Nitrogen sources for new production in the NE Arabian Sea during winter

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New productivity measurements using the ^{15}N tracer technique were conducted in the north-eastern (NE) Arabian Sea during five expeditions from 2003 to 2007 in winter. Entrainment of NO_3^- which supports the observed nitrogen uptake has been quantified. Deepening of mixed layer below 100 m (from its inter-monsoon value between 30-40 m) transferred often more than 100 mmol N-NO_3^- m^{-2} into the surface layers from below. The observed winter blooms in the region are supported by such input and are sustained for more than a month, as is also observed in satellite imagery. Higher new production and *f*-ratios have been found in late winter, whereas transport of NO_3^- is maximum in early winter. In general, new production and *f*-ratios vary progressively during winter.

Rethinking the organic sea spray function

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As the study of climate change progresses, a need to separate the effects of natural and anthropogenic processes becomes essential in order to correctly forecast the future climate. Marine aerosols are particularly important as they contribute considerably to the global aerosol load, are emitted from a large area of the Earth's surface, and can affect reflective properties and lifetime of marine stratiform clouds.

The marine primary organic aerosol emission function is explored using aerosol chemical composition observations from coastal stations in the Interagency Monitoring of Protected Visual Environments (IMPROVE) network and satellite-derived ocean and meteorological parameters. Multi-variable regression analysis showed that the surface wind speed and dissolved organic carbon concentration are likely to be the key variables in determining the organic mass fraction of sea spray aerosols. Application of this new formulation to sea spray aerosols with aerodynamic diameter less than 2.5 μm gives an average marine primary organic emission of ~20.6 Tg C yr^{-1}. Low winds and high dissolved organic carbon concentrations (as opposed to productivity) enhance the organic fraction of sea spray in our formulation, resulting in relatively high emissions rates over ocean gyres (Figure 1). These results suggest widespread emissions of primary organic matter from the oceans that could potentially influence marine aerosol number/chemical composition and the microphysical properties of marine clouds, thus having a sizable impact on atmospheric radiative forcing and climate.

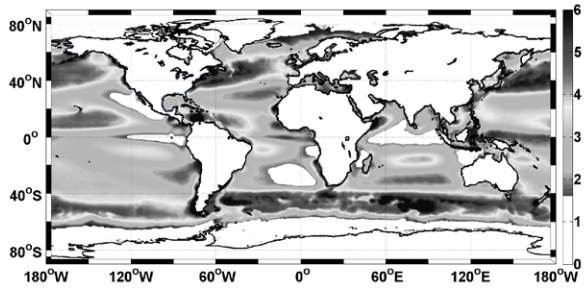

Figure 1: Predicted annual average marine primary organic emission rate in ng m^{-2} s^{-1}.