

Analysis of long-term spring data in Austria – trends and changes



Matthias Hausleber¹, Maria Obwegs¹, Raoul Collenteur¹, Matevz Vremec¹, Thomas Wagner¹, Jutta Eybl² and Gerfried Winkler¹

¹Institute of Earth Sciences, NAWI Graz Geocenter Austria, University of Graz, Austria
²Bundesministerium für Landwirtschaft, Regionen und Tourismus Sektion I - Wasserwirtschaft Abteilung I/3 - Wasserhaushalt

Bundesministerium
Landwirtschaft, Regionen
und Tourismus

RESEARCH OBJECTIVE

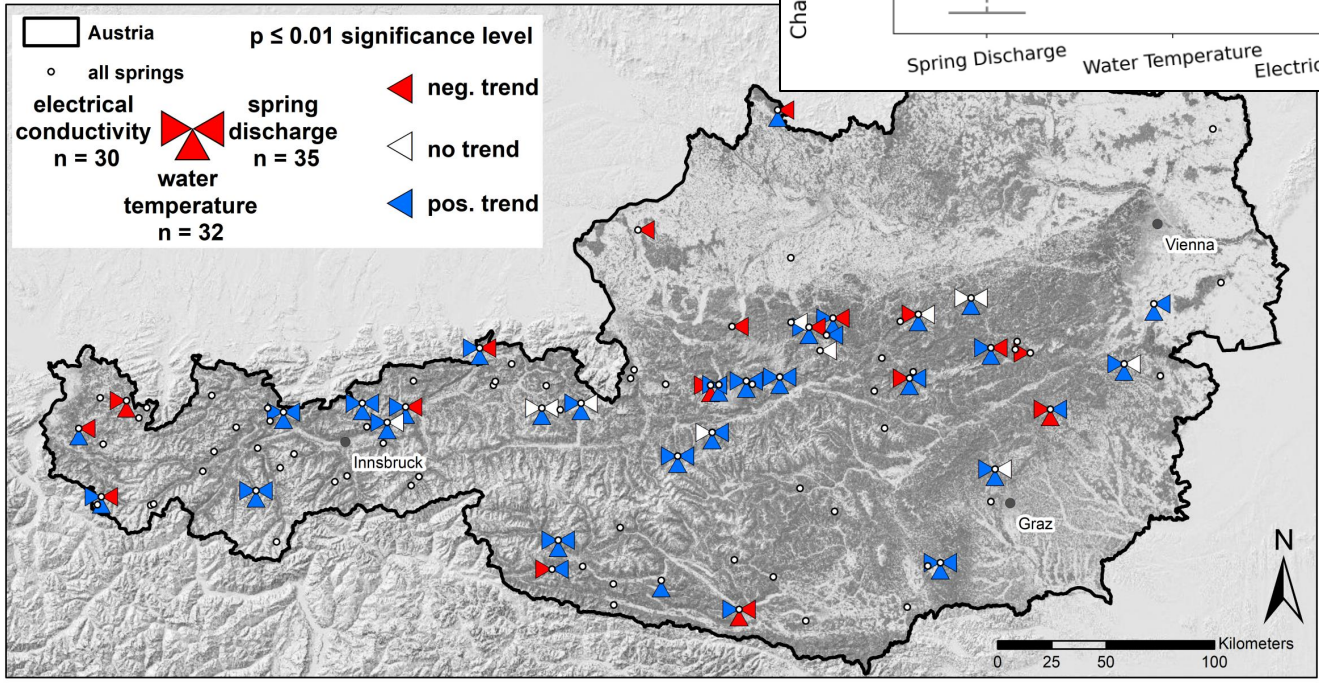
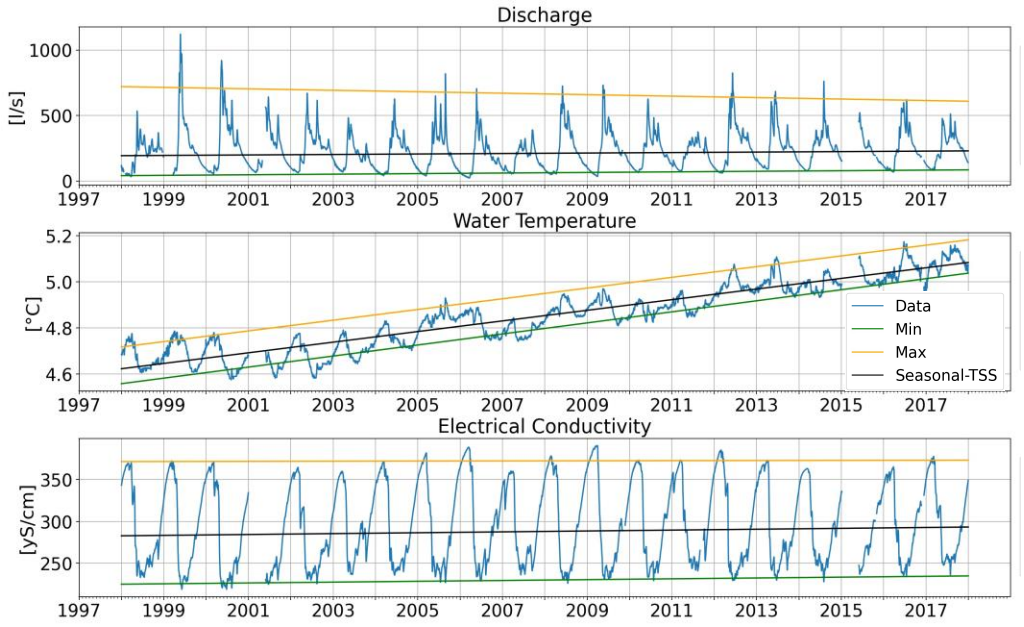
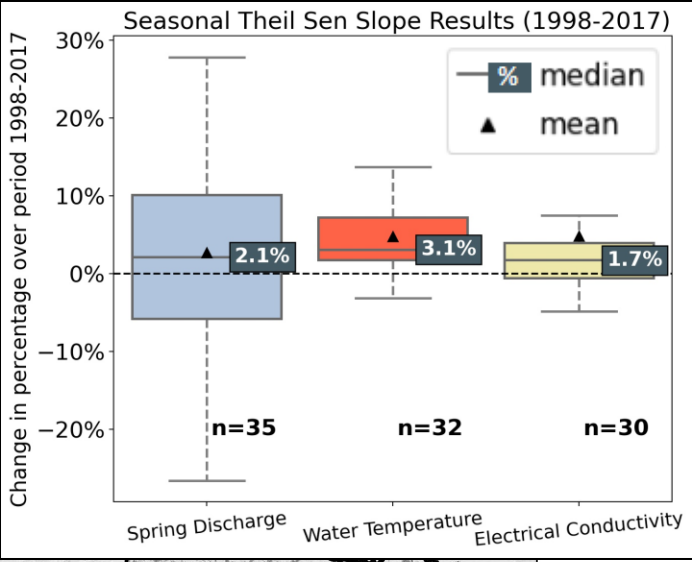
- Trends in long term spring-water data
- Possible regional patterns

