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Supplement of

The influence of dust optical properties on the colour of simulated MSG-SEVIRI Desert Dust infrared imagery

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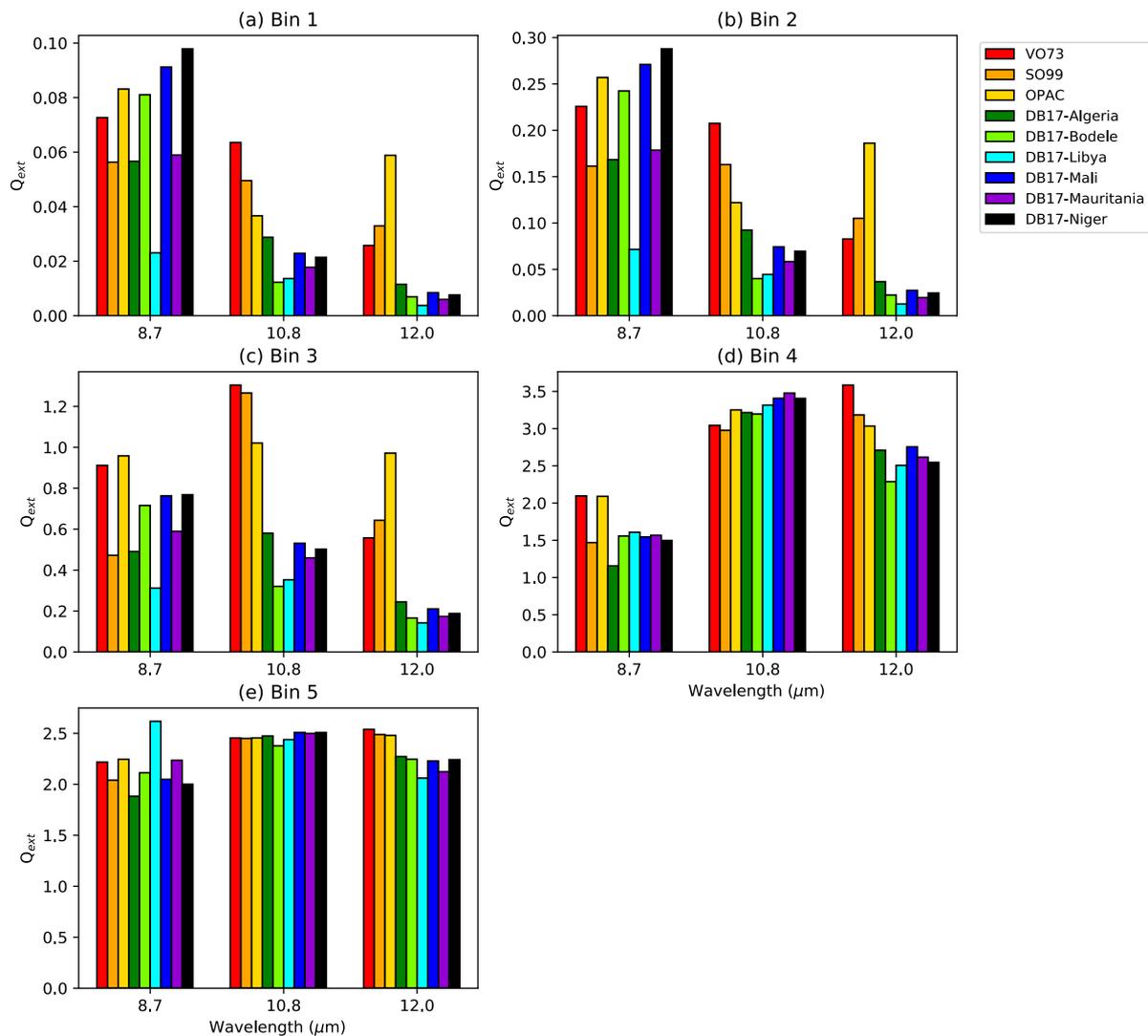
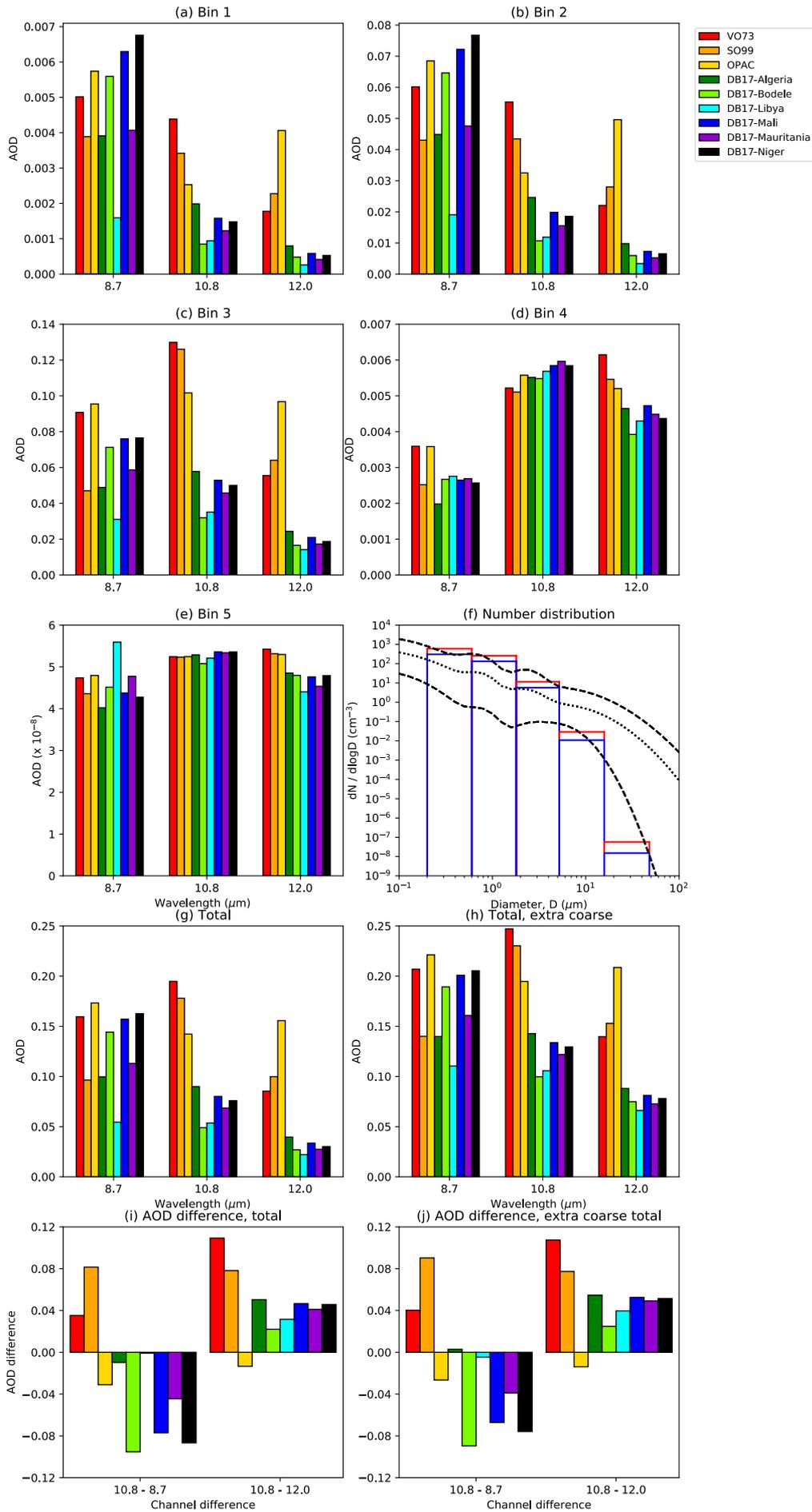


