

國立臺灣海洋大學  
海洋環境與生態研究所 專題討論

**題目：**

北太平洋副熱帶環流中的上層微塑膠：顆粒態有機碳中普遍存在的人為成分  
Pelagic microplastics in the North Pacific Subtropical Gyre: A prevalent anthropogenic component of the particulate organic carbon pool

**作者：**Shiye Zhao et al

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**Abstract**

Due to its ever-increasing ocean inputs, fossil-based microplastics (MP) comprise a considerable constituent in the particulate organic carbon (POC) pool, which is instrumental in ocean biogeochemical cycling. Their distribution within the oceanic water column and the underpinning processes, however, remain unclear. Here we show that MP prevail throughout the water column of the eastern North Pacific Subtropical Gyre, comprising 334 #/m<sup>3</sup> (84.5% of plastic particles <100 μm), with exponential relationships between concentrations and water depth in the upper 500-m layer and marked accumulation below this layer. Our results suggest that the biological carbon pump (BCP) strongly contributes to the water column MP redistribution in terms of polymer type, material density and particle size, which in turn could influence the efficiency of organic matter export to the deep sea. We further show that <sup>14</sup>C-depleted plastic particles predictably are an emerging nonneglectable perturbation to radiocarbon signatures in the deep ocean through depletion of the <sup>14</sup>C/C ratio in the POC pool. Our data provide insight into vertical MP flux and highlight the potential role of MP in alternating the marine particulate pool and interactions with the BCP.

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**摘要**

由於微塑膠(MP)不斷輸入進海洋環境，導致顆粒態有機碳(POC)庫中含有大量的微塑膠成分，並涉及了海洋生物地球化學循環。然而，它們在海水中水層的分佈情形尚不清楚。本研究顯示 MP 在整個北太平洋副熱帶環流東部水層中普遍存在，其中豐度為  $334\#/m^3$  (84.5%的塑膠顆粒 $<100\mu m$ )，上層 500 米的濃度和水深成指數關係，並在該層之下則有顯著累積。經研究結果表明生物碳幫浦(BCP)在微塑膠類型、材質密度，和粒徑方面對水層中 MP 再分配有很大的貢獻，反過來又會影響有機物輸出到深海的效率。本篇研究進一步表明，藉由 POC 中  $^{14}C/C$  的比率可知塑膠顆粒在傳輸的過程中已造成深海中放射性碳特徵之擾動。本次數據提供了對垂直 MP 通量的深入了解，並突顯 MP 改變海洋顆粒物之過程和與 BCP 相互作用的潛在作用。