PRELIMINARY CHARACTERIZATION OF COLUMNAR AEROSOL PROPERTIES (AOD-AE) AT THE SAHARAN TAMANRASSET (ALGERIA) STATION

C. Guiorado [1, 2], E. Cuevas [2], V. Cachorro [1], M. Mimouni [3], L. Zeudmi [3], C. Toledoano [1], S. Alonso-Pérez [4, 2], S. Basart [5], L. Blarel [6], P. Goloub [6], J.M. Baldasano [5, 7]

[1] Atmospheric Optics Group, Valladolid University (GOA-UVa), Spain, carmen@goa.uva.es
[2] Izala Atmospheric Research Center, Meteorological State Agency of Spain (AEMET), Spain
[3] Office National de la Meteorologie, Tamanrasset, Algeria
[4] Spanish National Research Council (CSIC), Spain
[5] Earth Sciences Department, Barcelona Supercomputing Center-Centro Nacional de Supercomputación, BSC-CNS, Barcelona, Spain
[6] Laboratoire d’Optique Atmosphérique, Université Lille, France
[7] Environmental Modelling Laboratory, Technical University of Catalonia, Barcelona, Spain

AEROSOL OPTICAL DEPTH & ÅNGSTRÖM EXponent at Tamanrasset

Since September 2006 a Cimel sunphotometer is running at Tamanrasset (Algeria) set up by the Izala Atmospheric Research Center (AEMET) in collaboration with the Office Nationale de la Meteorologie (Algeria). More than two years of aerosol measurements have been analyzed from October 2006 to January 2009.

TAMANRASSET STATION

The Cimel sunphotometer is placed at this station located at the headquarters of the Office National de la Metéo (ONM) which has integrated the AERONET network as a strategic site within the Global Atmospheric Watch (GAW) programme for its situation in the Ahaggar Mountains surrounding the Sahara Desert, as a, a priori, representative of pure desert dust, free of industrial activities.

HEAVY DUST PLUMES, CIRRUS CLOUDS & FICTITIOUS DIURNAL CYCLE

Several problems have been found during this two year record of continuous measurements. The cloud screening became an extremely difficult task because the presence of heavy dust plumes, preferentially during the summer-time (figures 1 & 4), which were confused many times with clouds (resulting in underestimation of the AOD) and by the very particular presence of cirrus clouds, associated to the sub-tropical jet stream, in wintertime, resulting in overestimation of the AOD. The measurements taken the 10th of July of 2008 help us to illustrate this underestimation of AOD (figures 8 & 9).

POLLUTION DERIVED AEROSOLS & NO DUST LOADED AIR MASSES

There are two kind of scenarios we want to analyze in depth: high turbidity events not related to desert mineral dust but linked to pollution derived aerosols, and clear air masses events during fall and winter time. The graphical method of Gobbi to discriminate different aerosol types is used in this task.

Figure 3. Monthly mean of AOD at 440 nm and Ångström exponent at Tamanrasset, calculated using the AERONET level 2 monthly mean values. Error bars indicate standard deviation

Figure 4. Frequency histograms of the AOD at 440 nm and Ångström exponent in Tamanrasset

Figure 5. Ångström exponent difference, (AE(440,675)−AE(675,870)), as a function of the 440-870 nm Ångström exponent and AOD at 440 nm (color code) evaluated using the AERONET level 2 all points values. The first graph is for the whole dataset values. The second graph is only for measurements from August 07-

Figure 8. Meteosat Second Generation (MSG) RGB composition images over Tamanrasset (cross marked in the small picture) on the 10th of July of 2008 at 14:45 UT. Pink color corresponds to dust storms and brown and green to clouds.

Figure 9. Aerosol Optical Depth (AOD) at 440 nm and 870-870 nm Ångström Exponent (AE) level 1.0 & 1.5 from the 10th of July of 2008. The AERONET cloud-screening removed the higher AOD values and there are no data for level 2.0.

Acknowledgements: This work was developed within the Specific Agreement of Collaboration between the University of Valladolid and the CSIC-EMETE “Establish methods and quality assurance systems for programs of photometry, radiometry, atmospheric ozone and aerosols within the atmospheric monitoring program of the World Meteorological Organization. We would like to acknowledge the AERONET-DPRTE-rama (http://aeronet.env.dgs.gva.es) network that provided and cooperated to get the calibrated data. Financial supports from the Spanish MICINN (ref. CGL2008-09939-C03-00ClI and CGL 2009-09740) and from the CR-220 Project of the Junta de Castilla y León are gratefully acknowledged.

References:

HEAVY DUST PLUMES, CIRRUS CLOUDS & FICTITIOUS DIURNAL CYCLE

Several problems have been found during this two year record of continuous measurements. The cloud screening became an extremely difficult task because the presence of heavy dust plumes, preferentially during the summer-time (figures 1 & 4), which were confused many times with clouds (resulting in underestimation of the AOD) and by the very particular presence of cirrus clouds, associated to the sub-tropical jet stream, in wintertime, resulting in overestimation of the AOD. The measurements taken the 10th of July of 2008 help us to illustrate this underestimation of AOD (figures 8 & 9).

POLLUTION DERIVED AEROSOLS & NO DUST LOADED AIR MASSES

There are two kind of scenarios we want to analyze in depth: high turbidity events not related to desert mineral dust but linked to pollution derived aerosols, and clear air masses events during fall and winter time. The graphical method of Gobbi to discriminate different aerosol types is used in this task.

Figure 3. Monthly mean of AOD at 440 nm and Ångström exponent at Tamanrasset, calculated using the AERONET level 2 monthly mean values. Error bars indicate standard deviation

Figure 4. Frequency histograms of the AOD at 440 nm and Ångström exponent in Tamanrasset

Figure 5. Ångström exponent difference, (AE(440,675)−AE(675,870)), as a function of the 440-870 nm Ångström exponent and AOD at 440 nm (color code) evaluated using the AERONET level 2 all points values. The first graph is for the whole dataset values. The second graph is only for measurements from August 07-

Figure 8. Meteosat Second Generation (MSG) RGB composition images over Tamanrasset (cross marked in the small picture) on the 10th of July of 2008 at 14:45 UT. Pink color corresponds to dust storms and brown and green to clouds.

Figure 9. Aerosol Optical Depth (AOD) at 440 nm and 870-870 nm Ångström Exponent (AE) level 1.0 & 1.5 from the 10th of July of 2008. The AERONET cloud-screening removed the higher AOD values and there are no data for level 2.0.

Acknowledgements: This work was developed within the Specific Agreement of Collaboration between the University of Valladolid and the CSIC-EMETE “Establish methods and quality assurance systems for programs of photometry, radiometry, atmospheric ozone and aerosols within the atmospheric monitoring program of the World Meteorological Organization. We would like to acknowledge the AERONET-DPRTE-rama (http://aeronet.env.dgs.gva.es) network that provided and cooperated to get the calibrated data. Financial supports from the Spanish MICINN (ref. CGL2008-09939-C03-00ClI and CGL 2009-09740) and from the CR-220 Project of the Junta de Castilla y León are gratefully acknowledged.

References: