**Air-sea exchange in the Aegean Sea 2012: Vertical fluxes of PAHs and halogenated semivolatile organic compounds**

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The marine atmospheric environment is a receptor for persistent organic pollutants (POPs) which are advected from sources on land, primary and secondary, such as volatilization from contaminated soils. Primary sources do not exist in the marine environment, except for polycyclic aromatic hydrocarbons (PAHs, ship engines) but following previous atmospheric deposition, the sea surface may turn to a secondary source by reversal of diffusive air-sea mass exchange.1-3 Long-range transport from urban and industrial sources on land are the predominant sources of PAHs and polychlorinated biphenyls (PCBs) in the Mediterranean. We studied the vertical fluxes of POPs based on concentration gradients in air and surface seawater concentrations at a remote coastal site on Crete in the eastern Mediterranean. To this end, silicon rubbers were used as passive samplers in seawater.

Vertical concentration gradients in air of 14 gas-phase species i.e., 4 parent PAHs, 3 PCBs, 5 organochlorine pesticides and 2 polybrominated diphenylethers (PBDEs), were followed at a remote coastal site in summer in the southern Aegean during 2 weeks. While deposition prevailed for almost all substances (with one exception i.e., BDE47), most substances seem to experience flux oscillations. These did not follow a day/night cycle. Using a micrometeorologically determined transfer velocity (eddy covariance), vertical fluxes, Fc, could be quantified for 7 day-time sampling intervals. For PAHs 9 fluxes were downward (Fc = 16±31 µg m-2 d-1), 6 upward (ranging Fc = 2.9-6.2 µg m-2 d-1 for fluoranthene and 1.0-4.5 µg m-2 d-1 for pyrene). For chlorinated species 29 fluxes were downward (Fc = 1.9±2.8 µg m-2 d-1), 2 upward (these were 0.5 for *γ-* hexachlorocyclohexane (HCH) and 3.0 µg m-2 d-1 for BDE47) and 22 insignificant.

Based on fugacity ratios averaged over the 2 week period, net deposition is suggested for most PAHs, HCH and PBDEs, but net volatilization from the sea surface for PeCB, HCB and PCB28 and -101.4

It is concluded that nowadays more pollutants are undergoing reversal of the direction of air-sea exchange and that longer observations are needed to assess the prevailing direction.

References

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