# The comparative study of Kongsfjorden and Hornsund of shifitng oceanographic and climatic conditions

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Arctic is experiencing the fastest rate of climate change globally, resulting in pronounced changes to sea-ice extent, oceanographic conditions, and glacier meltwater. Kongsfjorden and Hornsund, two glacially influenced fjords on the western coast of the Spitsbergen, offer a natural contrast: Kongsfjorden is strongly influenced by warm Atlantic inflow, whereas Hornsund, located further south, remains colder due to stronger influences from Arctic water masses. Significant differences in sea-ice conditions were observed between 2023 and 2024.

During two Arctic cruises of R/V OCEANIA (AREX 2023 and AREX 2024), underwater light field data were collected along transects from the inner part to the mouth of both fjords. Vertical profiles of downwelling irradiance and radiance were measured at each station using the Compact Optical Profiling System (COPS), operating in 18 spectral channels from 305 to 875 nm. Concurrently, temperature, salinity, and turbidity data were recorded to provide environmental context. These radiometric observations were complemented by Chlorophyll-a concentrations determined using High-Performance Liquid Chromatography (HPLC) to evaluate phytoplankton impacts on the measured underwater light fields.

The comparative study of Kongsfjorden and Hornsund highlights the sensitivity of Arctic fjords to shifting oceanographic and climatic conditions and offers important insights into the future optical properties of Arctic waters. The integration of radiometric, hydrographic, and biological data across multiple years provides a comprehensive understanding of how light availability and water properties respond to changing sea-ice dynamics and water mass influences. These results additionally emphasize the growing need for sustained, long-term monitoring efforts to better predict ecological responses and manage the impacts of ongoing climate change in polar marine systems.