Figure S1: Plots of IR extinction efficiencies for the five size bins, for MSG-3, and for each set of IR refractive indices considered in this study. Note that each panel has a different y-axis scale. The particles are spherical.

Figure S2 (overleaf): Plots of IR AODs, as per Figure 5 for panels (a-e and g). Panel (f) is the mean number density distribution over BBM during June 2013, as per Figure 6. Panel (f) suggests that the simulated concentrations in bin 5 are of order 10^6 times too low, so as a sensitivity study panel (h) describes the total IR AODs when the concentration in bin 5 is multiplied by a factor of 10^6 . Panels (i) and (j) explore the consequences for the inter-channel differences in AOD, for the channel combinations which govern the green (10.8-8.7) and red (10.8-12.0) beams.



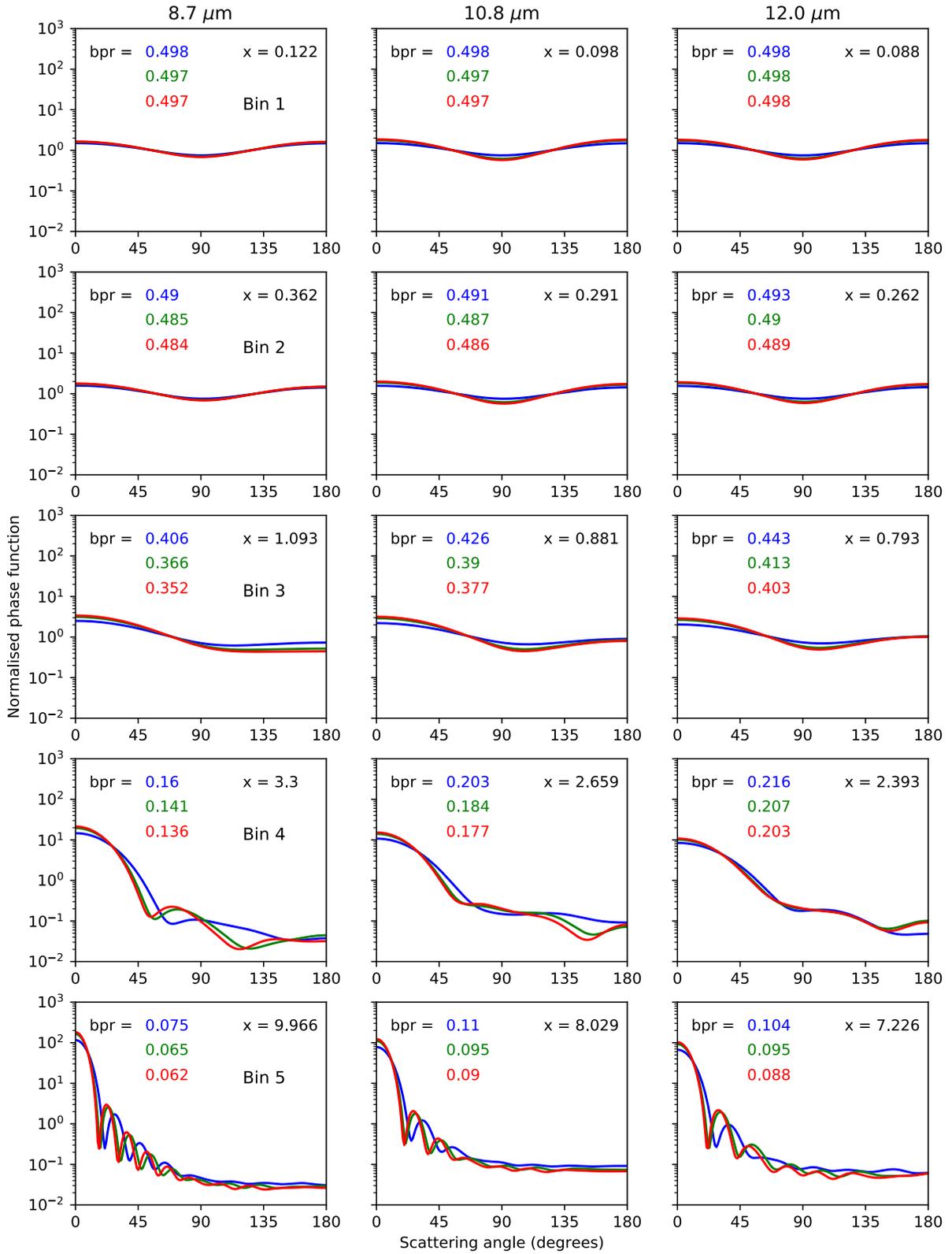


Figure S3: Plots of normalised phase functions for the three wavelengths of interest (columns) and the five dust size bins (rows), as a function of scattering angle. x is the scattering parameter, bpr is the back-scatter parameter. The lines are colour-coded by aspect ratio for horizontally-oriented dust: blue is $AR = 1$, green is $AR = 1.7$, and red is $AR = 2$.

