

## Auxiliary material for

### Quantitative estimate of the palaeo-Agulhas leakage

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## Introduction

This data set contains four supplementary figures and one supplementary table. A statistical cubic fit through the observations (foraminiferal groups) that was used to sort the virtual particles with the numerical ocean model INALT01 is given in figure “fs01”. The development of a common age model for marine sediment cores MD96-2048 [Caley *et al.*, 2011] and the Cape Basin Record [Peeters *et al.*, 2004] is illustrated in figure “fs02”. Figure “fs03” illustrates the regression between leakage and ALE in INALT01. Table “ts01” furnish the results of the statistical t-test between the ALF and ALE records. Figure “fs04” illustrates the comparison between the quantitative index for the Agulhas Leakage Efficiency (ALE) presented in this study and the previous qualitative index for the Agulhas leakage: Agulhas Leakage Fauna (ALF) [Peeters *et al.*, 2004].

1. fs01 (Figure S1) Statistical cubic fit through the observations, representing a probability function to sort the virtual particles into IOTG and SOG.
2. fs02 (Figure S2) ALE index from marine sedimentary paleorecords. a) Groups of foraminifera (IOTG/IOTG+SOG) forming the informative index for the downstream record (Cape Basin Record) [Peeters *et al.*, 2004] with associated uncertainties. b) Groups of foraminifera (IOTG/IOTG+SOG) forming the informative index for the upstream record (MD96-2048) with associated uncertainties. c) Agulhas Leakage Efficiency (ALE) index. d)  $\delta^{18}\text{O}$  of benthic foraminifera from cores MD96-2048 [Caley *et al.*, 2011] and the Cape Basin Record [Peeters *et al.*, 2004] as a proxy for ice volume changes and allowing the development of a common age model. MIS and grey frames denote Marine Isotopic Stage during glacial periods.
3. fs03 (Figure S3) Regression between leakage and ALE in INALT01. We forced the equation through the origin. Indeed, no leakage would mean no ALE. We can predict Agulhas leakage (in Sv) from ALE using:  
Predicted leakage =  $0.41618 * \text{ALE}$   
We then propagate the uncertainties on the slope of the regression with the uncertainties on the ALE reconstructions to obtain the uncertainties on the predicted leakage. These uncertainties have a mean value of 1.8 Sv.
4. ts01 (Table S1) Statistical test (t-test) between the mean ALF and ALE records for each glacial/interglacial periods over the last 640 kyr. Significant differences can be observed for marine isotopic stages (MIS) 1, 8, 10, 11 and 16.
5. fs04 (Figure S4) Comparison between the ALE index (this study) and the ALF index [Peeters *et al.*, 2004] with associated error bars. Arrow denotes a significant difference between the two indices during Marine Isotopic Stages (MIS) 10.