Response to Reviewer1

"In my opinion the manuscript Direct radiative effects of intense Mediterranean desert dust outbreaks is acceptable for publication in ACP in its current state."

Thanks!

Before our paper being published in ACPD, the reviewer made the following comment and the Editor suggested that it should be answered in the current review process. Please find our response (regular font) below the reviewer's comment (bold font).

"My major concern is how the model takes into account the relative humidity to scale the optical (e.g. real and imaginary refractive indices) and the microphysical properties (e.g. size) of the aerosols. As authors well-know and say within the manuscript the water vapor influences SW and LW spectral ranges. It is not clear for me how the RRTMG considers this significant aspect (RH). An analysis the relative humidity (RH) in this area for these 20 desert dust cases would be very clarifying because it is huge important to go through how the RH changes from day to night times and how the desert dust optical and microphysical properties vary from day to night times. Relevant parameters in your calculations are the mass extinction efficiency, the single scattering albedo and the asymmetry parameter. The effect of the RH over them is well explained by Myhre et at. (1998)."

In the NMMB-MONARCH model, dust aerosols are externally mixed and hydrophobic. Therefore, no hygroscopic growth is considered and subsequently the RH effects are not taken into account in the RRTMG. This assumption, it is not expected to introduce large errors since it is well documented in literature that mineral particles are mainly hydrophobic and consisted of insoluble substances, particularly over desert regions. Of course, it is also known (e.g. Sullivan et al., 2009; Knippertz and Stuut, 2014) that dust hygroscopicity increases through mixing soluble of hygroscopic material with insoluble mineral particles, thus leading to the formation of internal mixtures of dust and sulfate, which can make mineral particles more soluble. Nevertheless, it should be noted that for such atmospheric processing to take place, time is needed and that this increase of dust hygroscopicity mainly occurs through aging. However, our study focuses on intense dust episodes above the Mediterranean, which basically transport fresh, and thus hygrophobic, dust particles. This clarification has been added in the revised manuscript (Lines 283-284). The paper of Myhre et al. (1998), regarding the effect of RH on optical properties, refers to sulfate and soot aerosols, and not dust.