

Material and Methods

As part of the French-JGOFS activities, since 1987 the DYFAMED programme has been studying the downward flux of particles and carbon in the open northwestern Mediterranean Sea. The DYFAMED time-series measurements of downward flux is one of the few pluri-annual flux assessments currently underway. The objective of the programme is the observation and prediction of biogeochemical cycles of carbon and associated compounds through long-term study in the central Ligurian Sea, where biological production conditions vary from oligotrophic to mesotrophic. Since these characteristics are observed over large areas of the world ocean, the DYFAMED site can be considered as a model area.

Sampling took place at two offshore stations in the Ligurian Sea out of the influence of the coastal and Ligurian currents (1987-1988: 42°44 N, 8°32 E; 1988-1991: 43°25 N, 7°52 E). Both sites are protected from lateral inputs by the Liguro-Provençal current which establishes a physical barrier to direct coastal inputs. Automated sediment traps, either Technicap model PPS-3 (cylindro-conical, 0.125 m² surface opening) or PPS-5 (conical, 1 m² surface opening), were moored at 100, 200 and 1000 m depth to sequentially collect samples every 9 to 15 days. The sites were visited approximately every three months to check the mooring line and to exchange the sample collectors. The trap sampling cups were filled with a 2 % buffered formaldehyde solution to prevent grazing by swimmers and *in-situ* microbial degradation. Swimmers were carefully removed by sieving and hand-picking.

Following preparation of sample aliquots, carbon and nitrogen were analyzed by high temperature oxidation using a Heraeus CHN-O-Rapid analyzer and a VarioEl microanalyzer. The organic carbon fraction was measured in samples pretreated with a 1M phosphoric acid solution for removal of carbonates. At least two replicates of each sample (2-4 mg) were run for total and for organic carbon to reduce bias due to potential sample heterogeneity.

A sample aliquot of each sample was kept as reference. During some periods, fecal pellets were enumerated, measured by light microscopy and categorized according to geometric shape. Measurements were done using a high resolution digital table coupled to a microscope and connected to a computer. The resolution of the system was 15 µm.

Detailed information on the methodology can be found in:

*Miquel, J.C., S.W. Fowler, J. La Rosa and P. Buat-Menard. 1994. Dynamics of the downward flux of particles and carbon in the open NW Mediterranean Sea. *Deep-Sea Res.*, 41. 242-261.

*Carroll M.L., Miquel J.C. and S. Fowler. 1998. Seasonal patterns and depth-specific trends of zooplakton fecal pellet fluxes in the Northwestern Mediterranean sea. *Deep Sea Res. I*, 45 : 1303-1318.

*Miquel, J.C., S.W. Fowler and J. La Rosa. 2000. Seasonal and interannual variations of particle and carbon fluxes in the open NW Mediterranean: 10 years of sediment trap measurements at the Dyfamed station. At: *Ocean Biogeochemistry: A New Paradigm*, JFOFS Open Science Conference (13-17 April, Bergen, Norway). Abstract p.133.