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Validation of aerosol product based on a contrast reduction method for urban and regional air quality monitoring of the Lisbon Metropolitan Area

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The integration of remote sensing instruments in air quality monitoring systems at an urban and regional scale is a valid methodology with significant improvements regarding spatial distribution. Air pollution satellite data can be integrated in monitoring systems to complement ground data and improve comprehension on local and regional dispersion patterns. This work will focus in Aerosol Optical Thickness (AOT) satellite retrieval since aerosols are generally a good air quality indicator.

Measuring the contrast reduction effect caused by aerosols in satellite images by comparing an unpolluted image (reference) with a polluted one is an effective technique of retrieving AOT over urban areas. An algorithm, referred as Differential Texture Analysis (DTA), based on this method was developed by a research team in the National Observatory of Athens. Although tested, the processing algorithm never underwent extensive calibration or validation.

In this work an outline of this methodology is presented as well as preliminary results for a set of 12 MODIS images for the Lisbon Metropolitan Area from 2001 and 2002 integrated in the calibration and validation process of the DTA. The results were compared to the already validated MODIS aerosol product.

Preliminary results indicated that:

- The two datasets have a correlation coefficient of 0.42 (α=0.05).

- When comparing pixel by pixel results, for 12 images, the correlation coefficient

between the AOT values from the MODIS product and those calculated with the DTA algorithm is usually significant, with values grater than 0.6 (α=0.05).

- Considering all pixels values the correlation between the two datasets was very low (0.20, α=0.05). A detailed analysis showed that they have significant differences due to the spatial characteristics of the reflectance's values used in the AOT calculation.

These results indicate the necessity to calibrate the DTA algorithm calibration for different reflectance characteristics measured by the sensor that can be associated with land use. These results will be considered in future work to define new calibration parameters for each land use, mainly urban areas, forestry and agriculture. Others studies still to come will include the analysis of the seasonal relationship between to sets of values, and the application of equivalent calibration procedures for other types of sensors, namely Landsat and MERIS. This evaluation will be done using different imagery datasets for the same time period.