



## **Rainfall and dust event over the Ahaggar massif, Algeria, caused by a northward burst of the West African Monsoon: a case study from the African Monsoon Multidisciplinary Analysis Special Operation Period**

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Water supply in the Ahaggar massif (Algeria) is a crucial societal problem for a growing population (nearly 100 000 inhabitants in Tamanrasset) which is located in the middle of the Sahara in altitude, over 1000 m higher than the source regions and thus preventing affordable water pumping. Influence of the West African monsoon (WAM) on rainfall over the Ahaggar area is addressed in the present paper. A rainfall event that took place on the 23<sup>rd</sup> to 27<sup>th</sup> July 2006 and that was responsible for almost half of the total amount of precipitation over the year (59 mm) is here studied.

Ground-based measurements in Tamanrasset and Assekrem (1370 m and 2700 m above mean sea level, respectively) and space borne observations (SEVIRI radiometer and CALIPSO Lidar profiles) showed the occurrence of a major dust outbreak arriving to the Ahaggar one day before the rain event and lasting until its end (from 22<sup>nd</sup> to 28<sup>th</sup> July 2006). Dust lifting up was associated to density currents triggered by mesoscale convective systems over eastern Mali and western Niger. During the afternoon of each of the four days of precipitation (23<sup>rd</sup>, 24<sup>th</sup>, 26<sup>th</sup> and 27<sup>th</sup> July), clouds

were formed locally over the Ahaggar. They were located at the top of the Saharan atmospheric boundary layer (SABL) and associated to its convective development. Although SABL clouds were a common feature during July 2006, precipitation occurred only when moisture within the SABL overpassed a threshold ( $\sim 8$  g/ kg of water vapour mixing ratio).

According to ECMWF analyses, two consecutive northward bursts of the WAM flow (on 24<sup>th</sup> and 26<sup>th</sup> July) were responsible of the moisture increase in the Ahaggar region. We associate their occurrence to two phenomena: i) two westward displacements of the Saharan Heat Low (SHL) from the Algeria-Mali frontier (southwest from the Ahaggar) to western Mauritania one day before each rain event, which let the monsoon to progress northwards and ii) an African Easterly wave, put in evidence by ECMWF analysis and satellite imagery, which enhanced both the WAM and the SHL displacements.