SEAWEED CULTIVATION CONTRIBUTES TO THE DISSOLVED ORGANIC CARBON (DOC) POOL IN A REPRESENTATIVE MARICULTURE BAY, NORTHERN CHINA

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Seaweed cultivation provides quantities of macroalgae biomass in coastal ecosystems, and its contribution to blue carbon sequestration was emphasized in recent decade. Besides the removable C along with the seaweed harvest and the POC deposition, there is a neglected C sequestration process, that is the DOC released during the macroalgae growth and detritus also contributing the sequestered C pool. In order to assess the stability of macroalgal DOC, the concentrated DOC by solid phase extraction (C-18) from the seaweed farming waters and offshore coastal waters in Sanggou Bay, Northern China, was used to degradation by a natural microbial consortium in the laboratory for 360 days. The results showed that most (~84%) offshore DOC was utilized or consumed by marine microbes, whereas over half (~56%) of the seaweed DOC was remained in seawater for 300 days. Excitation emission matrix analysis revealed the presence of four FDOM components including protein-like and humic-like fluorescence, among them the protein-like (labile DOC) substance showed generally decreasing trends and humic-like (refractory DOC) components presented obviously enhancements. The DOC molecular compositions were also evaluated by FT-ICR MS technology, which showed the DOC with higher O/C ratio, lower H/C ratio, higher DBE and AI* values, higher percentages of MLBR, was constantly accumulated along with the seaweed DOC degradations. All above results clearly indicated the production of RDOC (refractory DOC) during the seaweed DOC degradations, which suggested that marine macroalgae do contain refractory compounds and thus may be more valuable to long-term carbon sequestration (Blue carbon) than we previously have considered.