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Investigation of Land-Based Pollution and Algae Blooms in Chinese Coastal Waters
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Synthetic aperture radar (SAR) images acquired by ERS SAR and Envisat ASAR over Chinese coastal waters have been analyzed with the aim of locating man-made sea pollution that has its origin on land. Pollutants of anthropogenic (man-made) origin are transported into the sea usually by rivers located in heavily populated or industrialized areas. Pollutants can only be captured by SAR when they are associated with surface-active material floating on the sea surface, which consists of organic material as encountered almost always in waste water of industrial and sewage plants. These surface films, which are usually only one-molecular layer thick, damp the short sea surface ripples almost as strongly (of the order of 8 dB) as mineral oil films originating from ship spills. The polluted areas become visible on SAR images as recurrent dark patches attached to the coastline. We have identified several areas at the east coast of the Pearl River delta (e.g. the mouths of the Dongboahe and Dashabe rivers and the Shenzhen Bay) and at the west cost of Taiwan (Gaoping river), where such dark patches are almost always present provided that the wind speed is not too strong (below 6-8 m/s). However, dark patches adjacent to the coast line are not always caused by anthropogenic pollution, but also by wind shadowing by coastal mountains, by cold upwelled water, or by biogenic surface films originating from phytoplankton blooms. In order to discriminate between dark patches originating from land-based anthropogenic pollution and from other phenomena, the so-called look-alikes, we have used also other sources of information, like data from weather services and other satellite sensors. The satellite data include near-surface wind fields derived Quikscat and ASCAT data, chlorophyll-a concentrations derived from SeaWiFS, MODIS, and MERIS data, and sea surface temperatures derived from AVHRR, MODIS, and ATSSR data. Areas covered with biogenic surface have been identified in upwelling areas north of Taiwan and in the Strait of Taiwan.

2870147

On the Response of the Ocean to the Typhoon Nanmadol
Tang, DanLing; Lin, Jingrou; Alpers, Werner; Wang, Sufen

A typhoon, called Nanmadol, crossed the Luzon Strait, which separates the Philippine island of Luzon and the island of Taiwan, between on 27 and 28 August 2011 from south to north. The associated cloud pattern was captured by the MERIS sensor onboard the Envisat satellite on 27 and 29 August, and part of the sea surface roughness pattern also by the Advanced Synthetic Aperture Radar (ASAR) onboard the same satellite on 28 August in the Global Mode (GM). Furthermore, radar backscatter data were acquired by the Advanced Scatterometer (ASCAT) onboard the MetOp satellite on 28 August when the eye of the super-typhoon was located over the northern section of the Luzon Strait. The near-surface wind field derived from the ASCAT data shows the typical typhoon pattern. One week after Nanmadol crossed the Luzon Strait, the research vessel (RV) Shiyan 3 of the South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, reached the Luzon Strait. Measurements of the depth profiles of water temperature, salinity, and chlorophyll-a (Chl-a) and dissolved oxygen (DO) concentrations were carried out from this RV at different locations. Despite of the time delay of one week, the in-situ data still show distinct signals of the typhoon. They show close to the typhoon track a decrease of water temperature and a strong increase in Chl-a and DO concentrations. These values differ significantly from the values measured further away from the typhoon track. Maximum Chl-a concentration is found at depths between 50 m and 75 m and maximum DO concentration at depth around 5 m. The layer of high DO concentration extends from the surface down to a depth of 35 m and is strongly mixed. We explain the strong increase in DO concentration and the strong vertical mixing being caused by the typhoon wind, which gave rise to increased entrainment of oxygen from the air.

2878883

Marine Ecosystem Response to Typhoons in the South China Sea
Tang, Danling; Tang, DanLing; Ye, H. J.; Sui, Yi.

Marine ecosystem response to typhoons in the South China Sea DanLing Tang1, HJ. Ye1, JR Lin1, Y. Sui2 1South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, P. R. China 2Department of Physics & Physical Oceanography, Memorial University, Newfoundland, Canada Tropical cyclones, typhoons or hurricanes are strong wind events in the weather system, which influence the upper ocean dynamics and the ecosystem in particular upwelling, water temperature, salinity, chlorophyll-a (Chl-a) concentration and primary production. Here we are studying on the Marine ecosystem response to typhoons in the South China Sea using satellite observations and in situ measurements. Previous studies showed that typhoons often induce chlorophyll a (Chl-a) blooms in the surface waters. This paper shows that Chl-a blooms can occur not only on the surface but also in the interior just above the thermocline after the passage of a typhoon. We used satellite and cruise survey data to analyze physical and biological characteristics in the South China Sea after the passage of the typhoon Nuri in August 2008. This paper shows that a subsurface (20 to 100 m depth) Chl-a bloom (¡Ý1.00 mg m-3) occurred and lasted for three weeks, longer than the surface Chl-a bloom (¡Ý0.50 mg m-3). The maximum value of Chl-a of 2.10 mg m-3 was detected at 50 m depth. This value was approximately 4-5 times higher than the background value of 0.48 mg m-3 measured at non blooming areas at the same time and about 5 times higher than the mean Chl-a value of 0.28 mg m-3 measured over the period of five years. The mixed layer depth and the thickness of the Chl-a bloom increased after the typhoon. Our analysis clearly shows that a long-lasting subsurface upwelling caused by the passage of the typhoon, uptook nutrients to the euphotic zone thus supporting the Chl-a bloom. These observations provide some insight on the effect of typhoons on marine ecosystems, especially as related to the Integrated Primary Production A decrease in seawater temperature and an increase in chlorophyll-a (Chl-a) concentration often occurs after the passage of a tropical cyclone, but little is known about the response of dissolved oxygen (DO) concentration to a typhoon in the open ocean. This paper investigates the impact of a typhoon on DO concentration and related ecological parameters using in-situ and remote sensing data. The in-situ data were collected one week after the passage of the super-typhoon Nanmadolin the northern South China Sea in 2011.A decrease in water temperature, increase in both Chl-a concentration and DO concentration was measured at sampling stations close to the typhoontrack. Maximum DO concentration is found at a depth of around 5 m and maximum Chl-a concentration at depths between 50 m and 75 m. The layer of high DO concentration extends from the surface to a depth of 35 m by vertical mixing. Also a strong negative mean sea level anomaly (21.58cm)indicating a cyclonic eddy and a phytoplankton bloom areobserved.We attribute thephytoplankton bloom to upwelling of cold nutrient-rich water.The data show that the elevation of the depth of maximum DO concentration to 5 m is mainly due to the entrainment of air causedby the typhoon wind .