

Interactive comment on “Atlantic water flow through the Faroese Channels” by Bogi Hansen et al.

Anonymous Referee #2

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The manuscript analyses observational oceanographic data from Faroese waters in order to clarify a question regarding the local circulation of Atlantic Water. Therefore, the recordings of moored current meters and ADCPs, CTD profiles, satellite altimetry and surface drifters from the region south of the Faroes including the Faroese shelf, the Faroe-Shetland Channel, the Faroe-Bank-Channel and the Wyville Thomson Basin are used. The temporal ranges of the observations reach from 1976-2015 (CTDs), 1993-2015 (satellite altimetry) up to 2011-2014 (ADCPs).

The question the authors try to answer is whether or not the Atlantic Water of the Faroe Current which flows eastwards north of the islands completely enters the Norwegian Sea. East of the Faroes a part of the Faroe Current branches off southwards into the Faroe-Shetland Channel. This water could either form a Circum-Faroe Current or re-

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circulate northwards within the Faroe-Shetland Channel. The first case was proposed by Rossby and Flagg (2012) who analysed ADCP data recorded aboard the high-seas ferry M/F “Norröna” on her route between Iceland, the Faroes and Denmark. With this, Rossby and Flagg contradicted the currently accepted theory which is based on the second case.

Because the current meters, whose records are temporally extended with the help of the altimetry data, only show a weak westward transport south of the islands and because the hydrographic observations south-west of the Faroes do not point to a large influx of Faroe Current water the circulation scheme proposed by Rossby and Flagg is rejected.

The warm and saline Atlantic Water which crosses the Greenland-Iceland-Scotland-Ridge forms the upper branch of the Meridional Overturning Circulation of the North Atlantic, a process of great importance of the regional climate because of the involved oceanic heat transports. In order to evaluate their models climate researchers need realistic, observational based circulations schemes of that key region. But these schemes are still far from being clear, unambiguous and ensured. Often enough, ocean modellers have desperately screwed their settings in order to fit an established circulation scheme until this was finally replaced by something much more in agreement with the initial numerical solution. A look at the oceanographic literature about the circulation along that ridge shows a row of conflicting schemes and dramatic changes of the established ones which happened during the last decades. Even the schemes denoted as “well-documented” in this manuscript are perhaps rather “well-established” or “often used” by established authors. Hence, we are just beginning to answer questions which stem from the 19th century. Therefore, the manuscript is an important piece of oceanographic work and I recommend the publication with some minor corrections or clarifications.

General comments

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Generally, the manuscript does not convince me that the transport of the South Faroe Current south of the Faroes is zero. The circled question mark in Figure 11 makes the impression of saying: “We found SFC water south-west of the islands (Fig. 7b) but this must not be caused by a current.” Though, the current meter at station ZA shows a westward flow during most of the time, which becomes even more pronounced within the temporally expanded time series shown in Figure 5. Also the fact that in Figure 3 the ZA station symbol does not come with an arrow makes a somehow unfortunate impression. The reader may ask why there is no current meter station at the most interesting position between ZQ and ZA, and how this record would look like. What would be the consequences if it would show a westward component comparable to station SX and FG? My impression of the presented data is that there is a small, shallow part of the SFC which is not recirculating but joining the clockwise coastal circulation. Its volume transport is obviously smaller than assumed by Rossby and Flagg. But I don't understand the absoluteness this branch is negated by the authors. This should be made clearer or changed.

Rossby and Flagg mention the tidal forcing of the proposed circum-Faroeer boundary current. Why this forcing is not discussed? Is it possible to obtain a 1.5 Sv residual current south of the Faroes? Aren't there any ocean models including the tides and assimilating the huge regional CTD data base, and perhaps even the current meter records, which could be used to examine the SFC dynamics? I do not demand an additional model study, but at least one sentence about the structure proposed by one of the state-of-art ocean models of that region would make sense.

The excessive and unnecessary usage of abbreviations – water masses, channels, basins, currents, instruments, data sets etc. – makes the manuscript hard to read. From my point of view, only SFC, CTD and ADCP are useful. It would be great if this could be reduced a bit.

Specific comments

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Page 1, line 13 and 27: “water masses from the Atlantic” as far as I know the term “Atlantic” comprises the entire ocean including the Nordic Seas.

Page 2, line 18: “Hátun (2004) called this current the Southern Faroe Current (SFC)” Why did he call a current east of the Faroes “Southern”?

Page 3, line 15: “these measurements were not, however, made”. I would change it to: these measurements were, however, not made . . .

Page 3, line 24: “Table S1” does not exist

Page 4, line 14: “For some applications. . .” If only spatial differences are used the subtraction of a constant value applied to the field should not have any effect.

Page 4, line 25: “Data on surface drifter tracks . . .” too brief description. State at least the temporal range and the number of drifters.

Page 5, line 25: “(e.g. SB – FG, Table S3)”, the pair SB – FG does not exist in Table 3 (S3?)

Page 6, line 18: “do not appear very barotropic”, change to “do not appear to be very barotropic”

Page 6, line 28: “has good data”, what does it mean? Be more precise.

Page 7, line 9: “From the altimetry data set, we have selected 6 altimetry points” the second “altimetry” is redundant.

Page 7, line 24: “for $\langle \alpha \rangle$ ($g/(f L)$)”, change to “for $\langle \alpha \rangle = g/(f L)$ ”,

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