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Techniques for improvement in-flight calibration of satellite optical sensors

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As known the accuracy of optical sensor calibration is an important factor determining the ultimate accuracy of the atmospheric correction and AOT retrieval . In this paper we will present a new approach developed recently for in-flight calibration of optical sensors of high and moderate spatial resolution. As known the traditional calibration procedure using measurements with test area meets a few difficulties which may decrease the calibration accuracy. Particularly the procedure includes the necessity of a priory assumption on the vertical structure of the aerosol –gaseous atmosphere and does not regard to the effect of influence of the reflection in the adjacent pixels. Because of the molecular and aerosol scattering in atmosphere, such influence may be not neglecting at distances about up to 5km. This feature may lead to non-controlled errors in the calibration of the sensors with high spatial resolution. A new procedure for in flight calibration of optical sensors in which the OTF of the atmosphere and influence of the reflection by adjacent pixels is taken into account automatically, which should lead to substantial improvements in calibration accuracy for satellite optical sensors with high and moderate spatial resolution has been elaborated and will be presented.

This procedure includes the registration of signal from two (or more) test areas with different known values of the surface albedo. These areas are supposed to locate closely with equal Sun irradiance. The theory has been developed that gives the calibration coefficient in terms of the values measured at the areas (the coefficient of the atmosphere transparency that gives the optical thickness of atmosphere, values of the averaged over pixels radiance coefficients of surface, Sun irradiance at the area). The analytical solution for the calibration coefficient is given in this paper both for Lambertian and bi-directional reflection of the surface at the calibration pixels. Use of more than two calibration pixels allows including the statistical optimization at calculation of the calibration coefficients. The theory and examples of calibration will be presented.