

High concentrations of ozone over the sea: experimental results and numerical simulations

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Numerical simulations indicate large water basins, specially those surrounded by crowded or highly emitting areas, as particularly prone to ozone formation. To verify this numerical evidence, a two years campaign of measurements (2009-2010) has been carried out in the Northern Adriatic. The aims of this monitoring campaign were those to: i) assess the correctness (qualitative and quantitative) of the simulated high concentrations of ozone over the Northern Adriatic basin; ii) suggest possible explanations, both under the point of view of meteorological determinants and emission pressures. The monitoring campaign was carried out by way of passive samplers positioned on the shore, lagoon and on buoys. Numerical simulations were carried out at a resolution of 4x4 km by way of an off-line photochemical model using a local emission inventory for the study area, the National Inventory for the Italian domain and EMEP and GEIA inventory for the boundary conditions. A puff numerical model was used to evaluate the impacts of local pollutant sources (a power plant near to the shore) on the ozone precursors (nitrogen oxides).

Passive samplers confirm the increased amount of ozone over the Northern Adriatic basin in the right order of magnitude evidenced by the numerical simulations. High solar radiance over the sea seems to be the main reason for the high ozone concentrations, as well as the relatively high concentration of “old” nitrogen oxides, in particular related to road transports. High emission sources (harbours and shipping), on the contrary, reduce ozone concentration in their neighbourhood. Both these evidences show that reduction of ozone concentrations might be possible only with a widespread and generalized nitrogen oxides emissions.