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海洋渦漩研究室

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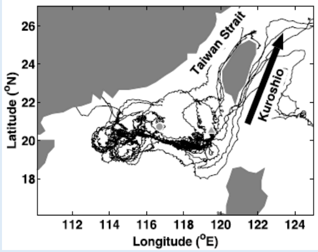
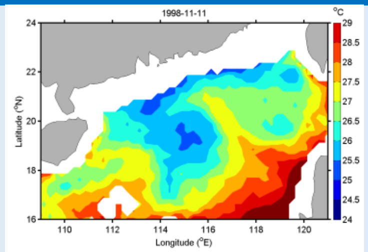
中央研究院 環境變遷中心 博士後研究員
中國海洋大學 物理海洋實驗室 博士後研究員

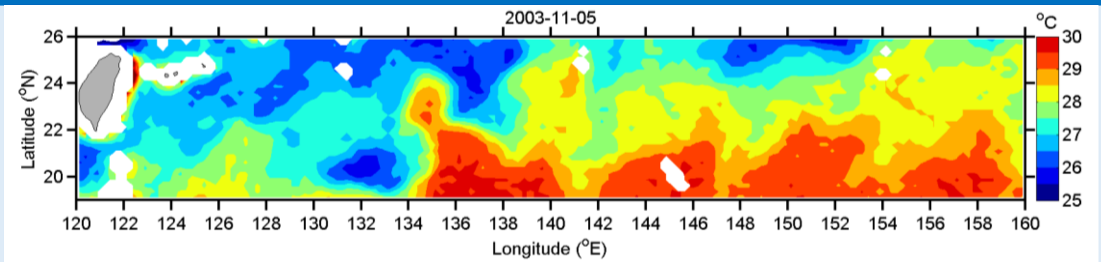
研究專長：海洋渦漩, 海流, 物理海洋學, 海洋—大氣交互作用, 氣候變遷

研究興趣：難預測的渦漩和其在海洋環境所扮演的角色

主要科學研究、發現和貢獻 (民國 97 年 至 110年)

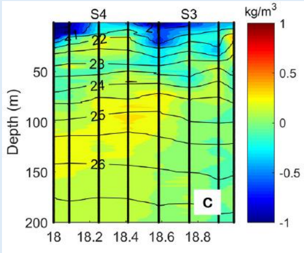


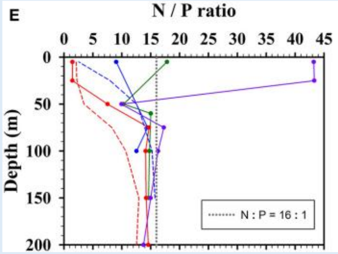


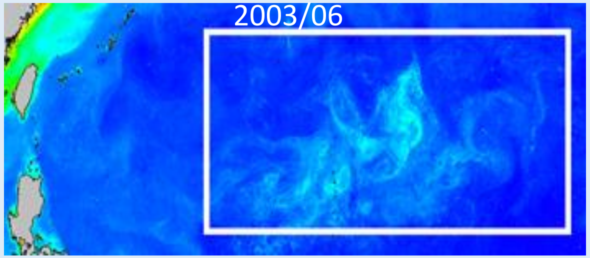


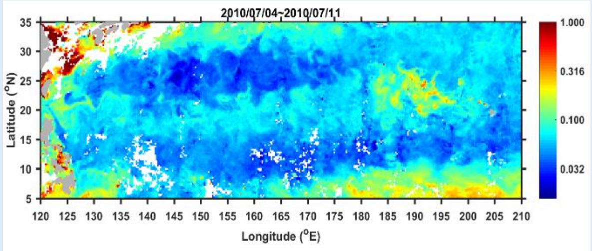
(↗) 觀察到重覆性的渦漩運動, 以及 (↑) 位於南中國海 和 (↗) 副熱帶北太平洋的渦漩對海表面溫度變化的可預報性影響。這些研究成果主要是依據表面浮標觀測和衛星觀測。研究進一步發現，渦漩所造成的海表面溫度變化將在天氣尺度上改變大氣風場。

