

## ***Interactive comment on “An observed 20 yr time-series of Agulhas leakage” by D. Le Bars et al.***

### **Anonymous Referee #2**

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#### General Comments:

In their paper D. Le Bars et al. propose a new method for the estimation of the Agulhas Current leakage based upon calculation of the integrated transport through both the Agulhas Current and Agulhas Return Current. This method is validated using numerical model output and then applied to 20yr of altimetry data to derive a time-series of Agulhas leakage anomalies.

The method and results are presented in a clear and coherent manner. The scientific contribution of this work is of benefit to the ocean community at large. This is a solid piece of work which I recommend for publication.

#### Specific Comments:

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More rationale could be provided in the introduction as to why the integrated transport through the Agulhas Current and Agulhas Return Current should be a good indicator for Agulhas Current leakage. How are the dynamics of the Retroflexion, and Agulhas Ring shedding events, related to the volume transport in the Agulhas Current and Agulhas Return Currents at the selected altimeters' track? Previous studies have shown a link between Agulhas Current transport and Agulhas Ring shedding events: Pichevin et al. (1999); Goni et al., (1997); Garzoli and Goni, (2000). Also the works of Garzoli et al. (2004) in the North Brazil Current has found a “direct relation between the latitude of penetration, the number of rings shed, and the intensity of the NBC.”

P175, L15: A reference to Rio et al., (2011) seems appropriate here

P177, L12: The “dynamic signal has good quality”. That is debatable. Although the altimetric measurements in the Agulhas and Agulhas Return Currents at the selected tracks do not suffer from limitation associated with coastal regions (within 50km from shore), the Mean Dynamic Topography is still poorly resolved in these altimetry products. The initially low spatial resolution of the first-guess MDT (about 300 km) is improved through the assimilation of in situ observations and climatological data.

P179, L20: The comparisons between the volume transport computed from the model across the 3 tracks prompts for more discussion. The authors state that the results are similar along the 3 tracks. Even though there are similarities in the mean leakage and trend, there are marked differences between the tracks even in the yearly averages. Track 122 in particular seems to show large standard deviations. What is happening in the years 1960 and 1970-1972? Are these marked differences in the value of the transport between tracks 122, 198 and 020 associated with longitudinal variations in the position of the Retroflexion? Later it is suggested that the lack of correlation between the tracks could be due to significant downstream variations in the vertical structure of the flow? Could the low correlations between the 3 tracks be a limitation of the algorithm to appropriately select the AR and ARC regions in that southern track? Would that explain why the analysis at track 020 (the northernmost track) shows a

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better agreement with the Lagrangian analysis ? Please expand.

P183, L4: “for the first time an observed time-series of Agulhas leakage has been generated employing satellite ADT”. What about the van Sebille et al., (2009a) (Figure 11) which you cite in your references? He also used the ADT from altimetry.

Technical comments:

P182, L24: Re-phrase “it was demonstrated to be possible to” to “we demonstrated it was possible to”.

P182, L25 to 27: Re-phrase. Sentence does not really make sense.

P183, L5: Replace “employing” by “using”

P183, L14: Maybe you could break up that sentence. Replace “make it possible to measure the mean leakage” to “make it possible to estimate the mean leakage with more accuracy”.

P183, L29: replace “strongly demanded” by “necessary”

Figure 8: Replace “woth” by “with”

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Interactive comment on Ocean Sci. Discuss., 11, 171, 2014.