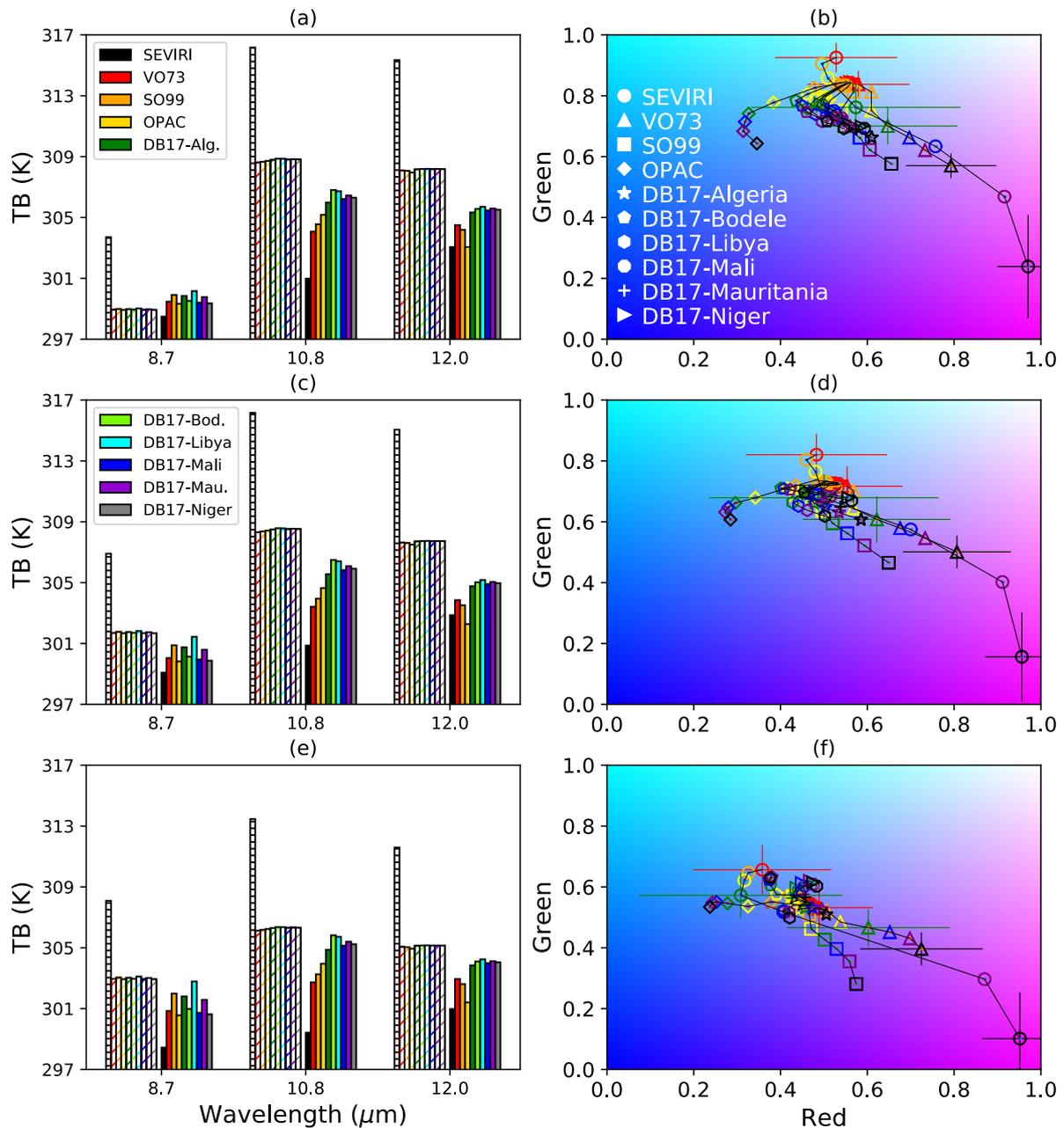


Figure S4: As per Figure 10, including a larger range of DB17 dust types. Mean brightness temperatures and colours across the domain for three ranges of surface emissivity values, for the SEVIRI measurements/retrievals and nine of the dust simulations, for the Junes and Julys of 2011-2013. Using emissivity at $8.7 \mu\text{m}$, the panels are: (a, b) emissivity from 0.7-0.8; (c, d) 0.8-0.9; (e, f) 0.9-1.0. The simulated dust is spherical. Per panel of brightness temperatures (left column), within each individual wavelength set there are two groups of bars: the striped bars on the left are points with AODs between 0 and 0.2 (i.e. the most pristine-sky case); the bold bars on the right are points with AODs between 2 and 3. The mean colours (right column) are plotted within specified AOD ranges denoted by the coloured symbols: red is 0-0.2; orange is 0.2-0.5; yellow is 0.5-1; green is 1-1.5; blue is 1.5-2; purple is 2-3; black is > 3 . The blue beam is held fixed at 1. Error bars denoting the standard deviations of the mean values are only included, for clarity, for three of the SEVIRI and the VO73 points.