(↓) 海洋垂直結構 和 (↘) 海洋生地化分佈甚至能被一顆小渦漩改變。根據經過此小渦漩的現場船測，當南海北部之海洋分層減弱時，這顆小渦漩能產生湧升流，竟把海洋深處的營養鹽向上輸送至透光層，促進了海洋浮游植物的生產。在副熱帶北太平洋方面，結合現場觀測和衛星觀測，證實了渦漩在海洋沙漠中的兩大浮游植物綠洲之生成有舉竹輕重的角色: (↙) 於2003年的稀有綠洲 以及 (↓) 最大的2010年綠洲。在副熱帶北太平洋的海洋沙漠中，海洋衛星過去不曾在這些海域中觀測到那麼大範圍的海洋浮游植物綠洲。









Chun Hoe Chow, Assistant Professor

Ocean-Eddy Research Laboratory

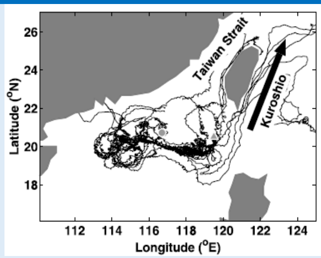
Education：
- PhD in Marine Environmental Informatics & MS in Oceanography, National Taiwan Ocean University.

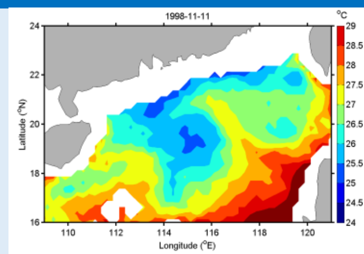
Professional Experience：
- Assistant Professor, Department of Marine Environmental Informatics, NTOU
- Contract Assistant Professor, Department of Oceanography, NSYSU
- Postdoctoral Researcher, Research Center for Environmental Climate, AS
- Postdoctoral Researcher, Physical Oceanography Laboratory, OUC

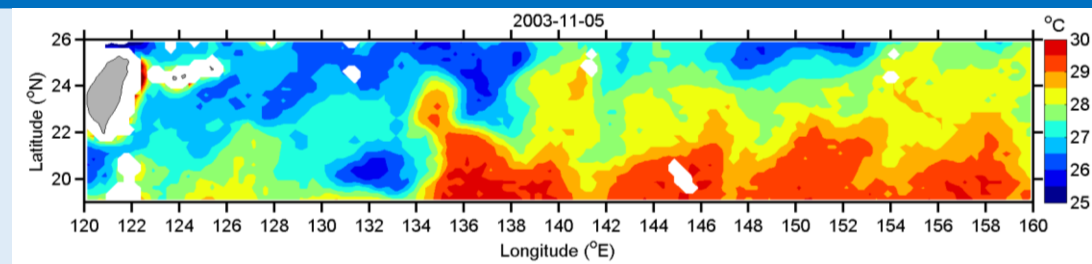
Research Expertise：
Ocean Eddies, Ocean Currents, Physical Oceanography, Ocean-atmosphere Interaction and Climate Changes

Research Interest：
Hardly-predictable ocean eddies and their roles in changing environments

Main Scientific Work, Findings & Contribution (2008 to 2021)

