Dear Referee,

We are grateful for these constructive comments. Our answers to the main points of your review are as follows.

[Referee] The abstract could/should better stress: What is new? What is the advantage of the new approach? : : :.compared to other, published (well established) schemes.

We will try to address this in the revised version of the paper.

[Referee] The authors may want to cite the recent overview paper of Knippertz and Todd, Rev. of Geophys.

Thank you for this suggestion. The paper was not formally published at the stage when we submitted our manuscript. It is certainly a relevant reference which we shall include in the new version.

[Referee] It would be of advantage to distinguish more clearly between dry PBL convection and deep moist convection.

Thank you, we will go through the manuscript and see at which places this differentiation needs to be emphasized.

[Referee] It is not clear to me whether the model approach is now applicable to dust devils or not? Can one also use such an approach to detect dust devils and convective plumes (e.g., by analyzing meteorological fields of temp, wind, pressure) and to quantify their impact on dust emission? Or, at least to see whether meteorlogical conditions are favorable or not?

…

[Referee] Furthermore, a rough estimation (quantification) of the impact of this dry convection process (emission) should be given, i.e., what is the relative contribution to total dust emission. Renno stated a contribution of 35% by convective plumes and vorticities to the global buget. Does your study corroborate that?

Dust devils are special cases of large convective eddies with high dust concentration. Our new dust emission scheme does therefore also include dust produced by dust devils. The presented approach can be easily applied to LES, where small-scale turbulence is resolved. These resolved meteorological fields can be used to determine momentum transport directly. With this, the dust contribution of dust devils or convective plumes can be investigated. We are currently preparing another paper addressing these issues in more detail. Since the present paper is based on a meso-scale model, it only simulates dust emission on regional scales and does not directly simulate dust devils.

[Referee] At many places, more details and descriptions (in the derivation steps) would facilitate reading.

We needed to find a compromise between concentrating on the main points and giving enough information to enable understanding. We appreciate your comments and will try to improve the manuscript.

[Referee] What is missing is a more extended comparison with literature values and results (obtained with other implemented, established schemes), and this not only for low winds.

Until now, most research concentrated on strong wind conditions and dust emission is mostly measured for wind speeds larger than a certain threshold. Consequently, literature values are unfortunately very rare. Our scheme is designed to represent convective turbulent dust emission as an addition to existing dust emission schemes. Wind-tunnel and field experiments are being considered and we plan to carry more detailed scheme validations in future studies.

[Referee] It would be interesting to see (discuss) the size distribution of the emitted dust and sand. It is reported in the literature that not only dust but also sand particles (diameters > 60 microns) are lifted by dust devils. Ist that true? What do your simulations show here?

Our model predicts size-resolved dust emission, but currently only for 4 size bins up to 20 microns. Particles with diameters larger than 60 microns are therefore not represented. Newer data will become available in the next two years.

[Referee]Section 3.1: Can you provide more details regarding : : :cohesive forces can be treated as a stochastic variable: : :.. Are the data of Zimon (1982) representative. I did not read that paper. What about chemical binding forces, they also show a stochastic behavior.

As indicated in the mentioned section (Section 3.1), the retarding force is composed of several forces among which one component are the chemical binding forces. As the characteristics of each particular particle as well as that of its environment are highly variable, the forces contributing to the cohesive force also vary by a large degree. This leads to the stochastic behavior of the cohesive force.

[Referee] Section 4.2.1: When integrating the lidar data from ground to, e.g., 10 km height, what about the lowermost 1 or 2 km, where the lidar is not really trustworthy (overlap problems).

We are aware of the overlap problem and the lidar data have been empirically corrected for the lowest few hundred meters with reference to the ground dust concentration measurements. At this stage, no better data are available to the authors.

[Referee] What about co-authorship of the Japanese lidar people. They contributed to an important figure (Figure 6). The problem is probably that this is a two-author paper.

The main purpose of this paper is to introduce our new idea on convective dust emission. The mentioned figure is used to provide a preliminary validation of the scheme, but it is not our emphasis. We therefore believe, with consultation with our colleagues, it is appropriate to mention their contribution in the acknowledgement. Now that we are more experienced with the model, we have plans to start an extended work in collaboration with our Japanese colleagues in the coming years.