The following supplement accompanies the article

Decadal changes in blood $\delta^{13}C$ values, at-sea distribution and weaning mass of southern elephant seals from Kerguelen Islands.

Julie Mestre[1,2*], Matthieu Authier[3,4], Yves Cherel[1], Rob Harcourt[5],

Clive R. McMahon[5,6,7], Mark A. Hindell[7], Jean-Benoît Charrassin[8], Christophe Guinet[1]

[1] Centre d'Etudes Biologiques de Chizé (CEBC), UMR 7372 du CNRS- La Rochelle Université, 79360 Villiers-en-Bois, France.

[2] Sorbonne Université, Collège Doctoral, F-75005Paris, France.

[3] Observatoire PELAGIS, UMS 3462 La Rochelle Université & CNRS, La Rochelle, France.

[4] ADERA, Pessac Cedex, France.

[5] Department of Biological Sciences, Macquarie University, North Ryde, NSW, Australia.

[6] IMOS Animal Tagging, Sydney Institute of Marine Science, Sydney, NSW, Australia.

[7] Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, TAS, Australia.

[8] LOCEAN/IPSL, Sorbonne Université-CNRS-IRD-MNHN, UMR 7159, Paris, France.

*Corresponding author: julie.mestre@cebc.cnrs.fr; j.mestre@hotmail.fr

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Supplementary Materials S1: Female southern elephant seals tracking

1) Female southern elephant seals latitudinal distribution

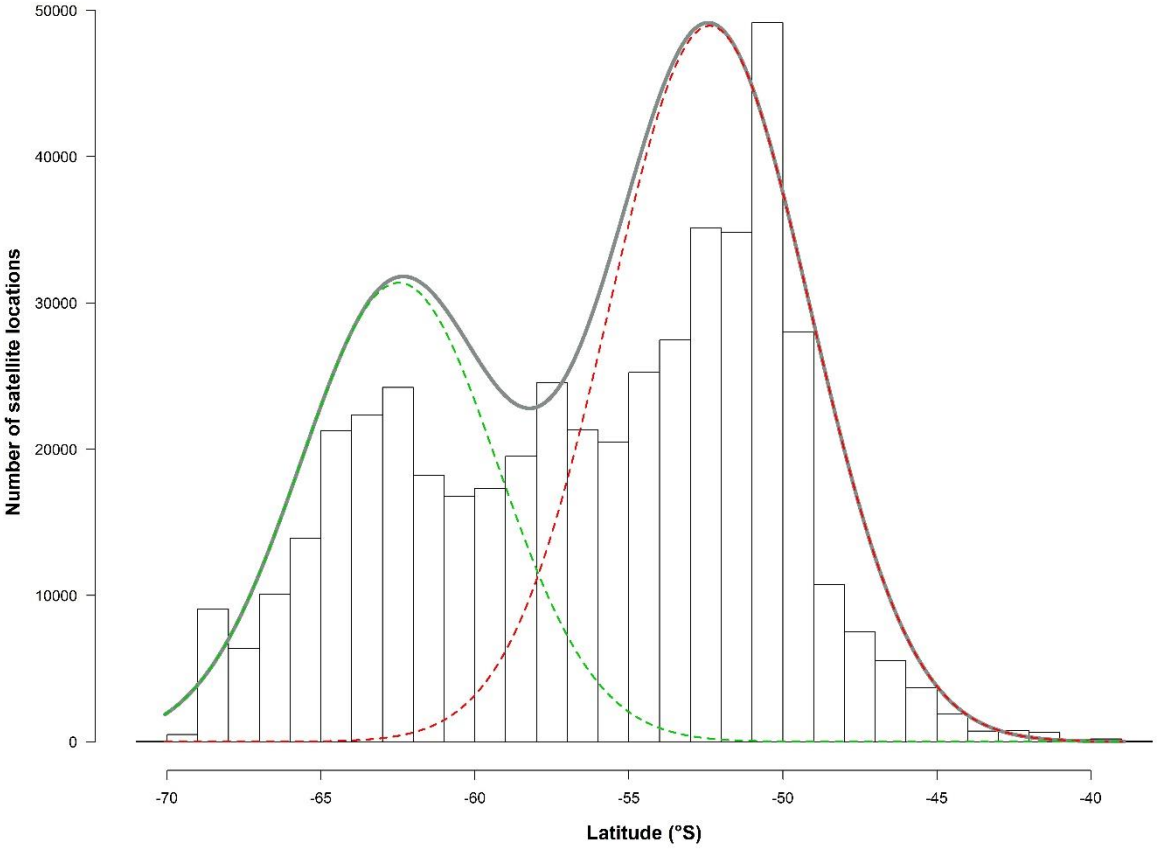

Figure S1. Latitudinal distribution of female southern elephant seals satellite locations during their post-moult trips. Density plot of all locations is represented in solid line, and underlying distributions of the two females' foraging habitats are shown in dotted lines. The two distributions are obtained thanks to a mixture model run by Rmixmod package. The red curve represents the distribution of females' locations in the sub-Antarctic zone, whereas the green distribution corresponds to females foraging in Antarctic waters. The latitudinal threshold at -58°S separates both distributions.

