

Interactive comment on “Aerosol direct radiative effect in the Po Valley region derived from AERONET measurements” by M. Clerici and F. Mélin

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Response to Reviewer 1 (J. Roger) :

Specific comments:

1. It is indeed interesting to consider the ADRE over an highly reflecting surface, and we have performed additional simulations using a snow albedo spectrum from ASTER library (as in Ricchiazzi et. al., 2005, added reference). The resulting ADRE at TOA changes from negative to positive, due to the aerosol being more absorbing than the underlying surface, with high values at low SZA. The effect on ADRE at the surface is evident especially at low SZA, and confirm the dependency already seen for the previously used albedos (less negative ADRE for more reflecting surfaces). These

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results are discussed in the final release of the article, with modifications to figure 7, paragraph 2.3 and 3.1.2.

On the other hand, significant snow events are rare in the Po Valley (statistics of the mid 20th century report an average of 10 days of snow coverage in the area around Milan, but it is recognized that these precipitations are less and less frequent in the last decades). Around Ispra (in the pre-alpine part of the Po Valley) the annual number of days with snow precipitations has been just a few over the last 10 years. Moreover the snow spectra we found (mainly derived from models) are more representative of glaciers or uniform snow-bodies, than the conditions of the Po Valley. This is confirmed from an analysis of the MODIS albedo (MOD43B3 product) in this area, during the winter season, which made evident bright surfaces (albedo at 470 nm higher than 0.3) only for the Alps glaciers.

Moreover, the seasonally averaged MODIS albedo we have used should implicitly take into account the snow precipitations that occurred in North Italy in January (7th and 9th) and December (23rd and 24th) 2003. But the resulting optical signature of the snow cover at the scale of the Valley or around Ispra is found much smoothed out.

2. In order to clarify that the comparison with other AERONET sites is done only in terms of the optical properties, we propose to change line 16 to 18, page 29 as following:

"These aerosol optical characteristics also resemble those of sites located in a urban/industrial environment (Holben et al., 2001; Dubovik et al., 2002).

and lines 29/3232 to line 10/3233 with :

These properties, in terms of amplitude and spectral dependence, are well in line with results published for other continental sites, even if the local sources might have different characteristics. For instance, the average spectra of ω_a and g_a appear close to those reported at Greenbelt, Maryland, U.S., and Créteil-Paris, France (Dubovik et al., 2002,

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at these 2 sites] ω_a decreases from 0.98 to 0.95 and from 0.94 to 0.91, respectively), or at Lecce, southeastern Italy (Perrone et al. 2005; 2 modes of the frequency distribution of $\omega_a(440)$ are there distinguished, centered at 0.94 and 0.974). It is however acknowledged that much lower values of ω_a can be found, particularly close to large cities, as reported for example in summer for the Marseille or Paris urban areas (respectively, $\omega_a(550)$ of 0.85 ± 0.05 , Mallet et al. 2003, and $\omega_a(550)$ of 0.85-0.92, Chazette et al. 2005), or as annual mean for Valencia, Spain (ω_a of 0.90 ± 0.05 , Estelles et al. 2007).

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