

Sources and transformations of natural and anthropogenic DOC throughout the oceanic water column

Romera-Castillo, C.¹

¹Marine Science Institute-CSIC (ICM-CSIC), Barcelona, Spain

Marine dissolved organic carbon (DOC) is one of Earth's largest exchangeable carbon reservoirs, with an estimated budget comparable in magnitude to that of atmospheric CO₂. This vast reservoir plays a fundamental role in regulating the global carbon cycle and Earth's climate, although many of its internal dynamics remain poorly understood. Approximately 99% of oceanic DOC is considered recalcitrant, persisting in the ocean for centuries to millennia. A small fraction of DOC is of anthropogenic origin, such as that resulting from the degradation of plastics. Although the total contribution of anthropogenic DOC (ADOC) to the global DOC pool is small, its impact on marine microbial communities may be significant, particularly in polluted surface waters. Some components of ADOC may also be chemically recalcitrant, contributing to long-term carbon accumulation. The formation of recalcitrant DOC and its accumulation in the deep ocean represent a long-overlooked but potentially important pathway for oceanic carbon sequestration. However, many aspects of these processes remain unresolved. Here, we will explore the main drivers of surface DOC variability, the sources and sinks of recalcitrant DOC in the deep ocean, and how one of the most pervasive ocean pollutants - plastic debris- is contributing to the oceanic DOC pool.