Primary production and potential for carbon export in naturally iron-fertilized waters in the Southern Ocean

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Since the recognition of the key-role of iron in the High Nutrient Low Chlorophyll Southern Ocean (SO), several expeditions have been conducted in natural iron-fertilized zones from the Subantarctic to the Antarctic Zones (Kerguelen Plateau, Crozet Plateau, southeast of Tasmania, South Georgia). During the productive season the surface waters in these areas show high chlorophyll contents (as derived from satellite observation). However, depth integrated productions and regimes of production lead to mixed observations in term of potential for carbon export. A global positive effect of natural iron fertilization on primary production and carbon export has been reported for the KEOPS 1 and CROZEX expeditions. However, this may not always be the case and results for the SAZ-Sense expedition south of Tasmania, for instance, reveal lower production and poor carbon export efficiency in the naturally iron fertilized area. Also, KEOPS 1 results suggest that increased export not necessarily results in increased efficiency of export relative to production. The KEOPS 2 expedition was carried out during early spring 2011 off Kerguelen Island and reveals quite a large spatial-temporal variability of export efficiency, with export production (EP) reaching the 700m horizon ranging between less than 1 and up to 20% of New Production (NP). Results from KEOPS 2 will be presented with reference to previous natural iron fertilization studies in the Southern Ocean. The questions of High Biomass Low Export system and winter primary production will be discussed.