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Modelling of PCB trophic transfer in the Gulf of Lions; 3D coupled model application

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This work aims at assessing the role of plankton in the transfer of PCBs to higher trophic levels in the Gulf of Lions (NW Mediterranean Sea) using a 3D modelling approach, which is coupling biogeochemical and hydrodynamical processes and taking into account the physical-chemical properties of PCBs.
Transport of various PCB species were simulated during one year: total dissolved, freely dissolved, particulate, biosorbed on plankton, assimilated by zooplankton. PCB budgets and fluxes into the Gulf of Lions between various species were governed by different processes, such as: adsorption/desorption, bacteria and plankton mortality, zooplankton excretion, grazing, mineralization, volatilization and biodegradation. CB153 (2,2',4,4',5,5' hexachlorobiphényle) congener have been considered in the model, since it presents a large amount of PCB among the other congeners in the environment of the Gulf of Lions.
At first, the simulated PCBs distributions within particulate matter and plankton were compared with available in-situ measurements (COSTAS and Merlumed field campaigns) performed in the Gulf of Lions. Two size classes of plankton X (60μ m<X<200μ m and 200μ m<X<500μ m) and suspended solids have been considered for the comparison. In general, the magnitudes of CB153 concentrations within two size classes of plankton in April are comparable to the measured ones except the eastern station C1. The magnitudes of living CB153 concentrations in January are less close to the measured ones in vicinity of the Rhone River.
Then, the analyses of spatial-temporal variations of PCB within different compartments and within three different zones (coastal, intermediate and offshore zones) of GoL have been performed in order to advance in understanding the contamination pathways from air and water to plankton. For all zones CB153 concentration is raising in January and in July 2010, what is linked with two Rhone River flood events started in the middle of December 2009 and in the middle of June 2010. In all zones among the organisms bacteria adsorbs more and copepod adsorbs less CB153, such a tendency increases from shallower to deeper zone. In the offshore zone HNF obtain more CB153 from bacteria through grazing than other predators. In turn, in the intermediate zone copepod's grazed CB153 is more dominant.