Geophysical Research Abstracts, Vol. 9, 03729, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03729

Seasonal behavior of Saharan dust events at the Mediterranean island of Lampedusa in the period 1999-2005

D. Meloni (1), A. di Sarra (1), G. Biavati (2), J. J. DeLuisi (3), F. Monteleone (4), G. Pace (5), S. Piacentino (6) and D. M. Sferlazzo (6)

(1) ENEA, Climate Laboratory, Roma, Italy, (2) Now at CNR, ISMAR, Venezia, Italy, (3) NOAA/ESRL Global Monitoring Division, Boulder, Colorado, (4) ENEA, Climate Laboratory, Palermo, Italy, (5) ENEA, PROT-INN, Bologna, Italy, (6) ENEA, Climate Laboratory, Lampedusa, Italy (daniela.meloni@casaccia.enea.it / Fax: +39 06-30486678 / Phone: +39 06-30486639)

Multi-filter rotating shadowband radiometer (MFRSR) measurements have been carried out at ENEA Station of Climate Observations (35.52° N, 12.63° E, 45 m above m.s.l.) in the island of Lampedusa in 1999, and continuously since 2001. Lampedusa has a surface area of about 20 km^2, and is located approximately 100 km East of Tunisia and 200 km North of Libya. A variety of aerosol types from different sources reach Lampedusa: dust from the Sahara desert, mainly in summer, polluted and biomass burning aerosols from the European continent, marine aerosols from the sea.

This study describes the Saharan dust (SD) events at Lampedusa on the basis of daily average optical depth at 500 nm, τ, and Ångström exponent, α, derived from MFRSR observations. Five-day back-trajectories ending at Lampedusa at 2000 and 4000 m a.g.l. are calculated by means of the HYSPLIT model using the NCEP-reanalysis dataset. SD events are identified as those for which the trajectories interact with the mixed layer in places where the surface wind exceeds 7 m/s, or spend a large fraction of time over the Sahara.

The SD days display values of $\alpha + \Delta\alpha \leq 1$, with $\Delta\alpha$ equal to the standard deviation of the daily α. Out of the 911 days with cloud-free measurements, 233 (26%) are influenced by Saharan dust according to the trajectories and to the aerosol optical

properties. The occurrence of SD events is maximum in summer (33%), when the largest seasonal average of τ (0.40$\pm$0.01) is measured, and minimum in winter (7%), when the smallest seasonal average of α (0.08$\pm$0.06) is found. In July 47% of the days are characterized by SD. The total number of events throughout the measurement period is 111, about 19 events per year; the average duration is 2.0$\pm$0.2 days, with a maximum length in summer (2.9$\pm$0.5) and a minimum in autumn-winter (1.6$\pm$0.2). The longest duration is 13 consecutive days, occurred from 6 to 18 August 1999, when the persistent dust transport was associated with a high pressure system centered over Southern Tunisia, and from 6 to 18 July 2002.

SD days have been identified from the back-trajectories also in days lacking of observations, due to either cloudiness or measurement interruptions. A total number of 2557 days has been analyzed, corresponding to the 1999-2005 periods. The frequency of occurrence of SD days shows little change with respect to the cloud-free periods (24%). The seasonal distribution shows a peak in May (38%), followed by July (37%). The number of SD events is 256, with an average duration of 2.5$\pm$0.2 days. The average number of SD episodes per year is 37, nearly doubled with respect to that of cloud-free cases.

Regions of SD production were derived from the HYSPLIT trajectories and NCEP-reanalysis surface winds. The source points are concentrated above 23° N in summer, and descend to 17° N in winter.

Finally, the MFRSR measurements at the solar zenith angle of 60° have been used to derive the single scattering albedo (SSA) for cases clearly dominated by dust ($\tau \geq$0.40 and $\alpha + \Delta\alpha \leq$0.5). The average SSA for the whole period is 0.77$\pm$0.04 at 415.6 nm and 0.94$\pm$0.04 at 868.7 nm. These results confirm that the dust aerosol present in the Mediterranean have a wide spatial and temporal variability in SSA. At short wavelengths we observe a relatively stronger absorption than found at different locations.