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Libro degli abstracts

River loads of freshwater and nutrients in the continental shelf area of the Northern Adriatic Sea

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River discharges have a great effect on oceanographic properties and production processes in the marine ecosystem of the Northern Adriatic Sea. The combination between meteorological forcings and the spreading of river waters, mainly from the Po River, determine formation and dynamics of the coastal fronts in the Western and Northern part of this continental shelf area, through the generation of alternated vertical and horizontal density gradients that drive the circulation of surface waters and the pattern of Southward flowing West Adriatic Current. High inputs of river borne nutrients sustain the peaks of production in this marine system, in particular during spring and autumn. However, they may also cause hypoxic or anoxic crises in the deeper waters, in case of weak circulation. Strong density gradients coupled to alternate ambient conditions experienced by plankton communities in the coastal area, due to the dynamics of low and high salinity waters, are also at the basis of dystrophic events that have often occurred in this area, such as the appearance of large dinoflagellate blooms and mucilage phenomenon.

Despite its basic importance, the role of river loads in the Northern Adriatic Sea has been poorly studied, to date. A number of studies were published in the literature, mostly for Po and Adige rivers, as a result of the efforts addressed to the mitigation of eutrophication problems in the coastal zones carried out during the 1970' and the 1980', while the comparison of river loads at sub-regional scale still remains largely incomplete.

In the framework of VECTOR research project (sub-task 6.1.3. Compilation of river load data, loads of nutrients and dissolved and particulate organic matter), the analysis of the current importance of river discharges in the Northern Adriatic Sea has been carried out, as a part of the study of carbon biogeochemical cycle in this basin, taking in account monitoring data provided by several environmental agencies and scientific institutions of Italy, Slovenia and Croatia.

From 2004 to 2007, water load by Po River (20.54 – 45.30 km^3y^{-1}) constituted, on the average, 66% of the total river load in the basin, Adige River (10%), Brenta River (7%) and Livenza River (6%) being the other important sources of freshwater. Despite Po is an highly significant proxy of the total river load in the Northern Adriatic, the inputs from the rivers located along the Northern and Eastern sections of the coast were not negligible (11 and 6% of the total, respectively) and often not in phase with the regime of Po River. As shown by distinct peaks of discharge and by prolonged drought periods that often occurred in the minor rivers differently from Po River, because of their more pronounced flashy flow regimes.

During the same years, total nitrogen (86,000 – 262,000 t N y^{-1}) and total phosphorus (3,840 – 9,500 t P y^{-1}) loads of Po River were highly variable, mainly as a consequence of the oscillations of annual integrated water discharges. The transport of TN and TP was constituted by dissolved inorganic nitrogen for 69% and by reactive phosphorus for 47%, whereas a high load of reactive silicon was also estimated (64,400 – 137,500 t Si y^{-1}). The rivers located in the Northern and Eastern areas of the coast contributed respectively for 8% and 4% to the total load of TN in the basin, but only for 4% and 1% to the total load of TP. This finding pointed out that the strong decreasing gradient from West to East of nutrient supply in the Northern Adriatic might be further exacerbated in case of a selective reduction of the flows of minor rivers, due to oncoming natural changes or to larger anthropogenic usage of the continental waters.

River loads estimated in this study do not strongly differ from the available data published in the scientific literature during the last decades, but they showed that the ecosystem of the Northern Adriatic Sea may experience a strong reduction (≈ -50%) of the supply of land borne nutrients during dry years, like in 2005. Recurring years characterised by extremely low discharges could have a great impact on the biogeochemistry of the whole Northern Adriatic basin.