2) Relationship between female latitudinal distribution and blood $\delta^{13}C$ values

The mean latitude of female post-moult foraging trips (for the months of May-July) was plotted against the blood $\delta^{13}C$ values for females whose trip was fully recorded and which were blood-sampled at tag retrieval. A linear model was fitted to the 32 available observations.

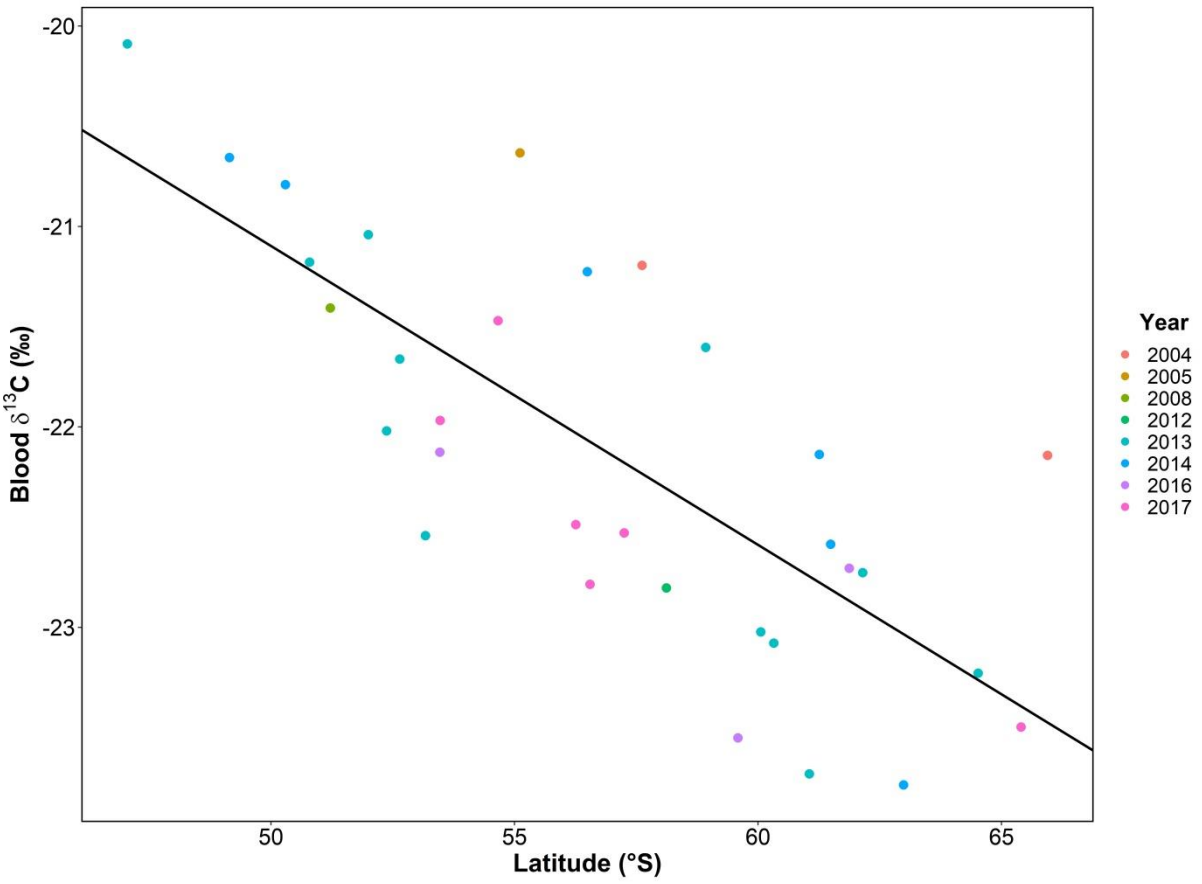

Figure S2. Relationship between blood $\delta^{13}C$ values of female elephant seals and the mean latitude (May-July) of their post-moult trips. The black line represents the linear model applied for all years.

First, a strong relationship does exist between the mean latitude (May-July) of female post-moult trip and their blood $\delta^{13}C$ values when their return ashore. This was confirmed with Spearman's rank correlation test (rho = -0.76).

The second noteworthy information is the equation of the linear model, which enables inferring the link between the latitudinal distribution of females and their blood $\delta^{13}C$ values. The linear regression equation is displayed as follow:

$$\textbf{blood } \delta^{13}\textbf{C value} = -0.15 * \textbf{latitude}_{\textbf{[May-Jul]}} - 13.64$$

This equation suggests that if a female seal moves 1° southward, its blood $\delta^{13}C$ value will decrease with the extent of -0.15 ‰. This means that to fully explain a -1.4 ‰ blood $\delta^{13}C$ decrease over the study period (2004-2017), female seals should have moved ~ 9.33° (corresponding to 1036 km) southward, which is not the case.