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Comment

## ***Interactive comment on “Temperature dependence of Arctic zooplankton metabolism and excretion stoichiometry” by M. Alcaraz et al.***

**M. Alcaraz et al.**

miquel@icm.csic.es

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Basically, referee # 2 is also concerned about methodological aspects that could affect the validity of the conclusions driven. The first comment regards the possible distortion of zooplankton respiration and excretion rates by differences in food quality and quantity, and therefore any covariance between temperature and food characteristics would bias the relation between temperature and metabolic stoichiometry. We were aware of this problem, and we hope that the answer given to referee # 1 to a similar comment about the particulars of the experimental approach (incubation in filtered seawater), and the lack of relation between temperature and biomass or composition of potential food for zooplankton, will suffice.

Regarding the effect of the metabolised body substrate (consequence of the trophic  
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habit of zooplankters) and the problem of the “black box” approach, although zooplankton biomass spanned about 2 orders of magnitude (Alcaraz et al. 2010), the relative proportion of the different taxonomic zooplankton groups across the stations was notoriously constant (see Fig. 5 in Alcaraz et al. 2010 and table I below), with a clear dominance of herbivore-omnivore copepods both in number and biomass (93.7 %). Carnivores were represented by Chaetognaths (3 %), amphipods (1.7 %) and cnidarians (0.14 %). Appendicularians accounted for 0.9 %.

Regarding the comments about the adequacy of the use of a conversion factor to transform organismal volume into organic C, the method had been satisfactorily tested (Alcaraz et al. 2003; 2010). The problem of the possible changes in the experimental community along the incubation by the inclusion of carnivores is diminished by the size-selection imposed in the data analysed: Experiments including amphipods or chaetognaths (a very small fraction of experiments, these groups being so scarce) were not included.

Although in general Q10 literature values traditionally range between 2 and 3, our high values are not unique. There are recent examples of high Q10 for metabolic (respiration) rates for Arctic plankton or copepods (for example, Vaquer-Sunyer et al. 2010, Q10 = 15.5; Alcaraz et al. (submitted), Q10 = 11.4, see table 2 in Pag. 15). Regarding the high variability in the metabolic response to temperature as responsible for the high Q10 values, it should be the contrary. As a matter of fact, regression coefficients are sensitive to the correlation coefficient, as the regression coefficient,  $b = r (\sigma y / \sigma x)$ . As Q10 is directly related to the activation energy E, calculated as the regression coefficient of the equation explaining the relation between the natural logarithm of the metabolic rates and the reciprocal of kT, uncertainty in E will result in lower Q10. The lack of homogeneity in the scatter of data along the X axis is something we cannot help.

Table I. Average and standard deviation of the percentage abundance of the different groups of zooplankton in the stations where metabolic rates were estimated.

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## Zoo groups Average % St. Deviation

Amphipoda 1.75 0.95

Appendicularians 0.91 0.81

Chaetognaths 3.26 2.28

Cnidaria 0.14 0.15

Euphausiacea 0.22 0.18

Copepoda 93.72 9.26

## Bibliography

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Interactive comment on *Biogeosciences Discuss.*, 9, 7443, 2012.

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