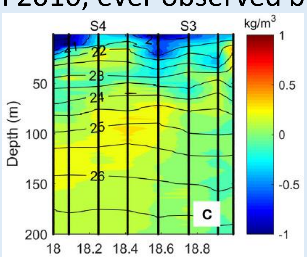


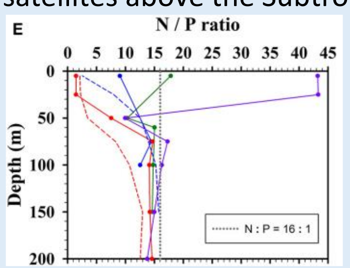


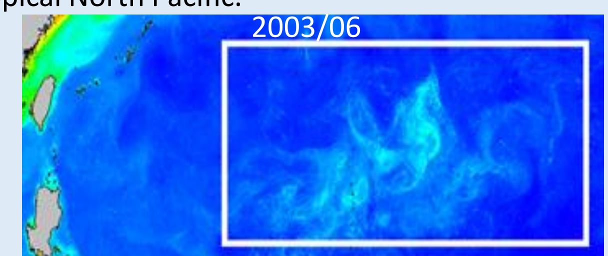


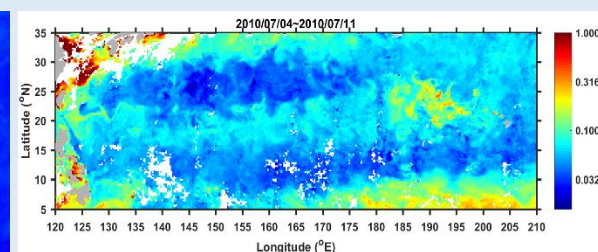
(↗) Observed a repeated eddy motion, and (↑) predictable eddy effect on sea surface temperature in the northern South China Sea and (↖) in the Subtropical North Pacific, using surface drifters and satellite measurements. The eddy-induced variability of sea surface temperature can then modify local surface wind on a weather time scale.

The changes in (↓) ocean vertical structure and (↓) biogeochemistry were even found being caused by a small eddy, which induced strong upwelling during the weakening of ocean stratification, via a cruise experiment executed in the northern South China Sea. Based on *in-situ* and satellite observation, eddies were discovered contributing to (↓) a rare phytoplankton bloom in 2003 and (↘) the largest phytoplankton bloom in 2010, ever observed by satellites above the Subtropical North Pacific.









Frontier in Marine Science **2021**, doi: 10.3389/fmars.2021.717576

frontiers in Marine Science

ORIGINAL RESEARCH article

The Wind Effect on Biogeochemistry in Eddy Cores in the Northern South China Sea

Chun Hoe Chow[1], Yung-Yen Shih[2], Ya-Tang Chien[1,3], Jing Yi Chen[4], Ning Fan[2], Wei-Chang Wu[1,5] and Chin-Chang Hung[4*]

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於南海北部的渦漩中心之風場對生地化學的影響

曹俊和[1]、施詠嚴[2]、簡雅堂[1,3]、陳靖宜[4]、范寧[2]、吳維常[1,5]、洪慶章[4,*]

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3. 中央研究院環境變遷中心
4. 國立中山大學海洋科學系
5. 國立台灣大學海洋研究所

重要研究成果

- 在南海北部，渦旋的垂直運動深受當地海洋分層的影響。
- 研究發現，當風造成海水從南邊輸送至南海北部時，當地海水分層減弱，使得渦旋中心較易發生明顯的垂直沉降或湧升的現象。 但是，黑潮的南海入侵將強化海水分層，抑制了渦旋中心的垂直運動。
- 在有明顯垂直運動的渦旋中心，發現了較高的碳通量，即使是在較小的渦旋。本研究提供了風—渦漩—海洋生地化的重要科學連接。

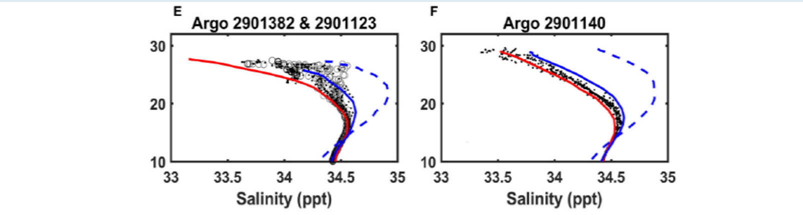

FIGURE 12 | Temperature-salinity (TS) diagrams during the month and a month before observing the ocean eddies *via* Argos **(A)** 2900825, **(B)** 5902165, **(C)** 2901170, **(D)** 2901379, **(E)** 2901382, 2901123, and **(F)** 2901140. The left and right panels are for anticyclonic and cyclonic eddies, respectively. The solid red and dashed blue curve represents the TS properties of water masses in the southern South China Sea (SCS) and in the Kuroshio region, respectively. In **(E)**, the dots are for the TS obtained from Argo 2901123 and the circles are for Argo 2901382, observing the same anticyclonic eddy with significant downwelling.

