

Temporal variation of increase of chlorophyll-a concentration after typhoon passage

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We show temporal variation of chlorophyll-a concentration (Chla) by typhoons, tropical cyclones in the western North Pacific ocean, by use of the product of Chla of the Geostationary Meteorological Satellite Himawari-8. The cases of 103 typhoons show that Chla is usually increased along the paths of typhoons. Chla increase is the maximum at the day of a typhoon arrival and it is terminated within two weeks. These measurements are almost not possible by use of the data of polar orbiting satellites as shown in previous studies. This is because the temporal resolution of Himawari-8 is tens times better than that of polar orbiting satellites and daily Chla distribution has a few disturbances of clouds by a composite of cloud-free data. The result that typhoons are cultivating ocean is important for studies of primary productivity of ocean and carbon flux between atmosphere and ocean.

Chla increase is usually observed but most of the increase rate, R_{Chla} , is less than 2, and R_{Chla} of only 10% of typhoons is greater than 5. R_{Chla} in most sea areas is proportional to the maximum 10-minute sustained wind speed up to 85 knots (44 m/s), 0.01 mg/m³/knot, because stronger wind would provide more nutrient due to more up-welling. R_{Chla} is, however, not at least increase by wind speed above it. Chla increase is the greatest at 85 knots. There is less relationship between Chla increase and wind speed in the east China sea because Chla is increased by weak wind. There is also less relationship and low Chla increase at the 10 degree North. These characteristics of Chla is not retrievable by use of sensors of polar orbiting satellites.

The decrease of sea surface temperature (SST) retrieved by Himawari-8 is little and it does not proportional to wind speed within a few days from a typhoon arrival. SST retrieved by the microwave radiometer AMSR2 is, however, the coldest just after a typhoon arrival. SST retrieved by Himawari-8 thus has clear sky bias because SST is only retrieved at clear days by Himawari-8 and it is retrieved at clear and cloudy days by AMSR2 and because Chla is the maximum at the day of a typhoon arrival. SST retrieved by AMSR is also proportional to wind speed up to 85 knot and SST decreasing is not enhanced by wind speed above it. SST decrease is the greatest at 85 knots.

Keywords: chlorophyll-a concentration, typhoon, Geostationary Meteorological Satellite