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Abstract for #IMC25

Evaluating the influence of heat waves on pollutant concentrations in the Pyrenees from in-situ measurements and Sentinel data

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Tropospheric ozone (O_3) is a secondary atmospheric pollutant formed through photochemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) under the influence of solar radiation. Ozone formation and accumulation are particularly relevant during the summer when high temperatures intensify photochemical reactions and can be advected by recirculations or formed in the presence of precursors during heat wave episodes. Instead, nitrogen dioxide (NO_2) concentrations mainly increase during winter with stagnant stability conditions and enhanced by the presence of thermal inversions. In this study we present an analysis of the pollutant concentrations in the Pyrenees and we also seek to find its relationship with heat wave episodes. A total of 20 ozone monitoring air quality stations located in the cross-border area of the Pyrenees are analyzed for the 5-year period from 2019 to 2023. Results show that the information threshold is exceeded occasionally in Bellver, Berga, Montsec, Torrelisa and Lourdes. We also found that urban locations such as Prat Gran (Andorra) and Iturrama (Basque Country) have lower mean ozone levels while rural places such as Montsec (Catalunya) and Torrelisa (Aragón) register the highest mean ozone levels. Using ERA5 data a total of 17 heat wave periods are selected during 5 years, including a total of 105 days. The highest ozone concentrations occurred in summer and during these heat wave periods (defined as 3 or more consecutive days that exceed the P99 of hourly temperatures). On the other hand, the spatial distribution of NO_2 vertical tropospheric column from Sentinel 5P revealed localized maximums during winter season. This study was performed in the framework of the project "Towards a climate resilient cross-border mountain community in the Pyrenees (LIFE22-IPC-ES-LIFE PYRENEES4-CLIMA)".