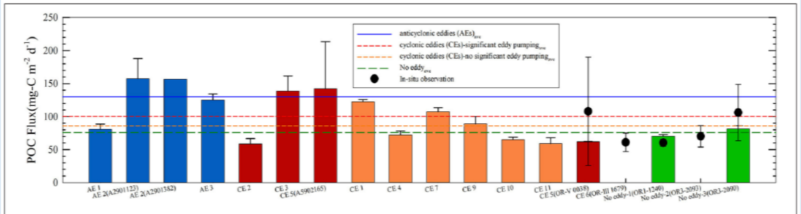

FIGURE 8 | Particulate organic carbon (POC) fluxes for the eddy cases based on *in situ* observation (solid circles) and satellite estimation (color-shaded bars). The bars in blue, red, orange, and green show the POC fluxes corresponding to the cases with significant anticyclonic eddies (AEs) pumping, significant cyclonic eddies (CEs) pumping, insignificant CEs pumping, and no eddies, respectively. All error bars show the standard deviation of the POC fluxes. The horizontal solid and dashed lines show the total mean of POC flux for each case based on satellite estimation. We performed direct measurement of the POC flux given by Shih et al. (2020) for CE5 (OR-V 0038) and CE6 (OR-III 1679).

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journal homepage: www.elsevier.com/locate/marpolbul

Marine microplastics in the surface waters of "pristine" Kuroshio

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於“清澈”黑潮水面上的海洋微塑膠

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d. 國立臺灣海洋大學海洋環境資訊系
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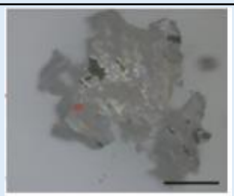
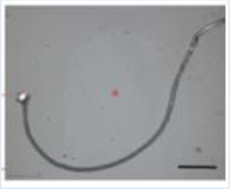
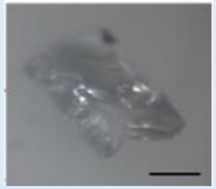

重要研究成果

- 第一個探討台灣東邊黑潮微塑膠顆粒的研究。
- 黑潮目前的微塑膠濃度可達**0.15 items/m^3**。
- 發現黑潮中和附近的主要微塑膠種類有聚丙烯、聚乙烯和對苯二甲酸酯。
- 研究調查發現兩處近海區有較高的微塑膠濃度：宜蘭縣和台東縣外海。另外，在黑潮的主軸上也發現較高的微塑膠濃度。

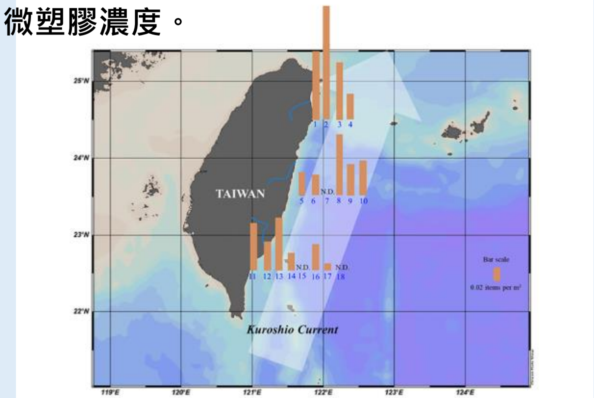

Fig. 1. Spatial distributions of microplastics (MPs) in the surface water off the east coast of Taiwan (Bar scale: 0.02 items m^{-3}). The white arrow indicates schematically the Kuroshio main stream. This map was produced by Ocean Data View.

