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Long-term observations of the strongest inflow branch of warm water to the Arctic Mediterranean

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Warm and saline water from the North Atlantic enters the Arctic Mediterranean through three gaps. The strongest of these three flows is the inflow between Iceland and Faroes, which is focused into a narrow boundary current north of the Faroes. This boundary current, the Faroe Current, has been observed with regular CTD cruises since 1988 and with moored ADCPs since 1997, as well as satellite altimetry since 1993. Once calibrated by the long-term ADCP measurements, the satellite altimetry is found to yield high-accuracy determination of the velocity field and volume transport down to fixed depth. Due to geostrophic adjustment, satellite altimetry combined with CTD data also allow fairly accurate determination of the depth of the Atlantic layer. From the combined data set, monthly transport time series have been generated for the period Jan 1993 to April 2019. Over the period, the annually averaged volume transport of Atlantic water in the Faroe Current seems to have increased slightly, while the heat transport relative to an outflow temperature of 0°C increased by 13%, significant at the 95% level. The salinity increased from the mid-1990s to around 2010, after which it has decreased, especially after 2016, leading to the lowest salinities in the whole period since 1988. To stay updated on a possible inflow reduction due to reduced thermohaline ventilation caused by this freshening, the future monitoring system of the Faroe Current is planned to be expanded with moored PIES (Pressure Inverted Echo Sounders). An experiment with two PIES in 2017-2019 has documented that these instruments allow high-accuracy monitoring of the depth of the Atlantic layer on the section, which combined with satellite altimetry and CTD observations should give more accurate transport estimates.