

## ***Interactive comment on “Estimation of positive sum-to-one constrained zooplankton grazing preferences with the DEnKF: a twin experiment” by E. Simon et al.***

**Anonymous Referee #2**

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### Overview

The manuscript compares two novel techniques for the estimation of zooplankton grazing preferences. The new techniques are required because the grazing preferences are positive and their sum is always equal to one. This is inconsistent with existing formulations of the deterministic ensemble Kalman filter (DEnKF).

The paper outlines two alternative transformations between the grazing preferences and auxiliary variables that allow estimation of the grazing preferences with the DEnKF. Both techniques are compared using twin experiments, and quantitative estimates of their performance are given. The results show that both techniques performed well

C353

with regard to improving estimates of the model grazing preferences.

I found the paper reasonably well written, with the exception that the level of English is slightly poor, particularly with regard to sentence formulation, which was occasionally confusing (e.g. P 1091, L 10-12). I was impressed with the quantitative and objective assessment of the two techniques, with some minor exceptions (outlined below).

On page 1097 it is suggested that for the spherical formulation, the results of the calibration are sensitive to the order in which the auxiliary/transformed parameters are assigned. If so, this is an important point which requires further discussion. For example, it would be very helpful to be able to compare results as the order is changed.

I would recommend the paper for publication in Ocean Science, after some minor changes.

### Specific comments

P 1086, L 22-23: PFTs do not aim to resolve individual species, but rather larger functional groups

P 1088, L 2: What is the “Gaussian anamorphosis”? This is mentioned several times in the text, including in the abstract, with no clear explanation. I am not sure if this is a standard term in this field, but I had not heard it previously.

P 1092, eqn 7: Given that the generalisation to N parameters is beyond the scope of the paper, is the “Remark” on the introduction of Hopf coordinates not also somewhat tangential?

P 1094, L 3: Please give units of Chl:N ratio

P 1094, L 13: “Z the concentration of meso- or microzooplankton feeder”, would avoid confusion with MIC as food

P 1094, L 18: Are the results shown in Fig. 1 based on the “true”, or default values?

C354

P 1097, L 6: “Since the mesozooplankton feeds the diatoms only”, suggest “Since the diatoms are the only phytoplankton type fed on by the mesozooplankton”. Or similar.

As suggested above, please elaborate on the apparent sensitivity of the spherical formulation to the choice of  $\pi_1$ ,  $\pi_2$  or  $\pi_3$  for each parameter.

P 1099, L 5: “Innovations”? Is this the correct word?

P 1102, L12-14: This estimate of performance is qualitative and subjective, as the grey shaded area seems quite arbitrary. A better estimate of shifts towards the true parameters would be given by RMS error statistics.

P 1102, L 27-28: “On average, the spherical formulation leads to significantly better final estimates of the preferences than the Gelman formulation”. “Significant” by what test? The spherical formulation looks marginally better, but both perform well, with all estimates within 1 s.d. of the true value.

P 1004, L 2: Change “correct estimates” to “improved estimates”.

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Interactive comment on Ocean Sci. Discuss., 9, 1085, 2012.