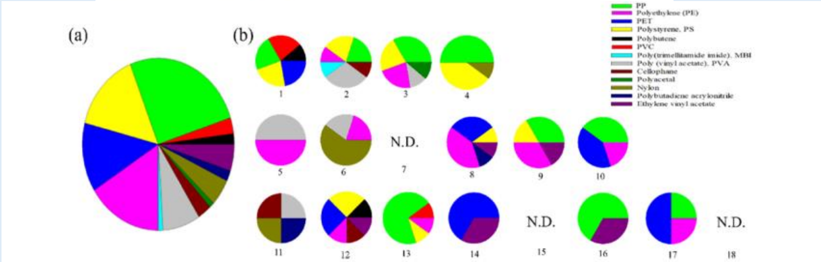

Fig. 4. Relative proportions of different polymer types of all collected microplastics (MPs) (a). Relative proportions of MPs at each sampling site (b), numbers represent sampling sites.

Frontier in Earth Science **2020**, doi: 10.3389/feart.2020.537332

frontiers in Earth Science

ORIGINAL RESEARCH article

The Impact of Eddies on Nutrient Supply, Diatom Biomass and Carbon Export in the Northern South China Sea

Yung-Yen Shih[1,2], Chin-Chang Hung[2], Sing-how Tuo[3,4], Huan-Jie Shao[2], Chun Hoe Chow[5], François L. L. Muller[2] and Yuan-Hong Cai[1]*

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南海北部渦漩對營養鹽、矽藻量和碳通量的影響

施詠嚴[1,2]、洪慶章[2,*]、托星豪[3,4]、邵煥傑[2]、曹俊和[5]、慕樂凡[2]、蔡元宏[1]

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2. 國立中山大學海洋科學系
3. 中央研究院環境變遷中心
4. 老道明大學海洋地球大氣科學系
5. 國立臺灣海洋大學海洋環境資訊系

重要研究成果

- 以現場觀測探討南海北部兩個冷渦和一個暖渦的營養鹽供應、矽藻生物量和碳通量。
- 研究發現，兩個冷渦中的碳通量比暖渦來得高，是因為海水分層在這兩種渦旋之間的差異所造成。
- 於冷渦中心的湧升流將營養鹽帶到透光層，增加了較大型矽藻和鞭毛藻的成長和數量的增加。
- 於暖渦中心的沉降流加強了海洋分層，阻礙了營養鹽的提供，因此僅發現較小浮植物的種類。

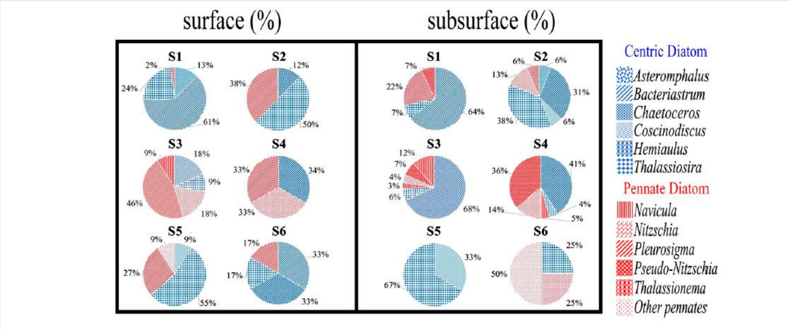

FIGURE 3 | Pie charts showing the relative abundances of centric and pennate diatom cells in surface (5 m) and subsurface (Chl maximum depth) waters.

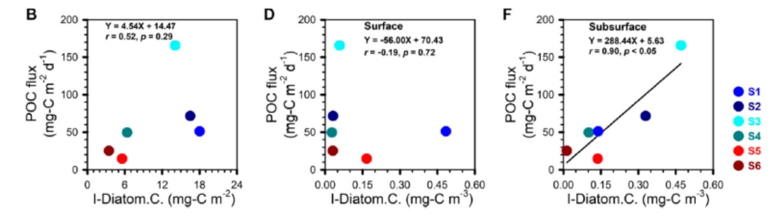

FIGURE 6 | POC fluxes vs. **(A, B)** I-Phytoplankton and I-Diatom carbon inventories (I-Phytoplankton **C.** and I-Diatom **C.**); **(C, D)** phytoplankton and diatom carbon contents (Phytoplankton C. and Diatom C.) in surface waters; **(E, F)** phytoplankton and diatom carbon contents (Phytoplankton C. and Diatom C.) in subsurface waters (i.e., SCM). The lines in the E and F denoted the result of linear regression.