

Interactive comment on “Aerosol shortwave daily radiative effect and forcing based on MODIS Level 2 data in the Eastern Mediterranean (Crete)” by N. Benas et al.

Anonymous Referee #2

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This paper has attempted to provide daily direct radiative effects by all and anthropogenic aerosols by using MODIS AOD and fine-AOD values referring to a particular time of the day, without demonstrating that the retrieved instantaneous AODs and fine-AODs can be considered representative of daily AODs. Hence, probably the presented results are unreliable. No attempts (with the exception of Table 4) are made by the authors to support their results by comparison with published results from global models and/or from local studies referring to the Mediterranean basin.

Major comments:

* The authors compare AODs by MODIS with AERONET AODs collocated in space

C8555

and time to support the reliability of MODIS AODs. How MODIS AODs are correlated to daily AERONET AODs?

* How the fine-AODs by MODIS are correlated to daily values of AERONET-fine-AODs (e.g. Santese et al., doi:10.1029/2007JD008482, 2007)?

* How asymmetry parameters by MODIS compare with daily values of the asymmetry parameters by AERONET?

* Why the authors have not averaged aerosol parameters retrieved by Terra and Aqua satellite measurements to get “more reliable” daily-AODs?

* AODs and fine-AODs can significantly vary with the time of the day mainly during dust outbreaks (Perrone et al., *Atm. Res.* 101, 783-798, 2011). In fact, Table 3 shows that the aerosol DREs retrieved by using MODIS-Terra aerosol parameters can be quite different than the values retrieved by using MODIS-Aqua aerosol parameters during a dusty day: e.g. 26/1/2005 and 10/06/2007. Can the authors infer the parameter and/or the parameters responsible for such large changes in DRE values?

* Some information on the aerosol vertical distribution used in the model should be provided.

* The used surface albedo values appear rather large to my opinion considering that the studied area is considered made by 50% land and 50% Sea, in accordance with line 2, page 19887. The surface albedo spectral dependence of Fig. 2 appear very close to the one reported for some Sahara sites (e.g. Bierwirth et al., *Tellus*, 61B, 252-268, 2009). Can the authors comment the used surface albedo values? How the used surface albedo values compare with the ones assumed for Crete in the AERONET inversion code?

* The authors have compared the downwelling SW radiation by the model with corresponding ground measurements to support model results. However, they do not provide any data regarding the spectral sensitivity of the ground used pyranometers.

C8556

* AERONET provides downwelling SW fluxes and aerosol DREs in addition to aerosol parameters (one of which has also been used by the authors in the model). How downwelling SW fluxes and aerosol DREs by the model of this study compare with the corresponding parameters provided for Crete-AERONET site?

* Probably, aerosol AERONET-DREs referring to Crete can be considered representative of a 50 km x 50 km area, being Crete a background area of the western Mediterranean. Then, some comments on the benefits and/o limits of using 50 km x 50 km MODIS aerosol parameters instead of AERONET aerosol parameters to calculate daily averaged aerosol DREs should be provided. * The authors use the MODIS fine mode fraction to calculate aerosol DREs by anthropogenic particles. Hence, they assume that the fine mode AOD is only made by anthropogenic particles. To what extent this assumption is a good approximation (e.g. Schulz et al., ACP, 6, 5225-5246, 2002)? Sensitivity tests should be provided. Sensitivity tests on the used single scattering albedo and asymmetry parameters values should also be provided.

In conclusion, I believe that it is not highlighted how paper results further contributes to the understanding of the aerosol DRE over the Mediterranean

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