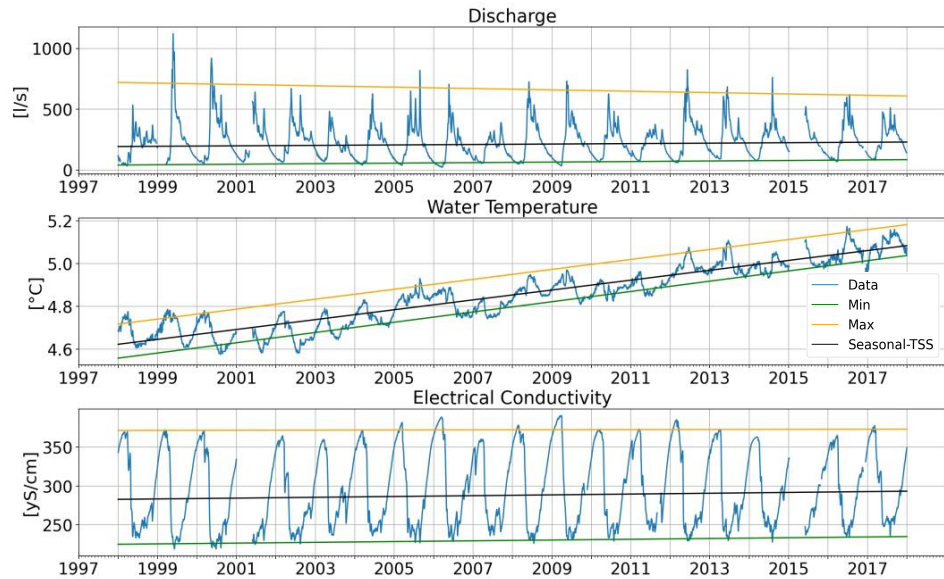
METHODOLOGY

- Theil Sen Slope/ Mann Kendall Test
- seasonal
 - yearly min and max values

PRELIMINARY RESULTS

- General increase in water temperature and electrical conductivity
- More diverse trends in discharge, with increasing seasonal median





 Bundesministerium
Landwirtschaft, Regionen
und Tourismus

Analysis of long-term spring data in Austria – trends and changes

Matthias Hausleber¹, Maria Obwegs¹, Raoul Collenteur¹, Matevz Vremec¹, Thomas Wagner¹, Jutta Eybl²
and Gerfried Winkler¹

¹Institute of Earth Sciences, NAWI Graz Geocenter Austria, University of Graz, Austria

²Bundesministerium für Landwirtschaft, Regionen und Tourismus Sektion I - Wasserwirtschaft Abteilung I/3 - Wasserhaushalt

Research objective & Methodology



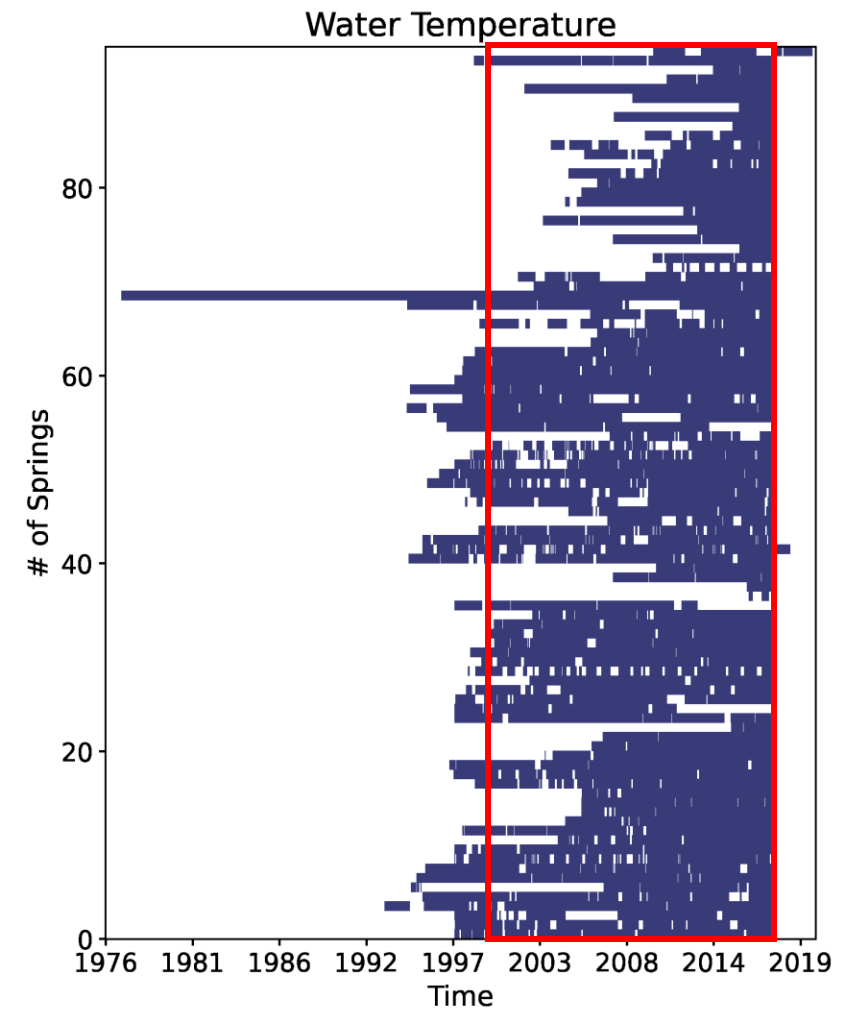
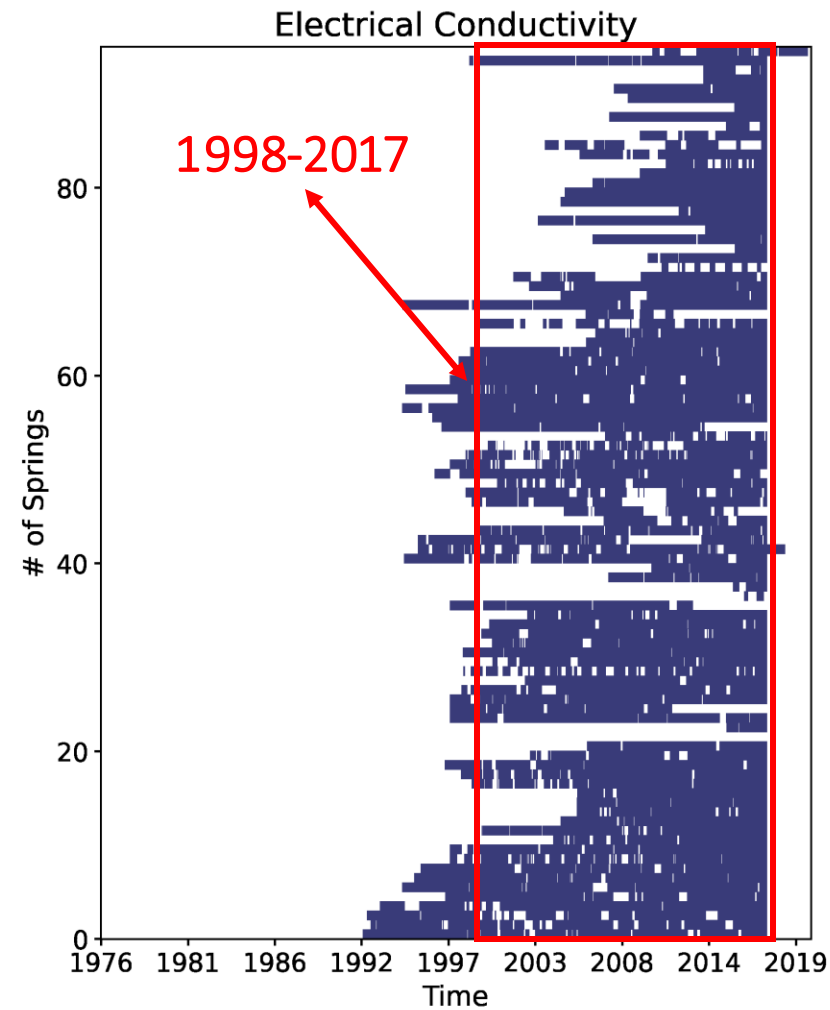
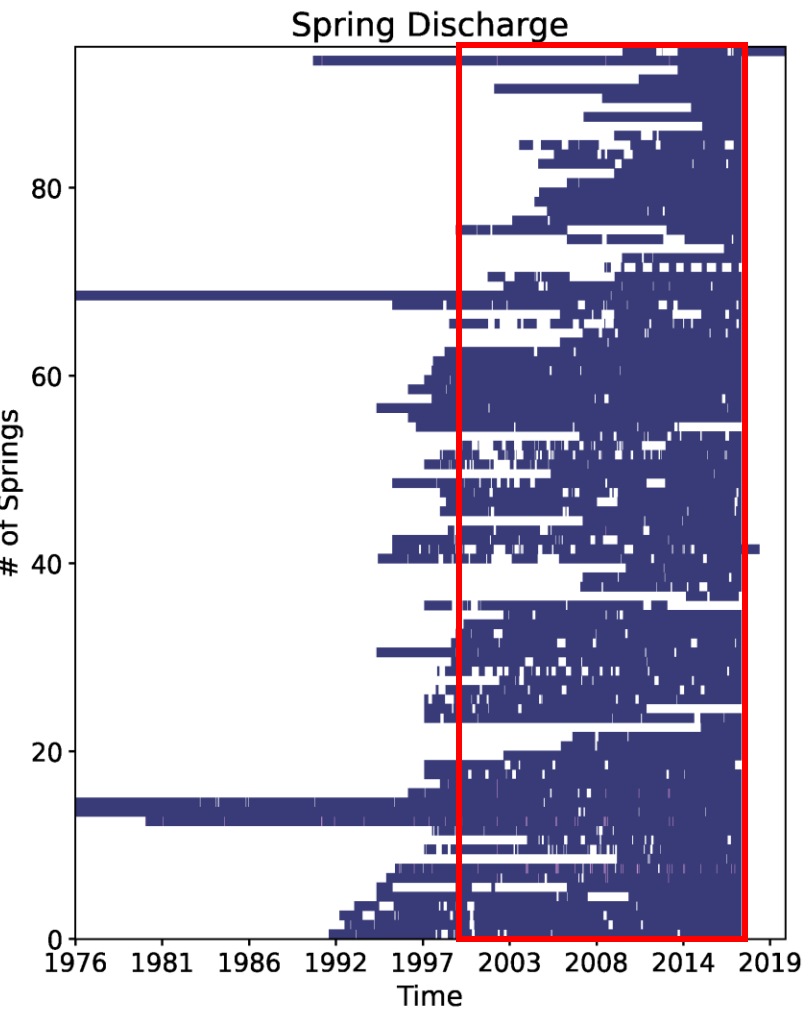
 Bundesministerium
Landwirtschaft, Regionen
und Tourismus