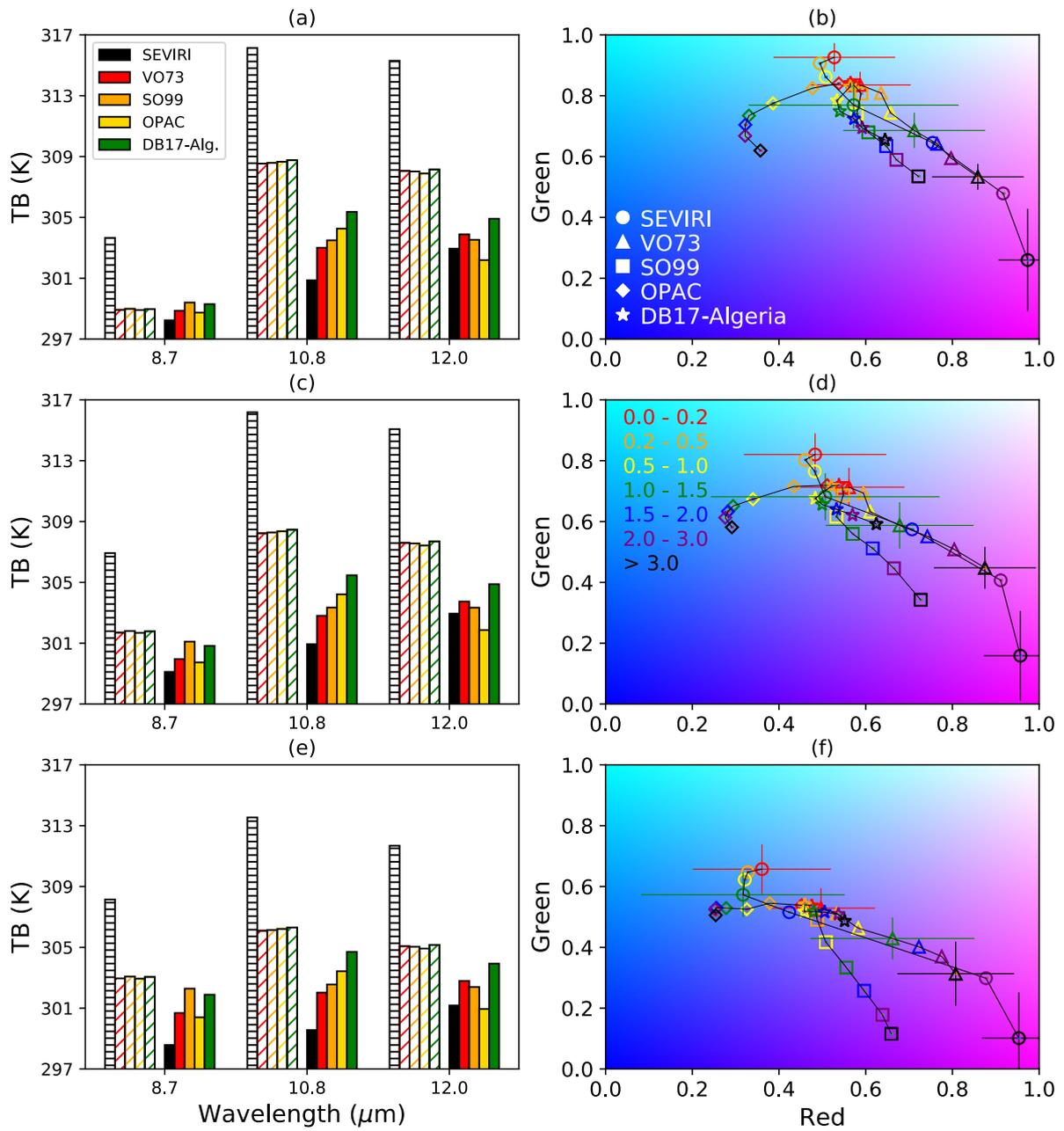


Figure S5: As per Figure 10, but for horizontally oriented dust with an AR value of 1.7.