

## **Seasonal changes in nutrient dynamics and limitation in the P-depleted ultra-oligotrophic Eastern Mediterranean Sea**

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The Eastern Mediterranean Sea (EMS) despite being an inland sea, has many of the characteristics of a P depleted oceanic gyre system such as the N.W. Atlantic gyre (e.g. BATS). As a result of its anti-estuarine circulation it is ultra-oligotrophic and picoplankton dominate the autotrophic community. Results from a series of monthly cruises, carried out using an ultra-sensitive nutrient analysis, showed a characteristic nutrient dynamic; In winter, which is also the time of the annual phytoplankton bloom, the photic zone was phosphate depleted while there was excess nitrate present at a concentration of 300-500nM. After the seasonal stratification was established in April, nitrate decreased until it became depleted in nitrate by mid-summer into autumn. Dissolved organic phosphorus (DOP) was also unusually low (30-40nM) with only minor seasonal changes. This seasonal nutrient dynamic seems to be characteristic of P depleted oceanic systems.

Nutrient limitation is a key parameter in controlling primary productivity and carbon uptake in such seasonally changing ocean systems. In this study we have developed and used a new method for determining the limiting nutrient. This method involves a 5 x 5 matrix of nutrient (N & P) additions and the determination of 2 endpoints simultaneously; Chlorophyll a is used as a proxy to define the limiting nutrient for the autotrophic community and an Alkaline Phosphatase activity (APA) endpoint in which the entire microbial community responds to the presence/absence of inorganic phosphate by producing or suppressing APA. Our results showed that in late summer, when the system was both phosphate and nitrate depleted, the autotrophs became N&P co-limited -> N limited while the heterotrophs were P limited. Results for winter and spring will be presented and the probably reasons for these seasonally changing pattern in nutrient limitation will be discussed.