	Summer-dry
Water balance	Negative	Positive	Positive
Water level	Astatic	Astatic	Static
Natural occurence	Non-existent	Non-existent	Common

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

Project-start 10/21

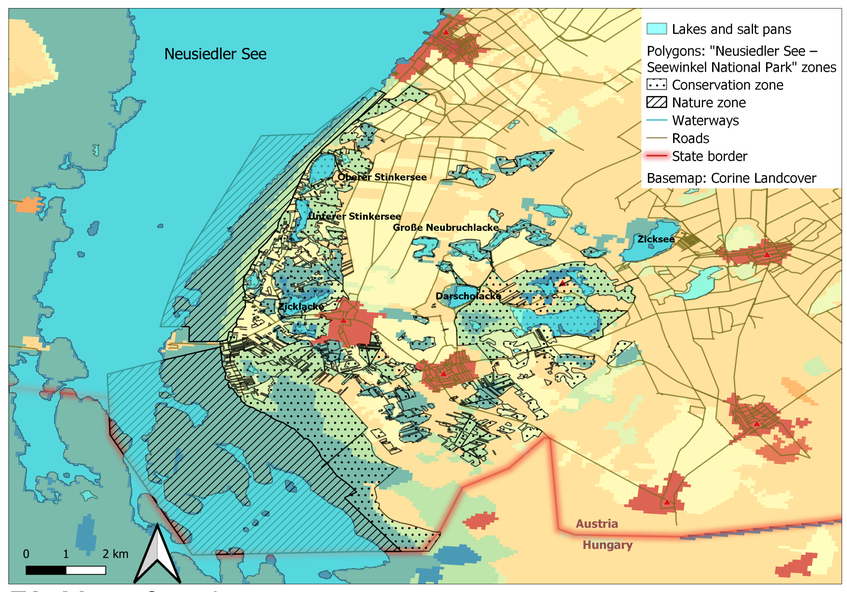
Data-acquisition

Monitoring salt pan dynamics

Modelling Lake Surface Area (LSA)

Forecasting LSA

Project-end 08/22



F2: Map of study area

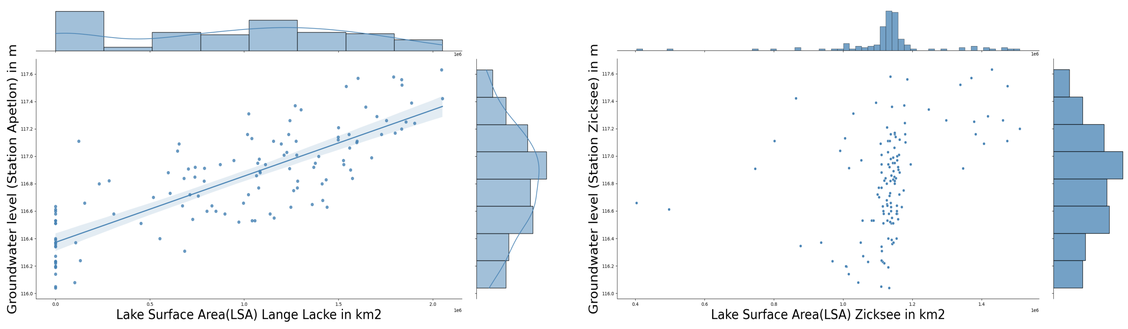
Lake Surface Area (LSA):
is an important variable when trying to quantitatively understand surface waters. It can be measured from space with satellites like Landsat - 5/8 or Sentinel – 2. (cf. Pekel et al. 2016)

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	*P2: Monitoring*	*P3: Data-driven modelling*
• Derivation of lake time-series • Auxilliary-data (e.g. ERA-5 Land, eHyd, WP Burgenland)	• Classification & characterisation of individual salt pans	• Modelling of water level („ground-truth“) • Modelling & forecasting of Lake Surface Area (LSA)

T2: Main research objectives



F1: Scatterplot between groundwater and LSA (Spearman's ρ: 0.8 resp. 0.46)

The main products are twofold. Firstly, the derivation of **individual remotely-sensed time-series** in *Neusiedler See – Seewinkel National Park* from **Landsat 5/8** images:

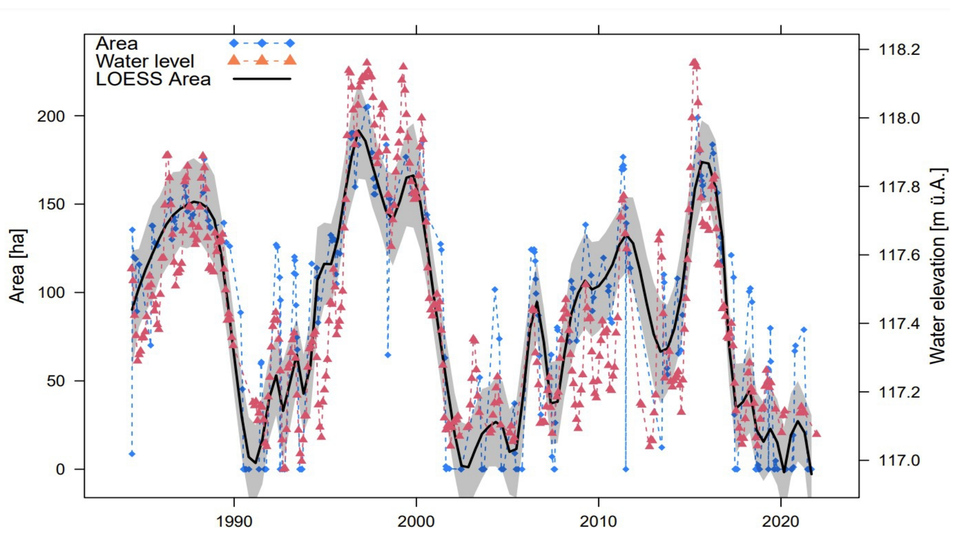
- Usage of **Google Earth Engine (GEE)** to access and manipulate Landsat-images
- Extraction of data for images with less than 10 % cloud cover

Secondly, the **data-driven modelling**, which includes:

1. Data-preprocessing & manipulation for **hydrological and climatological** variables
2. Application of basic statistical regression & advanced Machine Learning models (e.g. **Random Forest Regression**)
3. Tracking of model performance & choosing best model for each salt pan
4. **Forecasting** for future periods of time

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.



F3: Water level and Water Area Time-Series; Apetlon, Lange Lacke

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

Horváth, Zsófia; Ptacnik, Robert; Vad, Csaba F.; Chase, Jonathan M. (2019): Habitat loss over six decades accelerates regional and local biodiversity loss via changing landscape connectance. In: *Ecology letters* 22 (6), S. 1019–1027. DOI: 10.1111/ele.13260.

Krachler, R., Korner, I., Dvorak, M., Milazowszky, N., Rabitsch, W., Werba, F., Zulka, P., Kirschner, A., 2012. Die Salzlacken des Seewinkels: Erhebung des aktuellen ökologischen Zustandes sowie Entwicklung individueller Lackenerhaltungskonzepte für die Salzlacken des Seewinkels (2008 – 2011). Österreichischer Naturschutzbund, Eisenstadt, Austria.

Pekel, Jean-François; Cottam, Andrew; Gorelick, Noel; Belward, Alan S. (2016): High-resolution mapping of global surface water and its long-term changes. In: *Nature* 540 (7633), S. 418–422. DOI: 10.1038/nature20584.

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