



Sinking particle properties from polyacrylamide gels during the Kerguelen Ocean and Plateau compared Study (KEOPS): Zooplankton control of carbon export in an area of persistent natural iron inputs in the Southern Ocean

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Limnol. Oceanogr., 53(1), 2008, 212-224 | DOI: 10.4319/lo.2008.53.1.0212

ABSTRACT: The Kerguelen ocean and plateau compared study (KEOPS) examined the origin of elevated phytoplankton biomass in naturally iron-fertilized waters over the Kerguelen plateau during midsummer (January-February 2005). We report sinking particle characteristics determined from image analysis of thousands of individual particles collected in viscous polyacrylamide gels placed in free-drifting sediment traps at two sites: a high phytoplankton biomass site over the central plateau (A3) and a moderate biomass site at its periphery (C5). The particles were divided into three types (1) oval fecal pellets, (2) cylindrical fecal pellets, and (3) aggregates. The aggregates were most abundant and mainly consisted of agglomerations of the cylindrical fecal pellets. Conversion of the pellet and aggregate volumes to carbon contents suggests export fluxes of 50-60 mg C m⁻² d⁻² at 100-m depth, in reasonable agreement with independent estimates from carbon and ²³⁴Th measurements. Our observation that the majority of the particle flux was processed through the heterotrophic foodweb contrasts with the results of artificial iron-fertilization experiments and with models for export from productive diatom-dominated waters that emphasize direct export of phytoplankton detritus. The KEOPS results may offer more appropriate scaling for the response of ecosystem structure and carbon export to persistent iron fertilization in the Southern Ocean.

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