Atmospheric Measurement Techniques Discussions

Interactive Comment

Interactive comment on "Atmospheric correction of thermal-infrared imagery of the 3-D urban environment acquired in oblique viewing geometry" *by* F. Meier et al.

Anonymous Referee #1

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The paper "atmospheric correction of thermal-infrared imagery of the 3-D urban environment..." by F. Meier et al. describes a useful atmospheric correction scheme and demonstrates its application in practice. My points of criticism are essentially restricted to details of the presenation (I would like to recommend to expand Sections 2.1/2.2), I identified only one significant conceptual error (improper vignetting correction) which needs to be corrected. At the end of this review, I list a few minor corrections.

The discussion of contributions due to environmental thermal radiation scattered from a ground surface element observed by the camera is not fully self-consistent. If in

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the end you omit this contribution, this implicates emissivity eps = 1, so no need to have eps in equation 3. The authors start from the full equation (1) which includes the scattered contribution. As the final target is to derive thermodynamic temperatures of ground elements, it would be instructive to estimate how the neglected scattered contributions compare to the atmospheric corrections for a plausible range of surface element emissivities. Finally, it would be interesting to estimate the atm corrections as function of the camera's spectral bandpass to decide whether the strategy of introducing a narrower spectral bandpass (by inserting a bandpass filter) might be a useful approach to minimise the correction term due to atm self-emission.

As the authors state correctly, vignetting is a reduction of optical throughput of the camera as function of field height (or angle between optical axis and line of sight (LOS) for selected pixel). So this effect reduces the sensitivity of the system for an oblique LOS, which is a multiplicative effect. Therefore, a flat-field correction is required (divide the scene by a sensitivity function which is normalized to unity on the LOS), subtracting a radiance is incorrect. Moreover, the vignetting behaviour shown in Fig. 3 looks quite strange. Typically, a curve starting with zero slope and falling off more steeply towards maximum field height is observed (the authors themselves refer to the cosine fourth-law). I believe that actually a superposition of two effects is observed: narcissus, which is frequently met in IR camera systems (the central hot spot is radiation emitted by or reflected via the detector element and backreflected onto the detector by the lens system) and a true vignetting further out. A proper characterisation of vignetting would require an emitter which covers several pixels and should be moved across the observed field. The narcissus contribution might be comprised of additive (backreflected radiation emitted by the sensor) and / or multiplicative (incoming scene radiation reflected by the sensor and backreflected by the lens, proportional to the scene radiance).

List of typos / minor corrections:

Abstract: notable -> noticeable "Atmospheric effects are biased..." -> "Atmospheric affects introduce a bias of up to..."

Page 5 "heterogenic" -> heterogeneous

Fig.1 Specify air temperature in figure description

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 5671, 2010.