



Lead Author e-mail: [piotr.owczarek@uni.wroc.pl](mailto:piotr.owczarek@uni.wroc.pl)

**Title:** *A multi-proxy approach for revealing recent climatic changes - a case study from small partially glaciated basins from SW Spitsbergen*

**Piotr Owczarek**<sup>1</sup>, Adam Nawrot<sup>2</sup>, Krzysztof Migala<sup>1</sup>

<sup>1</sup>*Institute of Geography and Regional Development, University of Wrocław*

<sup>2</sup>*Department of Polar Research, Polish Academy of Sciences, Warsaw*

The High Arctic area is very sensitive to contemporary climate change. The increase in temperature and change in precipitation are influencing the biotic and abiotic components of the catchments. The aim of this study is: (1) to analyse growth-ring structure of dwarf shrubs as a source of information about contemporary climate changes, (2) to reconstruct the glacial and fluvial activity changes. The research were carried out in small partially glaciated catchments located in the SW Spitsbergen (Svalbard Archipelago): the Brattegg (7.79km<sup>2</sup>) and Arie (2.96km<sup>2</sup>) basins. A combination of dendrochronological analysis, aerial photographs interpretation and field mapping were used in this study. We analysed environmental consequences of changes using wood anatomy structures of dwarf shrubs (*Salix polaris* and *Salix reticulata*), ratio of glaciers retreat and morphology of non-glaciated valley bottoms. The dwarf shrubs collected have clearly visible and measurable annual rings. Research have shown considerable variation the growth-ring width. The average width has increased significantly in the last two - three decades. These changes highly correlated with the rapid growth of temperature and sum of summer and fall precipitation observed for the region. The main fluvial response to the climate warming is contraction of flow to narrower zone and leaving braidplains. From the beginning of 20th century, the Brattegg and Arie rivers incised and formed a sequence of abandoned channels and fluvioglacial terraces. Total area of the Brattegg and Arie glaciers decreased of approx. 50% since 1936. Development of terminal lakes and wide zone of moraines influences the matter flux and water regime of proglacial rivers. The increasing role of water input into the catchments from precipitation is observed, especially during short extreme rainfall events in August and September. The glacial-melt dominated runoff is restricted to the first part of the ablation season. The biotic and abiotic elements of the small high-latitude catchments shown distinctly visible changes which are correlate with contemporary climate warming. The multi-proxy approach can help to better understand the dynamic and direction of these changes.