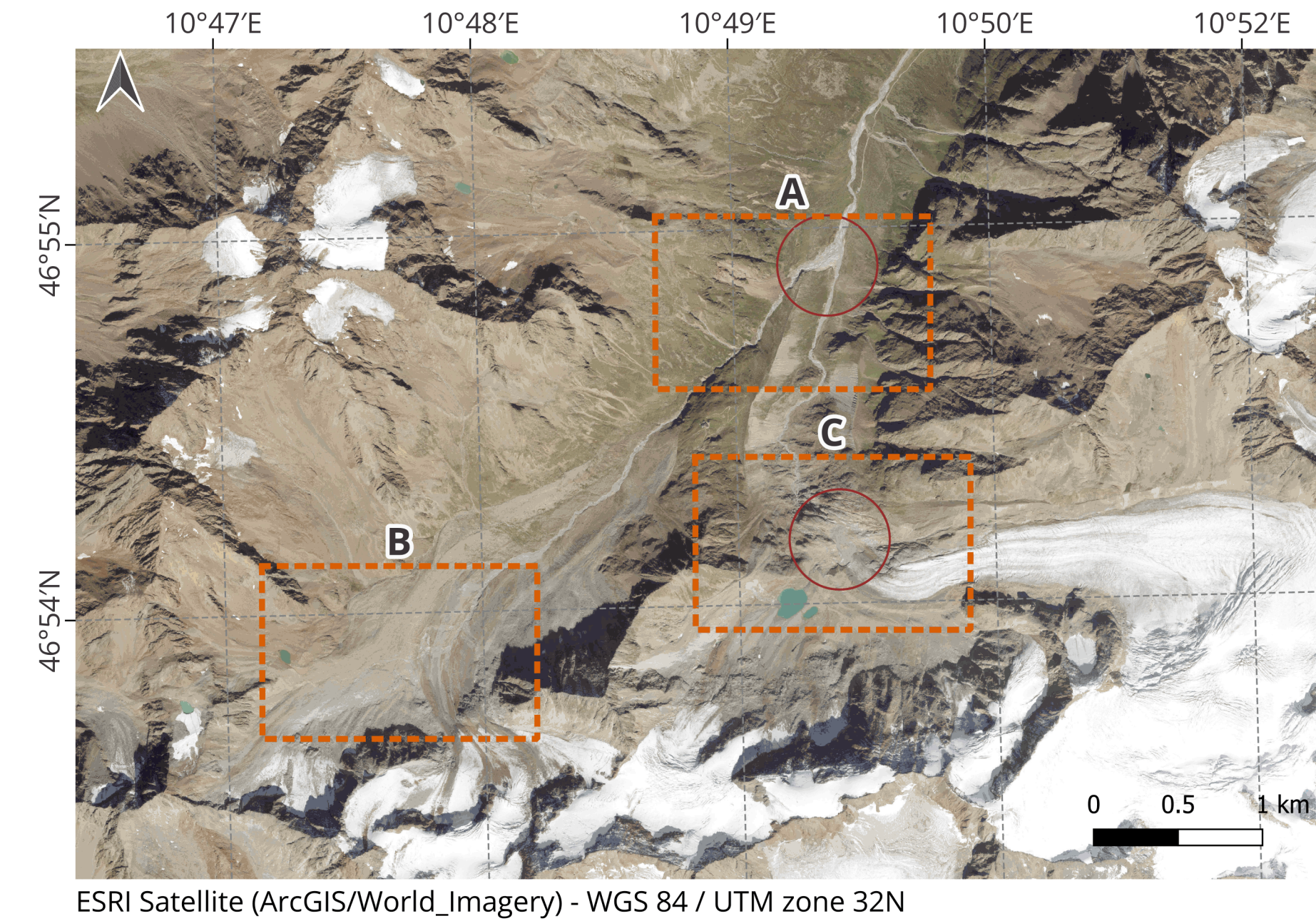


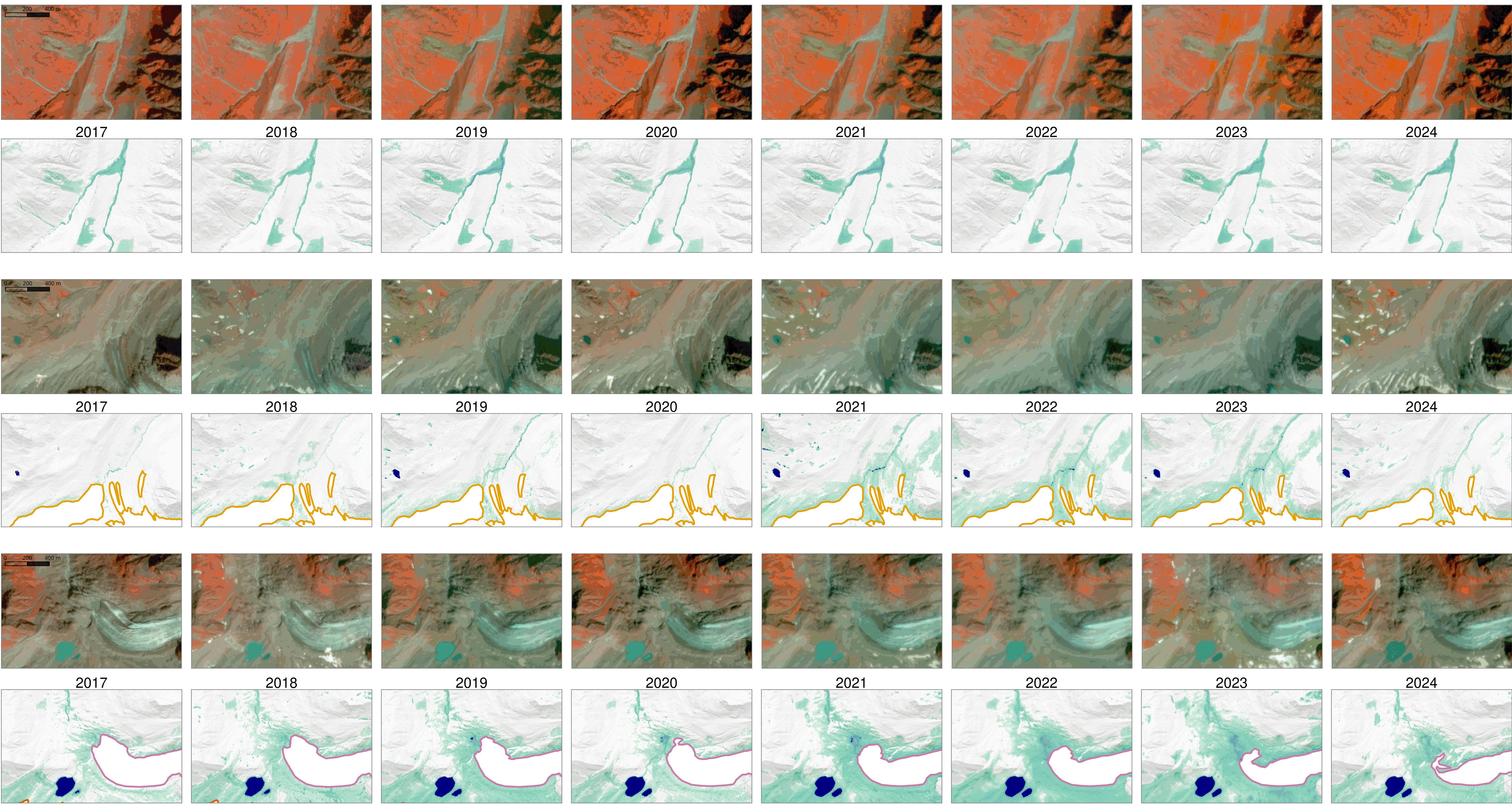
# Tracking river course dynamics in Alpine glacier forelands with satellite image time series

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In recent decades, the decline of glaciers and the related enlargement of glacier forefields have occurred at unprecedented rates, leading to the evolution of new landscapes. For instance, climate change has accelerated the meltwater runoff from glaciers, resulting in the alteration and expansion of drainage systems.

We performed a spatio-temporal analysis of the evolution of proglacial river courses in glacier forelands of the Taschachferner in the Ötztal Alps in Austria. For this, we created **on-demand data cubes** based on PlanetScope satellite image time series (**SITS**) [1], computed spectral indices and performed a spectral mixture analysis to classify water pixels.