Motivation: Groundwater from springs is an important source of water for ecological systems and drinking water production in Austria

Objective: The purpose of this study is to investigate if there are long term trends and regional patterns present in the measured spring data in Austria

Method: For this purpose, we performed a trend analysis of spring discharge, temperature, electrical conductivity on long term datasets of a large number of spring.

Data availability

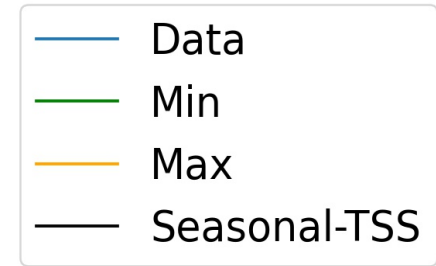
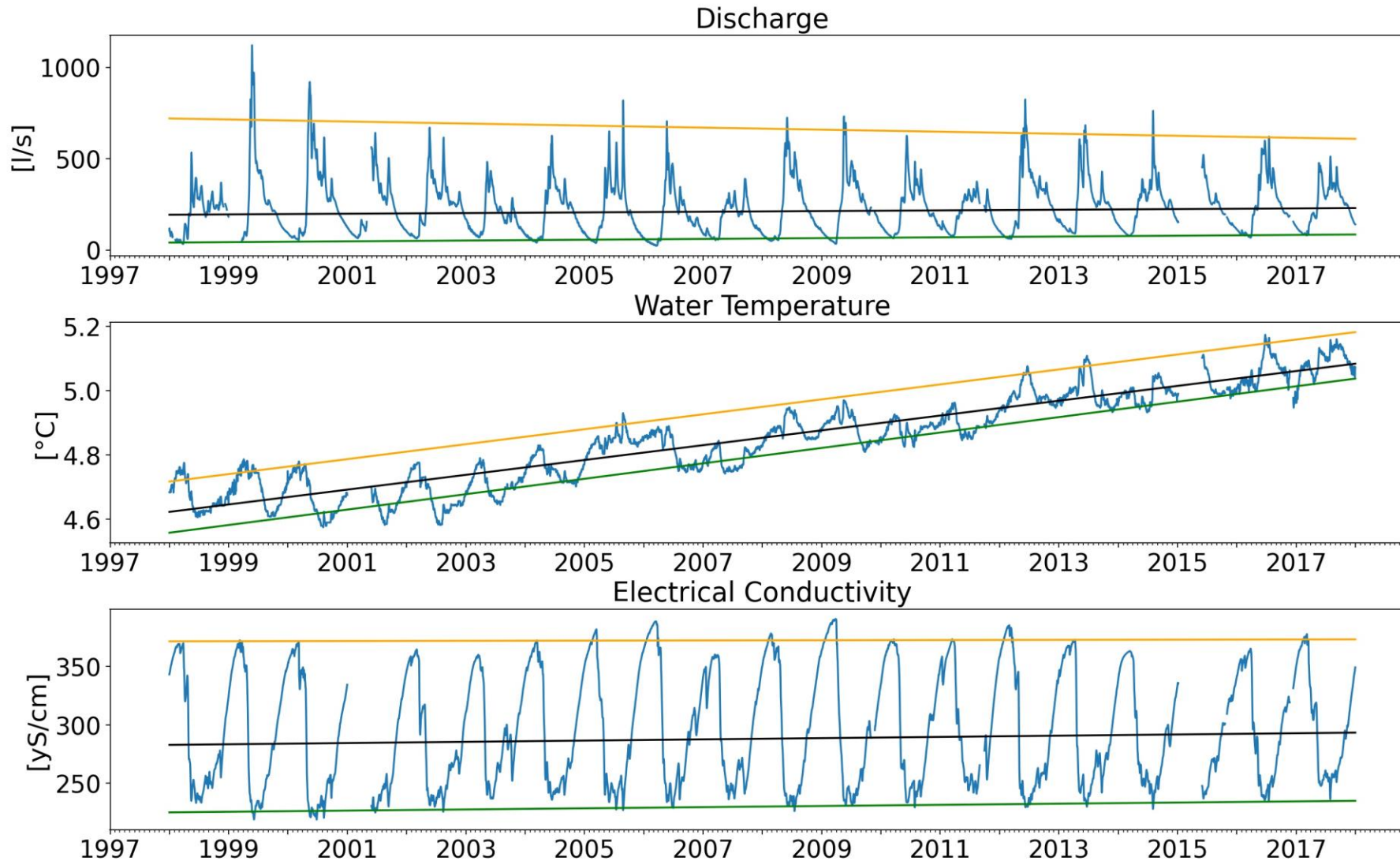


Methodology: Trend analysis



Bundesministerium
Landwirtschaft, Regionen
und Tourismus

Example 1:



For more details on the TSS method refer to Hesel et al. (2020)

