333

DEEP-SEA BENTHIC FLUXES AND FLUFF LAYER ANALYSES IN SEDIMENTS BELOW A SOUTHERN OCEAN IRON FERTILIZATION EXPERIMENT

E.J. Sauter[1], O. Sachs[1], M. Schlüter[1], I. Peeken[2], P. Assmy[1], V. Strass[1], U. Bathmann[1]

[1]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, [2]Leibniz Institute for Marine Sciences, Kiel, Germany

During late austral summer to early fall 2004 an iron fertilization experiment (EIFEX) was performed in the Atlantic Sector of the Southern Ocean, close to the Polar Front. Within a stationary eddy, the transfer of the iron-induced plankton bloom down to the deep-sea floor could be observed for the first time. Embedded into a multidisciplinary set of remote sensing, planktologic, and oceanographic investigations, the results presented here focus on processes at the sediment surface.

Benthic fluxes were determined by microsensors using an *in situ* deep-sea profiler and a fit procedure subsequently applied to the obtained oxygen profiles. *In situ* measurements were complemented by HPLC and fluorometric pigment analyses as well as by scanning electron microscopy and epi-fluorescence microscopy from shock-frozen and formalin-preserved sediment samples.

Results suggest that fresh material arrived at the deep-sea floor in up to 3900 m depth just prior to the performance of measurements and sampling, several weeks after the end of the fertilization activities in the surface ocean. The non-steady state microprofiles with extraordinary steep porewater oxygen gradients at the top layer convert to a sedimentary organic carbon flux higher than 10 mg m^{-2} d^{-1}. This was confirmed by visual observation of a greenish fluff layer on top of the obtained sediment cores. Accordingly, analyses of this fluff revealed high amounts of living diatom cells dominant in the fertilized bloom, intact and only weakly silicified diatom shells, and high phaeopigment concentrations.

On the basis of this multi-method study we propose that the iron-induced plankton bloom did arrive at the sea floor in almost 4000 m depth. Thus, CO_2 from the surface ocean transferred into organic carbon was transported to the deep ocean although it remains to be estimated which portion of the surface-produced material sank out to the deep. Furthermore, these first deep-sea *in situ* microprofiles through a fresh fluff layer, offer new insights into the mechanisms of sedimentation pulses and their benthic response at the Polar Front.