Atmospheric dispersion modeling with AERMOD for comparative impact assessment of different pollutant emission sources in an Alpine context

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High-resolution simulations are performed with the AERMOD model to analyze the impact on air quality of different pollutant emission sources in the area surrounding the town of Vipiteno in the northeastern Italian Alps. In this area the environmental burden of pollutant emissions is particularly high because of both its complex terrain and the presence of specific pollutant sources. In this study the effects of the main sources are analyzed and compared: the A22 motorway, which leads to the Brenner pass, the town of Vipiteno, mainly characterized by intensive use of biomass for house heating, three major plants with high emission rates, and a parking lot located near the motorway, offering park spaces for up to 260 trucks and 50 cars. To assess the impact of these pollution sources the AERMOD model is run with a spatial resolution of 25 m and with meteorological input data obtained from different datasets, such as annual series of standard meteorological variables taken from local weather stations and a set of vertical soundings. During the simulations the sources are modeled in different ways depending on the type of the emissions: the motorway is modeled as a linear source, the village as a diffuse source, the local companies as point sources and the parking lot is modeled as a composition of a diffuse source, representing the idling vehicles inside the park, and of a linear source, representing the access routes to the parking. For each type of source, specific emission factors are chosen, and hourly and seasonal emission patterns are set with particular attention to the analysis of idling vehicle emission factors. The results of the simulations are analyzed in terms of NO_2 and PM10 and the impact of each source is discussed.