# ATMOSPHERIC INPUT OF NUTRIENTS, IMPACT ON EAST MEDITERRANEAN WATERS

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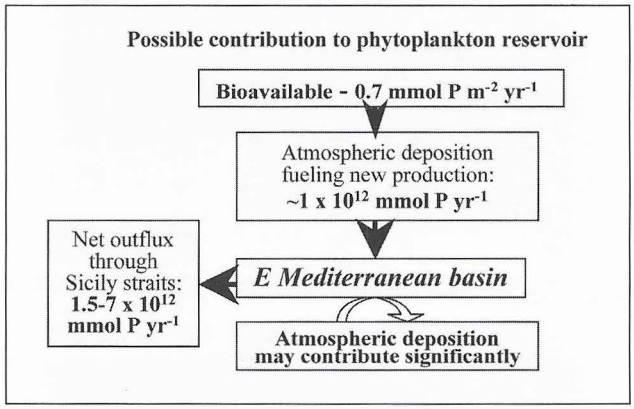
**Abstract**

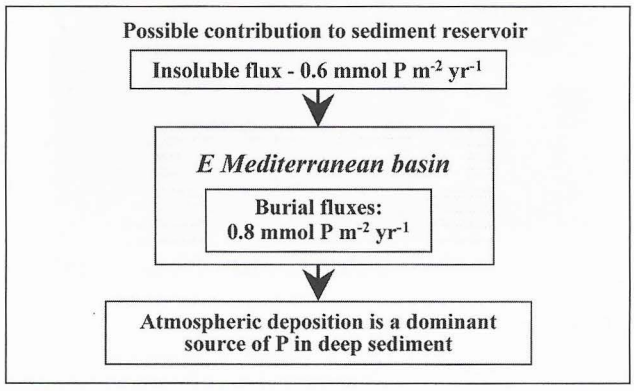
In the long-term, atmospheric deposition (especially dry fallout) play an important role in the supply of new nitrogen and phosphorus to surface water in the East Mediterranean, and contributes significantly to the relatively high N:P ratios in Levantine deep water. In the short-term, while clear fertilizing response was observed in an on-board dust gradient microcosm experiment, no such field response was seen through a dust storm event. More detailed field measurements are required during dust events before clear conclusion can be made on their short-term impact.

*Key words: nutrients, dust, seawater, atmosphere, Mediterranean*

Recent long-term (annual scale) studies have examined the leachability of nutrients from dry aerosols and provided annual flux estimates of seawater leachable (bioavailable) inorganic nitrogen (IN) and phosphorus (IP) into the East Mediterranean (1-4). These estimates emphasize the dominant role of the dry deposition mode in supplying new nitrogen and phosphorous into this basin. This annual-scale fertilizing impact integrates solubility variations which follow the aerosol character or source. Desert type aerosols exhibit lower P and N seawater solubilities as compared to aerosols associated with European air masses. Nevertheless, aerosol from both origins tend to increase the N/P ratios well above the Redfiled ratio found in most other oceanic areas and are probably an important driver for the unusual high ratios in the deep water.

It has been found that the atmospheric input of nutrients fuel the new production in similar amounts as exported by the anti-estuarine circulation through the Straits of Sicily (Fig. 1), while insoluble P is supplied at a rate similar to burial fluxes in the Levantine basin (Fig. 2).




It has been argued that short-term Sahara Dust pulses can cause phytoplankton blooms in summer when there is no nutrient supply by water column mixing. Results from the CYCLOPS program (Cycling of Phosphorus in the Mediterranean) indicates that while clear fertilizing response was observed in an on-board dust gradient microcosm experiment, no such field response was seen through a dust storm event. More detailed measurements are required during dust events before clear conclusion can be made on the short-term impact of dust events.

## References

1 - Guerzoni S., Chester R., Dulac F., Moulin C., Herut B., Loye-Pilot M-D., Measures C., Migon C., Rossini P., Saydam C., Soudine A. and Ziveri P., 1999. The role of atmospheric deposition in the biogeochemistry of the Mediterranean Sea. *Prog. Oceanog.*, 44: 147-190.

2 - Herut B., Krom M.D., Pan G. and Mortimer R., 1999. Atmospheric input of nitrogen and phosphorus to the SE Mediterranean: sources, fluxes and possible impact. *Limnol. & Oceanog.*, 44: 1683-1692.

3 - Herut B., Collier R. and Krom M.D., 2002. The role of dust in supplying N and P to the SE Mediterranean. *Limnol. & Oceanog.* 47: 870-878.

4 - Kouvarakis G.M., Tselipides N. and Stavrakakis A., 2001. On the importance of atmospheric inputs of inorganic nitrogen species on the productivity of the eastern Mediterranean Sea. *Global Biogeochemical Cycles,* 15: 805-817.