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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of satellite microwave backscattering (ASCAT) and visible/near-infrared reflectances (PARASOL) for the estimation of aeolian aerodynamic roughness length in arid and semi-arid regions" *by* C. Prigent et al.

Anonymous Referee #3

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Review on the manuscript entitled: "Comparison of satellite microwave backscattering (ASCAT) and visible/near-infrared reïňĆectances (PARASOL) for the estimation of aeolian aerodynamic roughness length in arid and semi-arid regions" by C. Prigent, C. Jimenez and J. Catherinot submitted to Atmos. Meas. Tech. Discuss.

The manuscript is focussed on the estimation of the aerodynamic roughness length

(z0) in arid and semi arid regions. The potential of two satellite approaches is discussed: visible/near-infrared observations (PARASOL part of the A-Train) and microwave backscattering measurements (ASCAT on board MetOp). The main objective of the paper is to derive a global map of z0 at 6km spatial resolution for arid and semi arid regions. This can be useful for atmospheric dust modelling. The manuscript contains a number of questions regarding the method used to derive z0 (semi arid regions, winter selected period, interpolation method...). These are described below. Also, additional work on the discussion of the z0 products appears to be necessary (PARASOL z0 vs ASCAT z0 in desert areas). Consequently, the manuscript requires important revisions before publication.

p. 2936, l. 20-22: "Our objective here is to find a practical relationship between the ...". Over arid regions, z0 is expected to be stable in time. Is it also the case for semi arid areas (seasonal vegetation, agricultural activities...)? How can the temporal variability of the vegetation in semi arid areas and its influence on the z0 derived from satellite observations be taken into account? Please discuss this point in the paper.

p. 2938, l. 20: "Figure 1 shows the mean k1/k0 coefficient for the 2007-2008 winter...". The median k1/k0 was used in previous studies (e.g. Marticorena et al., 2004). For this kind of applications, median values seem to be more relevant than averaged values. Why the mean k1/k0 coefficient is used here and what would be the results using median values?

p. 2939, l. 2-3: Please indicate the location and coordinates of the three different zones (a,b and c).

p. 2940, l. 10: "For this study, the 865 nm observations during the 2007 winter months will be used". The large variability of the shorter wavelengths is clearly pointed out by the authors (Fig. 2, 443 nm and 565 nm). For the third region (Fig. 2, c, right panel), variations are observed for the 3 wavelengths (670 nm, 765 nm and 865 nm). The use of the 865 nm observations instead of a combination of the observations at the 3

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wavelengths is not obvious for me and needs to be discussed more in detail.

p. 2940, l. 11: “For this study, the 865 nm observations during the 2007 winter months will be used”. The authors well-explain that winter months were chosen because the atmospheric dust contamination is the lowest during this period. The winter months (Nov. to Feb.) were chosen for North Africa and the Arabian Peninsula (p. 2938, l. 15-23). Yet, the seasonal variability of the atmospheric dust load is not the same for the different desert regions. In order to establish a z0 global map (Fig. 6 A), it needs to be pointed out which winter months were considered for the desert regions of the southern hemisphere (Nov. to Feb. are no winter months there). For instance, in Australia, October to March are considered to be the months of maximum atmospheric dust-loadings. Please indicate clearly in the paper which months were chosen for the different desert regions and add references to confirm their low dust periods.

p. 2940-2941, 2.3 In situ data: Please indicate which of the in situ data used correspond to arid regions and which ones correspond to semi arid regions. To derive z0 for arid and semi arid areas, statistical relationships should be established using in situ data representative of both arid and semi arid regions. Please discuss also if the same relationship can be used to obtain z0 for arid areas and for semi arid areas.

p. 2942, l.23: “A good correspondence is obtained between the two satellite products...”. Please indicate the PARASOL and ASCAT z0 values corresponding to the different locations in Table 1. This can help to discuss quantitatively the correspondence between the z0 datasets derived from the two satellite products.

p. 2943, l. 18: “Only regions with z0 lower than 0.1 cm are represented, corresponding to arid and semi arid areas.” Could you please explain how this 0.1 value was chosen? In Table 1, half the z0 values (14/29) corresponding to desert regions are higher than 0.1 cm. Maps of z0 estimates presented in Fig. 6 should be produced using a relevant threshold value.

p. 2943, l. 19: “For PARASOL, the averaged 2007-2008 winter observations are

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considered. . .". Please indicate the winter months for the northern and the southern hemispheres (see previous comment p. 2940).

p. 2943, l. 22: "For ASCAT, z0 is estimated from the yearly average (July 2007-June 2008)". The ASCAT standard deviation for the entire year 2007 was high in the Sahel on the map presented in Fig. 1 F. A yearly average might not be adapted for semi arid regions. Please discuss if the seasonal variability of z0 in vegetated semi arid regions can be problematic (seasonal vegetation, agricultural activities). Please discuss the relevancy of z0 monthly maps for semi arid regions to be used in atmospheric dust models instead of a yearly average.

p. 2943-2944: Contrary to the "good correspondence [. . .] obtained between the two satellite products. . .", the z0 maps (a,b) in Fig. 6 present different patterns (location of the higher and lower values. . .). Please discuss the differences observed between the two z0 datasets in the desert areas in details. Merging the two dataset seems tricky.

p. 2944, l. 1-4: When the PARASOL observations are not present, z0 retrieved from ASCAT observations should only be at 25 km spatial resolution.

p. 2944, l.6-11: "Regions that are likely rather wet. . ." "This suggest that. . .". The relationship developed here can be used to obtain z0 for desert areas but may not be easily extended for other regions.

p. 2950, Tab. 1: Please add two columns in Table 1: one for the PARASOL z0 values and another for the ASCAT z0 values obtained for these locations. This can be complementary to Fig. 4 and can help to have a quantitative discussion of the differences between the two z0 datasets in the paper.

p. 2953, Fig. 3: Please rewrite the z0 equations presented on the plots (z0 should be in cm). Please also present the bars indicating the standard deviation over the area for ASCAT.

p. 2954, Fig. 4: A scatter plot of log(z0) would be more relevant to present and

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discuss the results. z0 values presented in Tab. 1 range over more than three orders of magnitude (0.002 - 0.873 cm).

p. 2955, Fig. 5: Same comments as for Fig. 3. Please rewrite the z0 equations presented on the plots (z0 should be in cm). Please also present the bars indicating the standard deviation over the area.

p. 2956, Fig. 6: In order to interpret the z0 maps and discuss the variability of z0 values over several order of magnitude, log(z0) should be mapped. Please make new maps of A, B and C.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 2933, 2012.