

The decoupled seasonal cycling of dissolved organic carbon (DOC) and fluorescent dissolved organic matter (FDOM) in continental shelf waters

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We investigated the seasonal variations of dissolved organic matter (DOM) by using various DOM parameters including dissolved organic carbon (DOC), optical properties of DOM (chromophoric and fluorescent DOM; CDOM and FDOM, respectively), and radium isotopes in the northwestern Pacific marginal seas including the East China Sea and the Yellow Sea from 2017 to 2022. Our findings reveal significant seasonal and spatial variations in DOM compositions and behavior across the region. During summer, DOC concentrations were elevated due to riverine input and increased with shelf water age, as indicated by a radium tracer. In contrast, FDOM remained constant over the same period. The DOC and FDOM showed distinct correlations with salinity in different seasons, indicating that the sources and sinks of DOC and FDOM were seasonally decoupled. We propose that intensive summer irradiation effectively degrades FDOM while simultaneously promoting the production of refractory DOC in shelf waters. These findings provide critical insights into DOM dynamics and its significant role in the global carbon cycle.

