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The impact of dust particle morphological details on light scattering

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We investigate the impact of dust particle surface roughness and internal structure on light scattering. Starting from digital representation of realistically shaped dust particles, we vary the particle morphology, and perform light scattering simulations to both the original and the modified particles. By mapping the changes in morphology to the changes in scattering, we will get information of how strongly and in which way a particular change affects scattering.

All investigations have been done with complex, irregular particle shapes. For surface roughness studies we have kept the particle total volume virtually constant during the roughening process, and the roughness element size small enough to keep the overall shape relatively unchanged. For internal structure studies, the size and the external shape are kept constant. These safety measures help ensure that the effects seen are in fact due to the feature studied.

The work is notable for model development, because some models can not include surface roughness, for example. In that case, the people who use such models have to adjust for the fact that the results are inaccurate, and by knowing how surface roughness typically changes the scattering results, the adjustment can be made. As a corollary, if it is shown that a particular feature does not change scattering results in any noticeable way, the model developers can confidently ignore or simplify it.