# The riddle of Lake Bolmen: Can science solve it?

Water, the elixir of life, is facing increasing challenges due to the impacts of climate change, which are causing significant changes to its overall quality. Of all the water on Earth, only a small percentage—about 0.3%—is fresh water accessible to humans, making it crucial to take good care of this amount for a sustainable future.

One significant impact is the phenomenon of brownification, where clear lakes turn brown. This change not only complicates water treatment processes but also diminishes the aesthetic appeal of these water bodies. This brown color arises from a complex mixture of organic substances, also known as Natural Organic Matter (NOM), generated by the decomposition of trees, peat, and organic material, along with iron content.

Recent studies have illuminated the role of organic matter in causing brownification in lakes. However, much remains unknown about the deeper processes that contribute to this phenomenon, presenting a riddle that scientists are eager to solve. This is where Spectral Induced Polarization (SIP) comes into play. SIP is a technique that can "see" through the underground by investigating different signals produced by the SIP instrument. Therefore, it is a much-needed study to find any dependency between these two subsequent topics: NOM and SIP.

This thesis aims to understand how the SIP signal will behave when there is the presence of NOM in lake sediment. For this experiment, sediment samples and water samples from Lake Bolmen have been collected, and several measurements have been done to compare them with the amount of Total Organic Carbon (TOC) and iron (Fe) present in the lake sediment. TOC and Fe have been taken as measurement units because they closely represent a section of NOM and the color of the water.

The findings of this thesis were intriguing yet inconclusive. While there were some weak correlations between SIP data and organic matter, the links were not robust enough to draw a definitive relationship. This indicates that the relationship between SIP and the underlying organic matter is more complex than previously thought, and further study is needed to conclude it. We must keep in mind that the duration of the study and data sample were not sufficient enough to draw any decisive conclusions.

However, the encouraging aspect of this research is that it opens the door for further investigation. With more advanced analytical methods and long-term studies, future research may eventually reveal any significant relationship between SIP and NOM and uncover the secrets behind brownification more precisely, preserving the health and beauty of all precious lakes for future generations.