Dear authors,

I have read the reviewer comments and the answers.

To my point of view the paper still has a number of major methodological issues and also issues on describing the assumptions made in this work in order to end up in the conclusions.

Major aspects

The work has a major disadvantage. It tries to describe the effect of aerosol properties in the UV Index not having any aerosol properties measured at this region. So in order to end to the current conclusions there are the following assumptions:

- Ang. Exp derived from 400-500 range is accurately describing AOD at 305-315nm which is the effective (or the most important) wavelength range for UVI.

This can not be true as the introduced uncertainty is aerosol type dependent

- SSA in the visible range is equal or proportional with the one at UVB range for all aerosol types.

It is mentioned in the introduction that SSA spectral dependence is depending on the aerosol type.

- PM10 analysis ("In fact, assuming that the in situ measurements are representative of the entire column,…"). Based on the text and fig. 3 this is difficult to assume as there are a number of dust cases where is commonly known that aerosols can be found a lot heigher than the surface.

These three issues have to be re-discussed and relevant uncertainties and discussion has to be included.

Authors correlated UVI with AExp, AOD and SSA separately. Maybe it is a way to face the difficulties risen from the previous mentioned comment.

But in general. If SSA measurements are available UV changes are proportional to

AOD* (1-SSA). However, the spectral dependence of SSA is obviously affecting the results here. An example:

Figure 9a slope = -1.77 and Figure 9b slope = -2.96. That shows that for a unit of aerosol optical depth the decrease of UV index in an absorbing (at visible range) environment (fig. 9a SSA<0.85) is less than the one with less absorption (fig 9b SSA>0.85). Even combined with the intercepts fig 9a reports a ~25% reduction of UVI per unit of AOD and fig 9b a ~36% reduction per unit of AOD.

Is this possible ?

Possibly it means SSA spectral dependence affects this analysis.

And this SSA spectral dependence also probably linked with AOD (through different aerosol types). Something that also Bais et al., 2005 (Effects of aerosol optical depth and single scattering albedo on surface UV irradiance". Atmospheric Environment, 39, 1093-1102, 2005) has shown.

Same is valid for figures 9c and 9d. Still lower SSA cases (9c) are linked with smaller UV changes for the same (a unit) of AOD and also theoretically larger air masses (θ=40) should be linked with higher UV changes for the same AOD and SSA due the increased path of the atmosphere where the UV attenuates due to aerosols.

Other comments

Abstract

"The surface forcing efficiency, provided by the decreasing trend of UV index with AOD, which is the primary parameter affecting the surface irradiance during clear sky conditions in Rome, was found very significant, probably masking the dependence of UV index on SSA and Ångström exponents."

In general, to quantify the effect of AOD, and SSA separately you need to keep one of the constant especially here that they are interconnected. Theoretically the effect of AExp in UV here is just the effect of extrapolating correctly from the visible to the UV range.

"Moreover it was found greater for larger particles and with a more pronounced slope at the smaller solar zenith angle."
I can not understand this sentence.

Introduction

"because in this wavelength region the columnar absorbing and scattering properties of suspended particles are not deeply inspected as in the visible spectral range."

I would suggest "because aerosol absorption properties in the UV are more difficult to be determined compared with the visible range"

(SSA), that change to (SSA) that

Optical depth (AOD) -> aerosol optical depth (AOD)

Aerosol optical depth = AOD , single scattering albedo = SSA from then on to the whole document.

Especially in winter - (I think in all seasons)

“di Sarra et al. (2002), Panicker et al. (2009), and Antón et al. (2011), among others, have shown that an increase of AOD induces a reduction of the UV index (UVI), an effective parameter to quantify the potentially harmful effects of UV radiation.”

I do not understand this paragraph. Increase of AOD will lead to a UV decrease this is trivial. But how much it depends on other parameters and also by the use of AOD at UV wavelengths and not in 400nm. An effective aerosol related parameter not related with AOD but more with SSA and other aerosol optical properties can be defined as the aerosol radiative forcing efficiency (RFE) (e.g. see Kazadzis et al, 2009 (www.ann-geophys.net/27/2515/2009/). There is also a report there on how SSA can affect the RFE in an environment with much similarities as Rome.

Aerosol PREDE/POM measurements. You need to describe the aerosol properties you use in this study (AOD, SSA, Ang. Exponent) of which wavelengths and what is the uncertainty of these measurements.

“For sza>40, as in wintertime”, I think For sxa>40 is enough as straylight and cosine effects mentioned here are only related with SZA and not seasons.

The performance of the Brewer instrument for UV measurements was controlled every two years till 2014 through intercomparisons to the traveling reference QASUME UV spectroradiometer (Groebner et al., Applied Optics, 44 (25) 2005).

I would also propose to put this paragraph starting “the performance of the Brewer …till … Sianni et al., 2013)” in the end of this section after ..extrapolation”

SHICRIVM algorithm needs a reference

The elastic LIDAR … days affected by dust” . How ? (reference or text).

Methodology

Infact - > In fact

“To point out the possible effect of aerosol optical characteristics measured at 400 nm on UVI*, AOD400, SSA400, Ang and Ang400-500 were analyzed as function of UVI* at the two fixed solar zenith angles, taking estimations of aerosol parameters and UVI* within ±5 minutes.”

As said this is my main concern for this paper. The representativeness of aerosol properties in the UV solely by measurements in the visible.

AERONET and Skynet comparison: I think this paragraph is confusing.

On the one hand when results agree, authors conclude that results are within the Skynet standard deviations (this also should be replaced by Skynet uncertainty), but for March and May the authors refer to spatial issues due to the non collocation of the instruments.

“In fact, assuming that the in situ measurements are representative of the entire column,…”

How can this be possible when there are a number of dust events (fig 3) that in general affect much more the columnar properties due to the presence of aerosol plumes higher in the atmosphere ?

“The general behavior of observed five micro sources.. has been assumed not substantially changed in the last years” .

This is difficult to assume looking at the SSA variability for the 7 year period on fig. 1 and the text: “SSA_{400} vary between a minimum value of 0.84±0.08 (observed in 2016) and a maximum of 0.97±0.03 (observed in 2015).” This is a huge change in absorption that for sure has to do with changes in the aerosol type composition in the atmosphere.

Conclusions

Need to follow a number of previous aspects mentioned here.