



## **Effects on air quality over harbours due to the interplay between costal microclimate and ship emissions**

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Maritime transport is a sector that should grow in the next future according to the EU policies devoted to enhance economic development and reduce the environmental pressures exerted by road transports. Even if maritime transports on the average have a negligible impact on air quality, they can be more than relevant on harbours and on the inhabited areas that occupy their surroundings. These impacts can be magnified by the microclimatic characteristics of coastal areas. This work highlight some of the characteristics of air quality (ozone, nitrogen dioxide and particulate matter) over the northern Adriatic, carrying out a source apportionment devoted to estimate the impacts of ships emissions over harbours. The role of sea breezes and of mixing height seasonal variability on air quality over coastal areas is underlined as well as the observed reduction in cloud cover typical of maritime areas. Some classical strategies (electrification of docks and bi-fuel engines) to reduce ships emissions impacts are evaluated for the specific area as well as the positive impact that an efficient management of ships upload and download can have. This management, in particular, represents a win-win approach that reduces at the same time economical costs and environmental impacts. High resolution numerical simulations of ships emissions dispersion according to different meteorological parameters as well as source structure (e.g., chimney height and temperature) show the importance of an effective organization of harbour areas to reduce the impacts on air quality.