**Atmospheric
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Interactive comment on "Adaption of the MODIS aerosol retrieval algorithm by airborne spectral surface reflectance measurements over urban areas: a case study" *by* E. Jäkel et al.

Anonymous Referee #2

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This manuscript addresses the role of urban surface albedo in error in retrievals of aerosol optical depth from satellite. This is an important issue for the quality of satellite products and land cover and aerosol distributions continues to change. The case study uses airborne measurements to derive a spectral surface albedo over an urban area in China and to use this information to modify the fixed aerosol optical depth retrieval algorithms in MODIS C5 and C6, comparing the existing, operational algorithms to the algorithms modified using the measured urban surface albedo. This work represents an incremental improvement in retrievals of aerosol optical depth in urban regions and other areas with high surface reflectance.

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One glaring omission in this manuscript is the lack of explanation or discussion of the poor performance of the MODIS C6 algorithm as compared to C5 when modified for an urban surface albedo. It is noted that the performance is poor, but there is no attempt to help the reader to understand why. Since C6 presumably represents the current operational algorithm, applying modified slopes for urban regions would not improve AOD retrievals, thus it is critical that this issue be addressed. The way the paper is written leaves the question completely open as to how or if this work could be used to improve operational retrievals.

Another issue that goes without explanation in the manuscript is the use of the full measured spectrum from the SMART Albedometer to develop slopes for the urban land cover. Given Eq 2 and 3 and that the algorithm is completely dependent on reflectance of the surface/atmosphere system at 2.1 um, it is curious that the authors do not attempt to use information from the instrument in that spectral region. Reflectances are relatively flat near 2.0 um and it seems that some information could be used rather than ignoring the dependence in Eq 2.

Specific p7336, l11 – the abstract states that "slightly lower AOD values were derived. . ."; this statement should be quantified and further qualified (explained) – this is the whole point of the paper – some values are given at the end of the abstract but again, the C6 results are ignored – this does not tell the whole story p7338, l9-10 – the meaning of the statement about chemical transport models here is unclear – this seems out of context in this paragraph (or even the paper) p7341, l12 – 'due to a coding error' p7347, l25 – 'bias between the two regressions.' p7349, l8 – 'In this case, differences in the derived AOD. . .' p7349, l10 – 'Data were chosen. . .' p7350, l19 – 'observe a significant improvement. . .' p7353, l22 – remove dash p7354, l26 – 'indicates less spectral dependence. . .' p7355, l14 – 'alloy'? – not sure of the meaning of this word p7366, Fig 2 – the error bars for the surface reflectance are almost impossible to see – can color be used to differential and clarify the two sets of error bars? – otherwise the figures are nicely presented

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 7335, 2015.

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