EXPORT AND REMINERALIZATION OF CARBON AND SILICON IN THE SOUTHERN OCEAN - RESULTS FROM INVERSE MODELING

R. Schlitzer
Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany
schlitzer@awi-bremerhaven.de

In recent years large, globally integrated datasets of dissolved nutrients, silicate and other parameters related to marine biogeochemical cycles have been released and are now in wide use. Large observational programs such as WOCE or JGOFS are providing data resources of unprecedented quality and extent. These datasets contain valuable information about underlying biogeochemical processes such as productivity, downward sinking and remineralization, and can be used to determine biogeochemical fluxes and rates. The information from the water column data is complementary to satellite remote sensing data that capture the near-surface signals only.

As an example, an inverse model approach is presented that uses water-column distributions of hydrographic parameters, oxygen, dissolved nutrients, silicate, carbon and transient as well as steady-state tracers to determine the production, sinking and remineralization of particulate and dissolved organic carbon (POC and DOC) as well as opal. A comparison with satellite-derived POC productivity estimates shows large discrepancies in the Southern Ocean south of 50°S, where model export of POC are about a factor of 2 larger than satellite estimates. Possible explanations for this discrepancy are a potentially poor calibration of satellite sensors and productivity algorithms in this region and the difficulties to detect and/or parameterize frequently observed sub-surface chlorophyll patches. Opal production, downward fluxes and remineralization are distinctly different from POC fluxes and are largest in a circum-Antarctic high opal flux belt. A quantitative comparison of biogenic Si and organic carbon fluxes will be provided in the talk.