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## Water masses variability in inner Kongsfjorden during 2010-2020

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Kongsfjorden is an Arctic fjord situated in the Svalbard archipelago. The fjord hydrography is influenced by the warm and saline Atlantic water from West Spitsbergen Current (WSC) flowing northward on the shelf slope and the cold and fresh polar waters circulating on the shelf. Once several conditions are satisfied, Atlantic waters from the WSC can extensively flood the fjord. These intrusions are majorly confined to the summer season although some strong events have been identified also in winter. In this study, a decade of continuous observations is used to examine changes in water properties and water masses variability in inner Kongsfjorden, with a special focus on Atlantic water intrusions. Data have been gathered by the National Research Council of Italy (CNR) through the Mooring Dirigibile Italia (MDI) in addition to summer CTD surveys. MDI was deployed in September 2010 at 100m depth and comprises various temperature and salinity sensors placed at different depths. Analysis of the longest temperature series reveals a positive linear trend since 2010. However, both temperature and salinity present a peak at the beginning of 2017 and decreasing values toward the end of the series. No significant trends were found when considering the monthly water column temperature as average of few sensors' measurements. Yet, differentiating the seasonal contributions reveals that summer temperatures feature a fast warming (0.26 °C/yr) whereas winters do not show a statistically significant linear trend. Temperature and salinity observations gathered at 25 and 85m depth are used to depict water masses variability according to previous water masses classifications. Some evidences are noted: first, events of Atlantic water intrusions are always confined near the bottom and they are never seen at 25m, whilst summer freshwater is found only in the near surface. Second, the timing of occurrence of these two water types seems to be related: the presence of large freshwater volumes close to the surface are preceded by the arrival of warm and saline waters. This evidence is interpreted as the melting signal of Kronebreen, the largest tidewater glacier in Kongsfjorden, triggered by the intrusion of Atlantic water. As a result, the large freshwater input manages to dilute the Atlantic water settled near the bottom. Third, the temperature and salinity peaks at the beginning of 2017 are associated to a massive Atlantic water flooding in the inner fjord lasting several months in summer/autumn 2016 and 2017. After this period, Atlantic water is seen only for few months in summer 2019. CTD measurements are used to depict the summer hydrography of Kongsfjorden and the focus is drawn on the characterisation of the seasonal cycle for each

available year of measurements. Finally, the drivers of Atlantic water intrusion events are examined, as the presence of low pressure systems and the wind patterns in the region.