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Modelling the interactions between DOM and bacteria in marine ecosystems: state of the art and future prospective

Luca polimene

Marine dissolved organic matter (DOM) is the main source of carbon, nutrients and energy for marine prokaryotes, the most abundant life form in the oceans. Only a fraction of assimilated DOM is used by prokaryotes to synthesise new biomass (particulate organic matter, POM), while the rest is used for respiration or is excreted back into the environment as recalcitrant DOM (RDOM). The relative proportions of assimilated DOM that is distributed either to POM, respiration or RDOM is not constant but highly variable depending on the environmental conditions (e.g. nutrient availability, quality/quantity of DOM, temperature). This metabolic plasticity allows bacteria to shape the biogeochemistry of the surrounding waters by modulating three key carbon/energy fluxes fundamental for the functioning of the marine ecosystem: i) the transition from DOM to POM, ii) the remineralisation of carbon and nutrients, and iii) the transformation of labile DOM into recalcitrant DOM. The explicit representation of these processes (and their relative efficiency) in marine ecosystem models is a crucial (and challenging) issue which cannot be overlooked if we want to properly simulate marine biogeochemical cycles under present and climate changing conditions. This talk will provide an overview of how state of the art marine ecosystem models represent the interactions between DOM and bacteria, highlighting strengths and limits of the approaches currently used. A summary of future developments along with issues still open on the topic will also be presented and discussed.