<https://pubs.er.usgs.gov/publication/tm4A3>

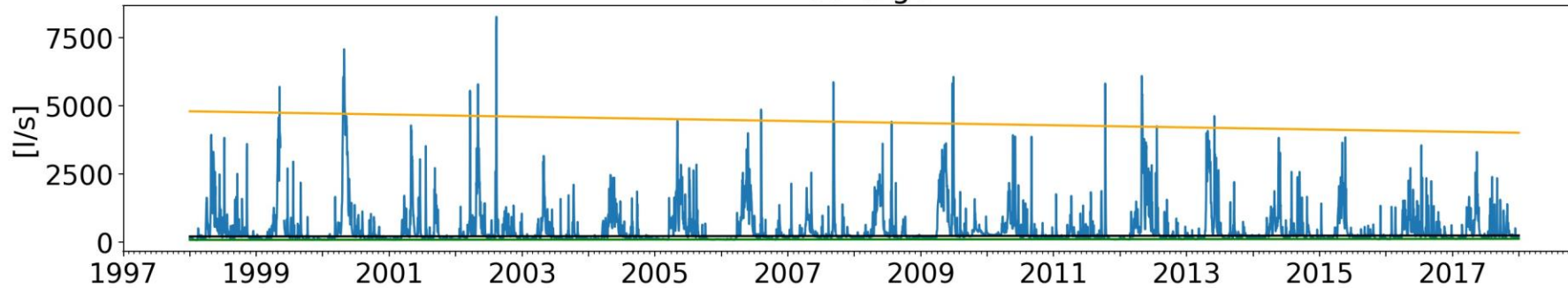
Methodology: Trend analysis



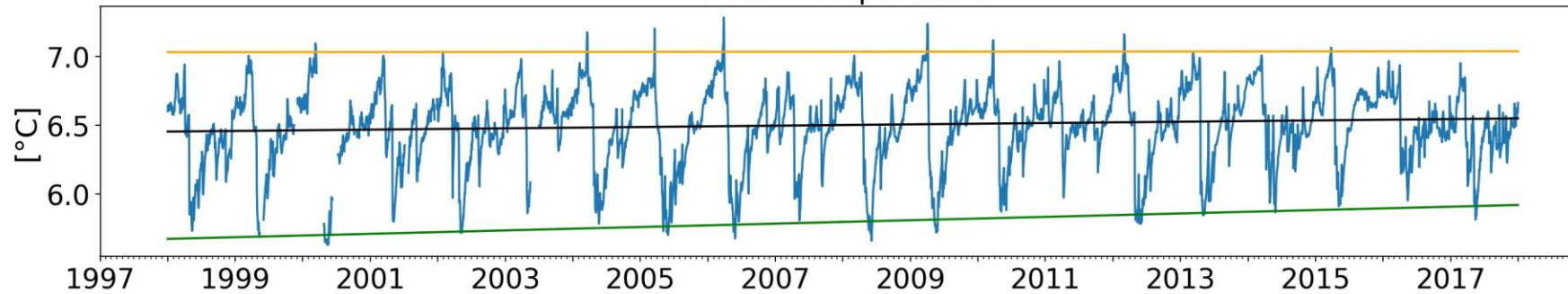
Bundesministerium
Landwirtschaft, Regionen
und Tourismus

Example 2:

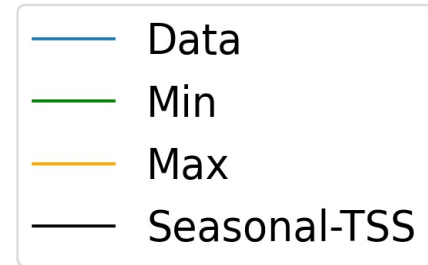
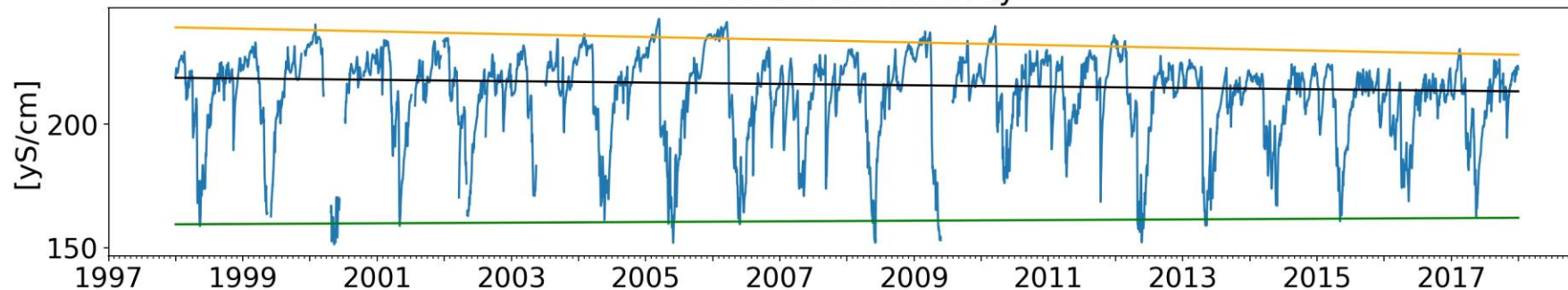
Discharge