Glacier manual delineations  
Sexegerten Ferner Taschach Ferner E Taschach Ferner W

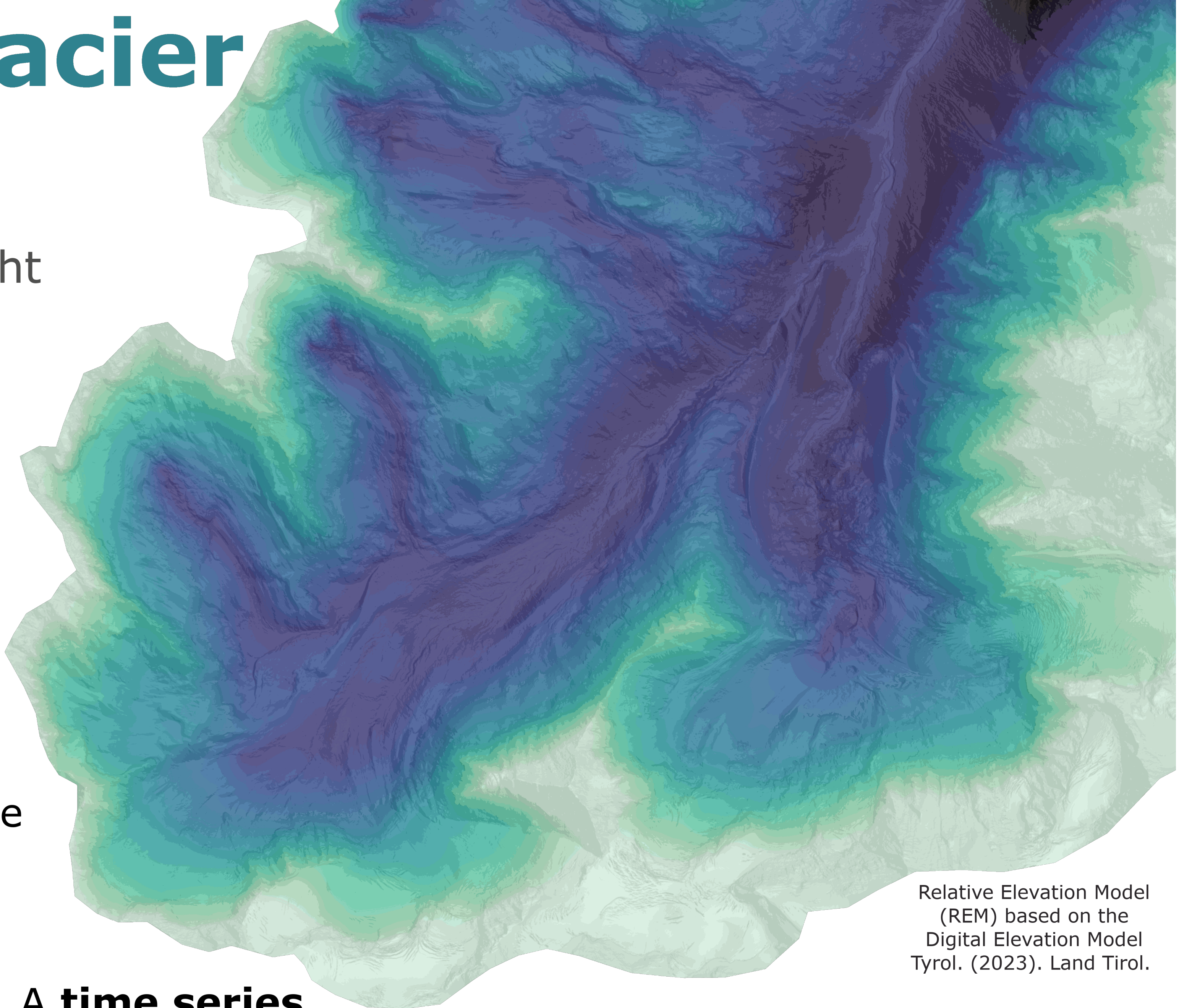
Lake NDWI  
low high

RGB false color composite: NIR-G-B  
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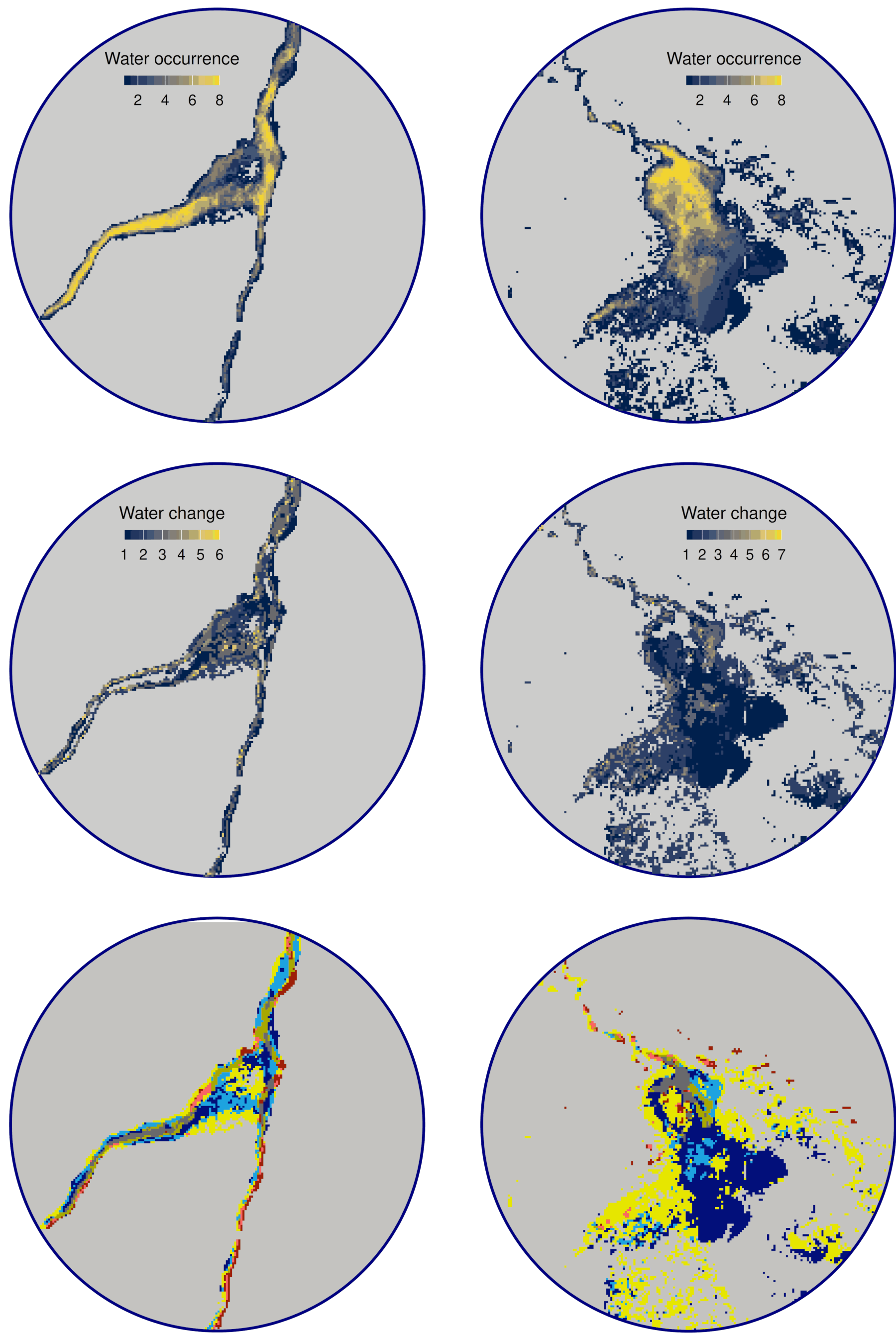
## A time series trajectory analysis

[2] allows the quantification of change per pixel, providing a detailed overview of the evolution of the river courses. These changes are strongly related to deglaciation processes driven by climatic variations.

The analysis contributes to a better understanding of how glacier retreat influences hydrological systems in alpine environments, offering valuable insights for future research and environmental management.



Relative Elevation Model (REM) based on the Digital Elevation Model Tyrol. (2023). Land Tirol.



Pixel trajectories  
Loss without Alternation Gain without Alternation All Alternation Loss First Stable Presence  
Loss with Alternation Gain with Alternation All Alternation Gain First Stable Absence

## References

- [1] Simoes, R., Camara, G., Queiroz, G., et al. (2021). Satellite Image Time Series Analysis for Big Earth Observation Data. Remote Sensing, 13(13), 2428. doi:10.3390/rs13132428  
[2] Bilintoh, T. M., Pontius, R. G., & Zhang, A. (2024). Methods to compare sites concerning a category's change during various time intervals. GIScience & Remote Sensing, 61(1), 2409484. doi:10.1080/15481603.2024.2409484

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