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The fate of biogenic iron during a phytoplankton bloom induced by natural fertilization: impact of copepod grazing

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The impact of copepod grazing on Fe regeneration was investigated in a naturally iron fertilised area during KEOPS (Kerguelen Ocean and Plateau compared Study, Jan.-Feb. 2005). 55Fe labelled natural plankton assemblages ($<$ 200 μm) were offered as food to copepod predators sampled in the field (*Calanus propinquus*, *Rhincalanus gigas*, *Metridia lucens* and *Oithona frigida*). Diatoms (*Eucampia antarctica*, *Corethron inerme* and *Navicula* spp.) constituted the bulk of the protists whereas microzooplankton (i.e. ciliates and dinoflagellates) were in very low abundance. Copepod grazing on phytoplankton ranged from 0.3 to 2.6 μgC ind-1 d-1 and reflected low utilisation of the food stocks (1-10% of total Chlorophyll a d-1) and low daily rations (0.2-3.3 % body C d-1). Copepod grazing resulted in a 1.7-2.3-fold increase in Fe regeneration. Fe speciation determined by extraction onto C18 columns showed that less than 1% of the regenerated Fe was complexed with hydrophobic organic ligands. This suggests that Fe was either stabilized as inorganic species or bound to freely soluble organic ligands. The biogenic Fe budget established from our experiments and literature based data indicates that most of the primary production is recycled through the detrital pool, which represents the largest Fe pool (49% of total Fe). Our iron budget further indicates that mesozooplankton and diatoms represent the dominant Fe biomasses above the Kerguelen plateau. The rate of Fe regeneration accounts for half of the Fe demand, suggesting the need for new Fe sources to sustain the massive phytoplankton bloom above the Kerguelen Plateau.