國 立 臺 灣 海 洋 大 學
海洋環境與生態研究所 專題討論

題目：Variability in the Correlation between Asian Dust Storms and Chlorophyll *a* Concentration from the North to Equatorial Pacific
作者：Sai-Chun Tan et al
出處：PLoS One(2013)vol. 8,Issue2:e57656
報告人：陳宣邑 碩一
指導教授：龔國慶 老師
報告日期：12/11/2019

Abstract

A long-term record of Asian dust storms showed seven high-occurrence-frequency centers in China. The intrusion of Asian dust into the downwind seas, including the China seas, the Sea of Japan, the subarctic North Pacific, the North Pacific subtropical gyre, and the western and eastern Equatorial Pacific, has been shown to add nutrients to ocean ecosystems and enhance their biological activities. To explore the relationship between the transported dust from various sources to the six seas and oceanic biological activities with different nutrient conditions, the correlation between monthly chlorophyll *a* concentration in each sea and monthly dust storm occurrence frequencies reaching the sea during 1997–2007 was examined in this study. No correlations were observed between dust and chlorophyll *a* concentration in the <50 m China seas because atmospheric deposition is commonly believed to exert less impact on coastal seas. Significant correlations existed between dust sources and many sea areas, suggesting a link between dust and chlorophyll *a* concentration in those seas. However, the correlation coefficients were highly variable. In general, the correlation coefficients (0.54–0.63) for the Sea of Japan were highest, except for that between the subarctic Pacific and the Taklimakan Desert, where it was as high as 0.7. For the >50 m China seas and the North Pacific subtropical gyre, the correlation coefficients were in the range 0.32–0.57. The correlation coefficients for the western and eastern Equatorial Pacific were relatively low (<0.36). These correlation coefficients were further interpreted in terms of the geographical distributions of dust sources, the transport pathways, the dust deposition, the nutrient conditions of oceans, and the probability of dust storms reaching the seas.

中文摘要

透過亞洲沙塵暴的長期紀錄證實，中國有七個發生沙塵暴的高頻率地區。亞洲沙塵暴會入侵於下風處的海域，包括中國海、日本海、北太平洋亞極區、北太平洋亞熱帶環流區以及赤道東、西太平洋等六片海域。

為了瞭解不同來源沙塵的傳輸，與六片具有不同營養鹽特性的海域（中等營養：中國海與日本海；高營養鹽低葉綠素 HNLC：北太平洋亞極區與赤道東太平洋；

低營養鹽低葉綠素 LNLC：北太平洋亞熱帶環流區(gyre)與赤道西太平洋），海洋基礎生產者生物量變動的關係，作者研究了 1997-2007 年期間，七個沙塵暴地區每月沙塵暴可傳輸至這六片海域的日數與這六片海域的 SeaWiFS 衛星海洋水色葉綠素 a 的月平均資料進行相關性分析。

結果顯示，在水深< 50 m 的中國海域中，並無相關性，因為大氣沉降作用通常在沿海區域的影響較小。而在其他海域則均可發現兩者之間具有相關性，只是相關係數的變化很大。

總體而言，除了塔克拉瑪干沙漠與北太平洋亞極區之間的相關係數(r)高達 0.7 之外，各沙塵暴地區與日本海的相關係數最高（r 介於 0.54-0.63 之間）；在水深> 50 m 的中國海和北太平洋亞熱帶環流區，相關係數(r)介於 0.32-0.57 之間；與赤道東、西太平洋的相關係數相較之下是最低的（r<0.36）。

這些相關係數的差異，可由沙塵來源、傳輸途徑、沙塵沉降量、海洋的營養狀況及沙塵暴發生頻率來解釋。

參考資料

Tan S-C, Yao X, Gao H-W, Shi G-Y, Yue X. 2013. Variability in the Correlation between Asian Dust Storms and Chlorophyll *a* Concentration from the North to Equatorial Pacific. PLoS ONE 8(2): e57656