

**Report #2:** Anonymous Referee #1, 02 Jun 2023

## **Consistent picture of the horizontal circulation of the Atlantic Ocean over three decades**

*The updated manuscript is much improved. My one reservation is the concern over the very small uncertainties quoted. The explanation in lines 160-175 is not sufficient to allow interpretation of these uncertainties. L160-162 wording implies a positive achievement in obtaining smaller uncertainties but then states this is through simplification (i.e. fewer constraints). L170-172 then add the fact that barotropic currents are missing. L166-7 suggests Ganachaud make a statement about how their uncertainties should be interpreted (although perhaps unjustifiable).*

*I suggest a clear statement be added here in the methods and repeated in the conclusions, for example*

*"All uncertainties quoted are formal results which depend on the limited assumptions imposed on the inverse model, and should not be regarded as strictly limiting the total strength of these time mean currents."*

Thank you for your input, we have included this statement in the text in both the methods and conclusion sections.

Lines 176-178: "As a result, all uncertainties quoted are formal results that depend on the limited assumptions imposed on the inverse model and should not be regarded as strictly limiting the total strength of these time mean currents."

Lines 702-704: "All uncertainties quoted are formal results that depend on the limited assumptions imposed on the inverse model and should not be regarded as strictly limiting the total strength of these time mean currents."

*I may have missed it but it should also be stated if 1 Std is being used for uncertainties.*

The reviewer is right, this information was not included in the text. We have now specified this in the manuscript.

Lines 157-158 "The Gauss-Markov estimator is applied to solve this highly underdetermined system of equations (Wunsch, 1996) with a minimum error variance solution (with 1 standard deviation for uncertainties) from the initial estimates of the unknowns..."

*Please do check that all acronyms are included in the list as there are so many*

Thank you. We have revised the manuscript throughout and checked that all acronyms were listed at the beginning. We have included the term NCEP-NCAR.

Line 51: "NCEP-NCAR                      National Center for Environmental Prediction and National Center for Atmospheric Research"

*Table 1 Cruise A11 should probably have 1992-93 as year stated?*

We appreciate the suggestion from the reviewer, as the data from this cruise begins in December 1992 and finishes in January 1993. We have changed Table 1 in the manuscript.

Section	Dates	Year	Cruise ID	Latitude	Country	Reference	No stns	Ref. layer	$T_{Ek}$ (Sv)
A11	27 Dec – 30 Jan	1992- 93	74DI19921222	30-45°S	UK	Saunders and King (1995)	91	28.15	$1.5 \pm 0.2$