Semi-quantitative methodology to assess efficiency of local air pollution abatement policies in contrast to national or continental ones

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Atmospheric pollution is one of the most challenging problems to which contemporary societies are faced, affecting human health, ecosystems, historical heritage and climate. Different strategies have been displayed by the European Commission to improve air quality throughout Europe in recent decades; others have been adopted at national levels; and local policies have been critical in this battle. Administration managers urge to develop tools to evaluate reduction air pollution concerning to the policies elaborated.

In this work we present a semi-quantitative method to assess the efficiency of the adopted abatement strategies discerning local to continental. It is possible studying trends of traditional pollutants depending on long-range transport air mass origin or lack of advection episodes. This methodology has been applied for the Balearic Islands regional case.

Description of the Methodology and some results

1) Database Generation: long time series of O_3 and PM_{10}, driven by local, regional or long-range external sources, are necessary to obtain appreciable results. Other traditional pollutants, such as NO, NO_2 or SO_2 do not comply those requirements.
For the case of Balearic region a 13-year database has been created as in Cerro et al. 2015, averaging concentrations for urban (UB), suburban (SB) and regional background environments (RB).

2) Air Mass Origin: air advections must be classified in a) long-range transport (LR) or b) lack of advection (LA). LR can be beyond classified depending on the origin. In our case, Atlantic (AT), Mediterranean (MD), European (EU) and North African (AF) are considered. Affection of all type of episodes in air quality has been previously studied in Pey et al., 2009, and the same within methodology has been used to classify advection episodes. Other methods could be used, for example, multiple backward air mass trajectory compilation using HYSPLIT tools (http://ready.arl.noaa.gov/HYSPLIT.php).

3) Inter-annual variations: annual trends in air pollutant concentrations have to be calculated for each air mass origin. It is suitable to use Theil-Sen method of Openair package from the software developed by the R project (http://www.R-project.org/, references within).

4) Considerations: Inter-annual variations for LR can be considered mainly for policies affecting throughout the continent. Whilst inter-annual variations when LA occurs would be caused mainly by local strategies added to the continental strategies affecting also local emissions, such as vehicle emission restrictions. Therefore, differences between variations for LA and LR scenarios may be due to local actions.

Moreover, for a given pollutant, the subtraction of RB concentrations to the UB and SB will provide the estimation of the urban and suburban inputs respectively (Leschow et al. 2001). Thus allows to distinct if local policies are affecting more in a regional, suburban or urban stage.

Calculations have been done for Balearic Islands region. In Table 1 we can see the inter-annual variations for EU episodes, as a representative for the long-range transport, and those for Summer Regional (SR) episodes, as lack of advection scenario.

		UB	SB	RB
PM_{10}	EU	-0,57	-0,48	-0,62
	SR	-0,87	-1,23	-0,73
	Local contribution	-0,30	-0,75	-0,11
O_3	EU	1,65	-1,75	0,01
	SR	1,26	-0,78	0,43
	Local contribution	0,39	0,97	0,42

Table 1. Inter-annual variations (Theil-Sen) in µg m^{-3} for Balearic Island Region.

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