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Atlantic water flow through the Faroese Channels

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The Faroese Channels is a system of channels linking the Faroe-Shetland Channel (FSC) to the Faroe Bank Channel (FBC) through the Wyville-Thomson Basin (WTB). The deep parts of this system are dominated by cold waters from Arctic regions that exit the system as overflow through the FBC and across the Wyville-Thomson Ridge. The upper layers, in contrast, are dominated by warm and saline water masses from the Atlantic. The flow of these Atlantic water masses through the channel system is important for understanding fish migration, potential environmental impact from offshore oil and gas exploitation, and the oceanic heat transport towards the Arctic. In spite of intensive research through more than a century, there are, however, still open questions with conflicting views in recently published literature. Here, we combine the evidence from many different observational data sets to address these questions and propose a general scheme for the Atlantic water flow through this channel system. In addition to the Atlantic inflow from the west, the FSC receives Atlantic water from north of the Faroes. This water flows southwestwards over the Faroe side of the FSC, but we find that it is totally recirculated within the combined area of the FSC and WTB, except possibly for a small release in the form of eddies. We find no evidence for a continuous flow of Atlantic water from the FSC to the FBC over the Faroe slope, as recently proposed. Rather, there seems to be a persistent flow of Atlantic water from the western part of the FBC into the FSC that joins the Slope Current over the Scottish slope. The net flow through the FBC is found to be southeastwards in the surface, but with increasing northwestward velocity in the deeper parts of the Atlantic layer. The volume transport of Atlantic water through the FBC seems to be close to zero on average, and its variations may be fairly well determined from altimetry.