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Landsat satellite data analysis for high spatial resolution aerosol mapping and backcasting over the urban area of Athens (1986-2001)

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The main objective of this study was to fill in the gap in small-size aerosol datasets in the Athens urban area before the year 2001, when the first ground based PM₁₀ measurements commenced. It also aimed at demonstrating the capability of high spatial resolution satellites to compensate the spatial deficiency of ground based monitoring stations, which are sparse not allowing reliable interpolations of their measurements. We used Landsat imagery to assess the aerosol optical thickness (aot), which is an air pollution indicator associated to aerosol loading, over the greater Athens area. The spatial distribution of aot was mapped during characteristic air pollution conditions associated to the most intense pollution episodes of each year between 1986 and 2001. The selection as well as the processing of satellite data was carried out using an original methodology. The images were visually examined, statistically analysed and digitally -automatically processed in order to produce aot maps informing on pollution density at intervals of 30 metres. These maps constitute a worldwide first prototype of diachronic urban pollution picture ever produced with such a detail. The aot accuracy was validated against available pollution concentration information on aerosol precursors (SO_x, NO_x). Interpretation of the maps showed significant changes in the evolution of the spatial distribution of pollution in Athens during the examined period.