Water Temperature



Electrical Conductivity



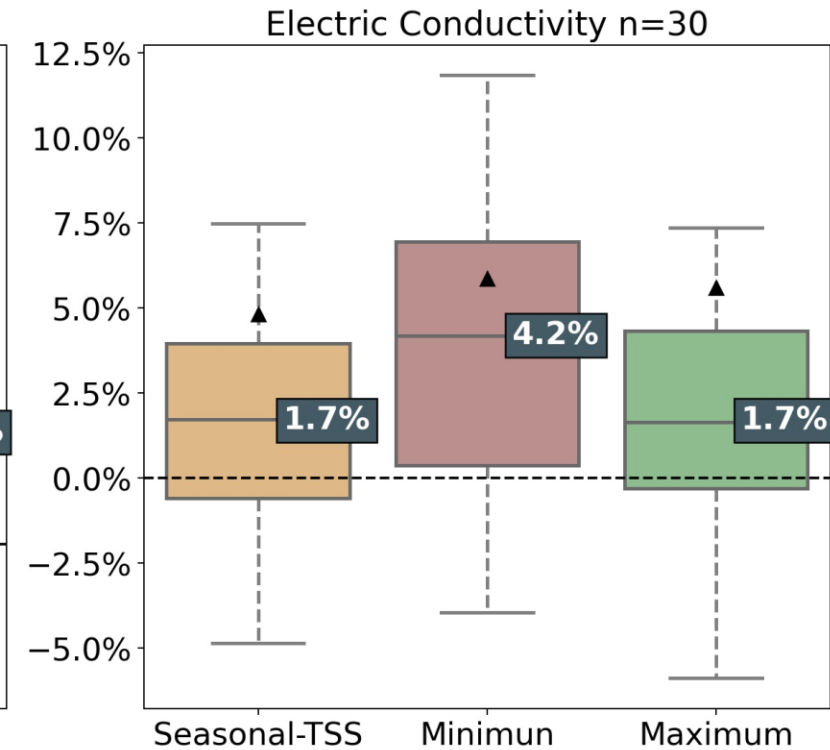
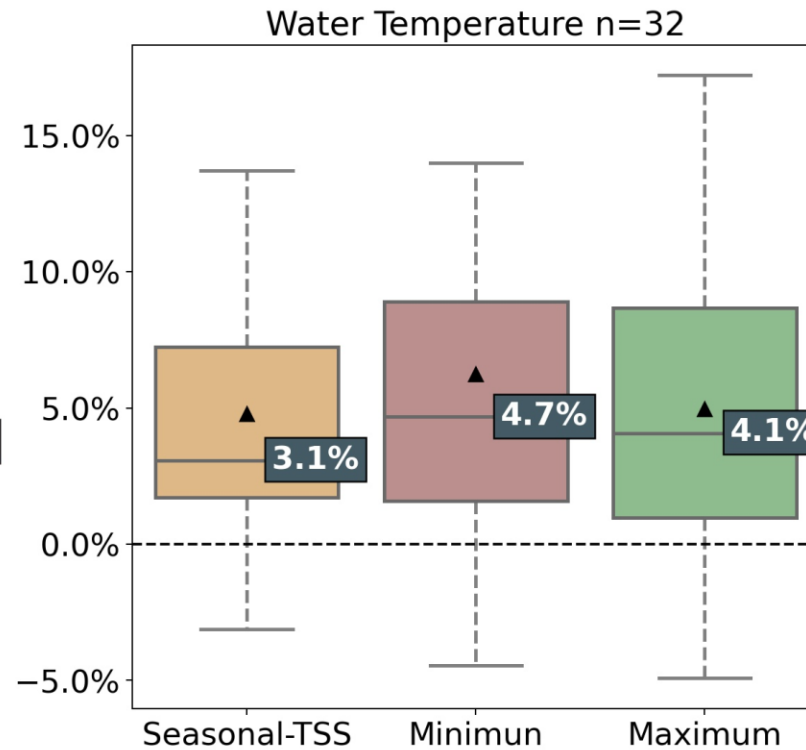
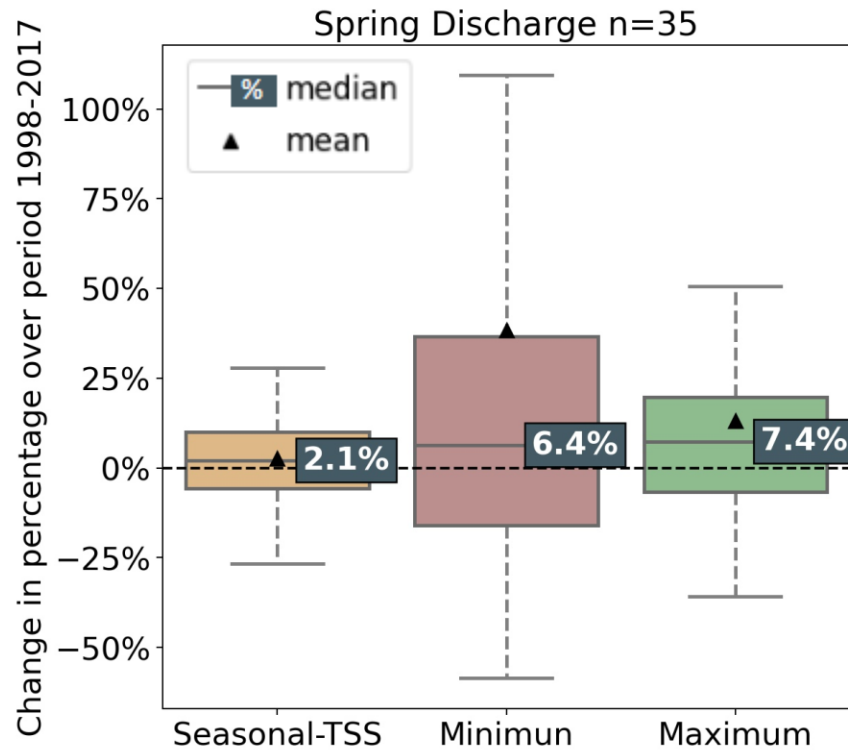
For more details on the
TSS method refer to
Helsel et al. (2020)

