

## 1. General Comment

This paper presents an overview of the temporal and spatial characteristics of aerosol absorption in the Mediterranean utilizing AERONET ground based observations and available satellite measurements. The ground-based component of the analysis is methodologically sound, and constitutes an important contribution in the regional and temporal analysis of AERONET aerosol absorption observations.

The satellite based analysis of three aerosol single scattering albedo data sets, however, is not well carried out. It lacks a consistent methodology in the description of the products, their expected accuracies, and associated validation/assessment analysis. The authors seem particularly unfamiliar with the OMI and MODIS Deep Blue SSA products. In their analysis and conclusions they tend to exaggerate the quantitative significance of the temporal and spatial variability of MISR SSA, a product admittedly meant to be used categorically rather than quantitatively.

If the authors are indeed interested in assessing the strengths and limitations of SSA retrieval techniques from space observations they should carry out a direct quantitative evaluation of these products using AERONET, SKYNET and other data bases as reference. Such an evaluation effort will benefit from the participation of scientists associated with the OMI and MODIS SSA products as well.

## 2. Specific Comments

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Line 10. The authors characterization of AERONET SSA retrieval accuracy is inaccurate. Dubovik's 2000 paper states a SSA accuracy of 0.03 for AOD > 0.2 only for water soluble aerosols. The same paper states the accuracy of desert dust and biomass burning SSA as 0.03 for AOD > 0.5 and solar zenith angle larger than 50 degrees. The Dubovik et al papers (2000, 2002) describes the SSA accuracy for AOD (440 nm) < 0.2 as 0.05 ~ 0.07. The authors should present a more detailed discussion of version 2.0 assurance criteria based on Holben et al, 2006 (AERONET's version 2.0 quality assurance criteria, SPIE, Volume 6408, SPIE paper number 6408-27).

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Line 4. Mention the spatial resolution of the monthly MISR SSA products. What is the typical number of days per grid-point per month when MISR SSA is retrieved? How representative of a monthly average are these measurements?

Line 8. In spite of the stated 'categorical' nature of the MISR SSA product, later in the paper it is used quantitatively with an implicitly assumed unprecedented accuracy. If the MISR SSA is to be used quantitatively, a reference-supported statement of the expected accuracy should be provided, indicating and what the possible sources of error are. Provide references of correlative analysis of MISR SSA with AERONET or other independent measurements. Also provide references on MISR assumptions on real and imaginary refractive index.

Line 13. At what temporal resolution and to what SSA accuracy can MISR separate adjacent air masses in terms of SSA? Are MISR statistics suitable for an analysis of regional patterns as suggested as the aim of this work?

Line 25: Provide reference for stated accuracies of OMI retrieved products.

Line 26: The OMI near UV algorithm does not retrieve SSA at 500 nm. The retrieval is actually carried out at 388 nm, and converted to 500 nm [Torres et al., 2007]. What is the spatial resolution of the monthly OMI SSA product. What is the typical number of days per grid-point per month when OMI SSA is retrieved? How representative are these monthly statistics? Provide references of correlative analysis of near UV retrieved SSA with AERONET [JGR, Torres et al., 2005; JGR, Torres et al, 2007]

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Line 1. Provide a reference to support the statement on the higher reliability of OMI retrievals over land.

Line 7. OMAERUV assumes real refractive index and particle size distribution. No assumption on imaginary refractive index is made.

Line 8. What is the typical number of days per grid-point per month when MODIS SSA is retrieved? How representative are these monthly statistics? Provide references of correlative analysis of MODIS retrieved SSA with AERONET observations.

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Line 8. In addition to retrieval accuracy, an important difference between versions 1.5 and 2.0 is instrument calibration. Version 2 data is produced after the instrument is recalibrated. Aerosol inverted products are particularly dependent on calibration. Therefore, version 1.5 and 2.0 sky-radiance-derived data should not be combined. Please comment.

Line 6. The presence of OC in biomass burning plumes has been confirmed by OMI satellite observations [Jethva and Torres, ACP, 2011]

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Line 10. What it is even more important AERONET does not make any absorption measurements at wavelengths shorter than 440 nm where the influence of brown carbon absorption is more prevalent.

Line 15. The work of kirchstetter et al [JGR, 2004] and Jethva and Torres [ACP, 2011] confirm the high AAE values of smoke aerosols when taking into account wavelengths shorter than 440 nm.

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Lines 2-4 This is a highly speculative statement that adds nothing to the discussion, taking into account the documented uncertainty of AERONET SSA retrieval (0.03).

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Line 9. It should be mentioned that the North-South gradient observed by OMI is consistent with AERONET AAOD observations in Figure 3 while MISR shows an opposite trend.

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The author's interpretation of the MISR SSA data in this paper is ambiguous and confusing at best. On page 9275, the authors clearly state that the MISR SSA data is to be treated as 'categorical' rather than quantitative. They seemed to stick to that position when discussing the N-S gradient absorption clearly present in both AERONET (Figure 3) and OMI observations but missed by MISR (Figures 13 and 14) which actually shows a reversed gradient. However, in the analysis of data over the Mediterranean the authors suddenly shift to a detailed numerical interpretation of the MISR data assigning to it unprecedented accuracy in satellite derived SSA. They report an alleged east(0.96~0.98) - west (0.97--0.98) on the basis of a seasonal difference of ~ 0.01 in single scattering albedo difference between the two regions over different time periods. That regional difference would be statistically insignificant even for AERONET measurements whose accuracy is +/- 0.03. How can then any significance be given to such small number based on a parameter not meant to be used quantitatively, without regard to the poor temporal and spatial sampling of the MISR sensor and undocumented accuracy of the SSA product?

The existence of the alleged east-west gradient in the AERONET data can't be supported either based on the data presented in the paper. There are no AERONET measurements of SSA in the Mediterranean geographically representative of the satellite measurements. An analysis of AERONET SSA data in the Mediterranean coastal and island stations in Table 2 shows statistically insignificant differences (~0.92) for both basins.

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Lines 10-12. Can any conclusion really be derived about the differences in absorbing properties between the Eastern and Western basins within the undisclosed uncertainty of the MISR data?

### 3. Minor Comments/corrections

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Line 5 What is the meaning of the quotes in 'pure'

Lines 9 and 13. Replace tendency with trend.

line 23 What is the meaning of the quotes in 'dusty'?

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Line 9. Is this correlation scientifically relevant?

Line 9285

Line 2. Replace 'explains' with 'would explain'.