Remote sensing of desert dust aerosols over the Sahel : potential use for health impact studies

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Since the end of the 70's, remote sensing monitors the desert dust aerosols due to their absorption and scattering properties and allows to make long time series which are necessary for air quality or health impact studies. In the Sahel, a huge health problem is the Meningitis Meningococcal (MM) epidemics that occur during the dry season : the dust has been suspected to be crucial to understand their onsets and dynamics.

The Aerosol absorption Index (AI) is a semi-quantitative index derived from TOMS and OMI observations in the UV available at a spatial resolution of $1°$ (1979-2005) and $0.25°$ (2005-today) respectively. The comparison of the OMI-AI and AERONET Aerosol Optical thickness (AOT) shows a good agreement at a daily time-step (correlation ~ 0.7). The comparison of the OMI-AI with the Particle Matter (PM) measurement of the Sahelian Dust Transect is lower (~ 0.4) at a daily time-step but it increases at a weekly time-step (~ 0.6). The OMI-AI reproduces the dust seasonal cycle over the Sahel and we conclude that the OMI-AI product at a $0.25°$ spatial resolution is suitable for health impact studies, especially at a weekly epidemiological time-step. Despite the AI is sensitive to the aerosol altitude, it provides a daily spatial information on dust.

A preliminary investigation analysis of the link between weekly OMI AI and weekly WHO epidemiological data sets is presented in Mali and Niger, showing a good agreement between the AI and the onset of the MM epidemics with a constant lag (between 1 and 2 week). The next of this study is to analyse a deeper AI time series constituted by TOMS and OMI data sets. Based on the weekly ratios PM/AI at 2 stations of the Sahelian Dust Transect, a spatialized proxy for PM from the AI has been developed. The AI as a proxy for PM and other climate variables such as Temperature (T°), Relative Humidity (RH%) and the wind (intensity and direction) could then be used to analyze the link between those variables and the MM epidemics in the most concerned countries in Western Africa, which would be an important step towards a forecasting tool for the epidemics risks in Western Africa.