Item-by-item response to Reviewer #2

The authors greatly acknowledge the reviewer for carefully reading the manuscript and providing constructive comments that have led to an improved paper.

This document contains the author's response to comments from reviewer #2. Each comment is discussed separately with the following typesetting:

*** Reviewer's comment**

++ Author's response

Changes in the manuscript

Specific comments:

* **Firstly, the model underestimation of clear sky erythemal irradiance needs more of a discussion. A low single scattering albedo (SSA) for aerosol is will give rise to lower irradiances. Estimation of SSA at 440 nm by the Cimel radiometer is not necessarily a good estimate of the SSA for erythemal wavelengths (Petters et al., 2003; Kazantzidis et al., 2001; Bais et al., 2005, Nunez et al., 2010). Not using a lower SSA in the UVSPEC model will produce relatively lower UVER compared to measurements. These lower UVER value will of course not appear in empirical models of UVER as in equation 2 of this paper.**

++ The radiative transfer code used in our study overestimates the experimental erythemal irradiance data during clear sky conditions (mean bias of 8%). The modeled clear sky values were derived assuming cloud-free conditions. In addition, the atmospheric aerosol for these simulations was the natural background. For that, we set to constant values of 1.20 and 0.03 for the Angström coefficients, α and β, respectively. This means a low aerosol load (AOD=0.11 at 340 nm). Therefore, the influence of the the SSA on modeled UVER values is quite limited. In this sense, we have used a fixed SSA value equal to 0.88 in the simulations for clear-sky cases. Changes around this fixed SSA value will produce small variations in the modeled UVER data. For instance, if a strong absorption of the aerosols is assumed in all simulations (SSA=0.78), the modeled UVER values present variations smaller than 2% with respect to the simulated data using SSA=0.88. In summary, the fixed SSA used as input in the simulations of clear-sky UVER data cannot explain the overestimation found in our study.

*** Secondly, it is probably somewhat misleading to say that the Cimel radiometer only provides information on cloud properties at the local zenith. The method is based on the difference between two zenith radiances in the visible and infrared wavelengths (440, 870 nm). While the visible radiance comes from the base of the cloud, the contribution from infrared radiance comes from the ground surface which reflects highly due to vegetation and is further reflected by the cloud base into the radiometer. The extra infrared radiance comes from the entire sky hemisphere and which is reflected by the vegetated surface (Marshak et al., 2000; Barker and Marshak, 2001). How much vegetation is in the experimental area?**

++ The cloud-mode retrieval method indeed requires the presence of green vegetation in the surrounding area. Surface albedo estimates for Granada during June–November 2007 were (0.077±0.004) and (0.262±0.016) at 440 nm and 870 nm wavelengths, respectively. The normalized difference vegetation index (NDVI) is greater than 0.3, providing a sufficient surface albedo contrast for the cloud-mode retrieval method. All this information has been included in the text.

The reviewer is right; determining the size of the effective area that cloud-mode retrievals represent is difficult, because it depends on surface albedo as well as cloud base height. Since we mainly focus on low stratiform water clouds in this study, the local surrounding area and overhead clouds have a much larger contribution to the determination of cloud optical depth. To avoid misleading statements, we have revised our wording and provided some explanations.

*** While the paper discusses the possible spatial variability of the cloud regime, there is little mention of cloud type. Altostratus or cirrostratus clouds are expected to be homogeneous in their spatial variability, but cumulus or stratocumulus are expected to be highly variable as they are influenced by boundary layer processes (Nunez et al., 2005). The authors need to provide some indication of dominant cloud types in their study area.**

++ The authors agree with the reviewer's comment that the characterization of cloud type over the area is relevant. Unfortunately, cloud information is not available from ground-based instruments during the period of interest therefore, a study based on satellite information for the overcast cases analyzed in the paper was done. For this purpose, MODIS cloud product level 2 data (1 km spatial resolution – MOD/MYD06, Collection 5.1) obtained from the Level 1 and Atmosphere Archive and Distribution System (LAADS, http://ladsweb.nascom.nasa.gov) have been collected in correspondence with the dates and times of the cases considered in the paper, for overpasses differing less than 30 minutes from the cloud-mode measurements. Since cloud-mode retrievals are based on water cloud assumption, ice cloud cases need to be minimized to warrant a meaningful intercomparison in Fig. 1. To estimate the possibility of ice cloud contamination in our intercomparison, cloud phase retrievals from MODIS cloud product were checked. The analysis shows that 85 % of MODIS retrievals correspond to liquid water clouds.

A discussion on this has now been added to the manuscript, in the end of the first paragraph of Section 4.