<https://pubs.er.usgs.gov/publication/tm4A3>

Results (1998-2017):

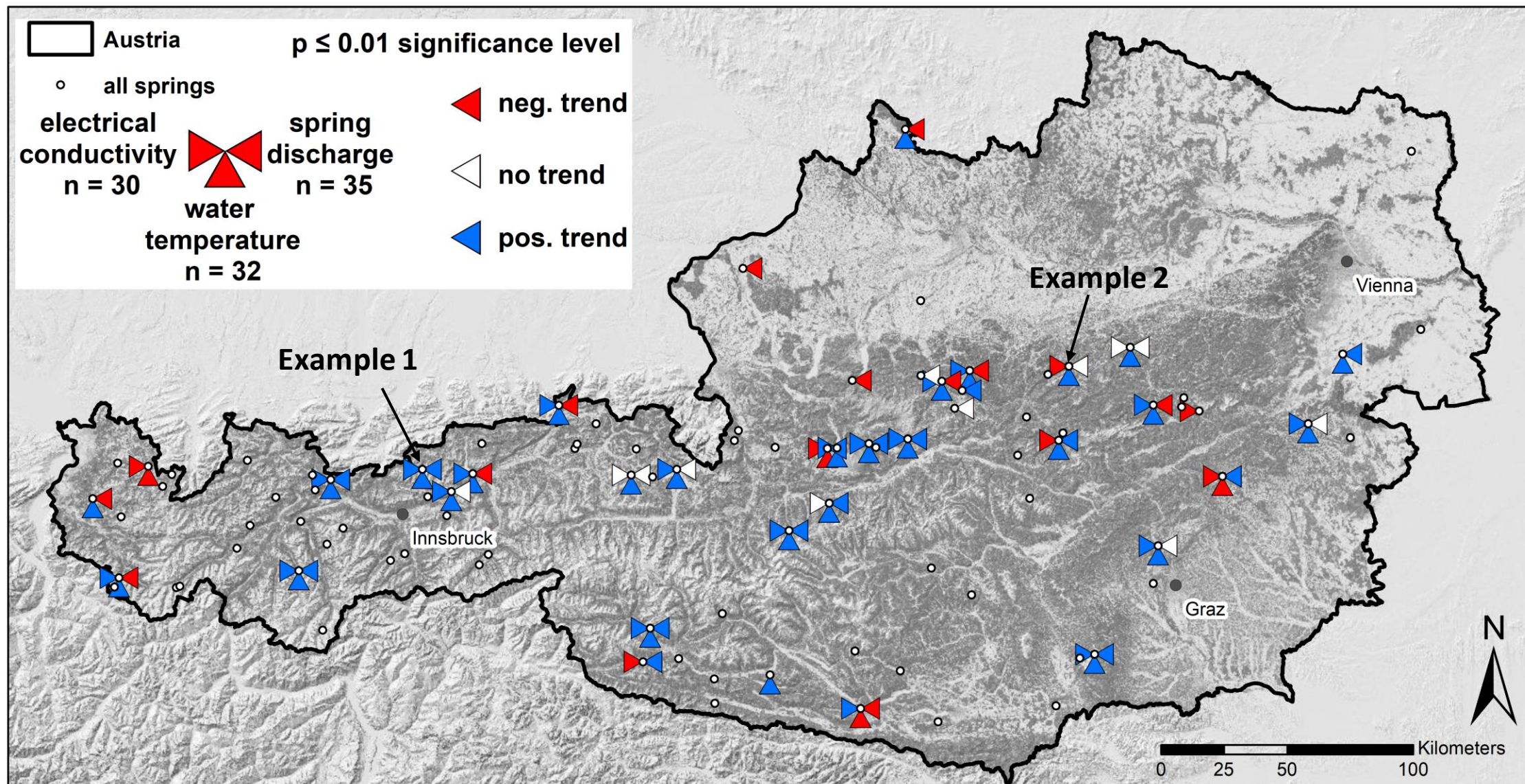


Bundesministerium
Landwirtschaft, Regionen
und Tourismus



note the different scales of the y-axis

Results: Spatial Analysis (1998-2017)



Conclusion & Outlook

- General increase in water temperature and electrical conductivity
- More diverse trends in discharge, with increasing seasonal median
- Future work will focus on identifying changes in system characteristics over the observation period, by computing autocorrelations and master recession curves over different time periods.
- Long term data investigation (40 years, only a few springs)
- Climate impact on spring data?