

Figure S1. (a) Maps of the division of the West-Sahara in 3 sub-regions and of the Hoggar in 2 sub-regions. (b) Z600 value at 12UTC for mid-top days (solid line) and clear days (dashed line) for each sub-region and for 15 day periods. (c) Same as (b) but for T850 at 18UTC.

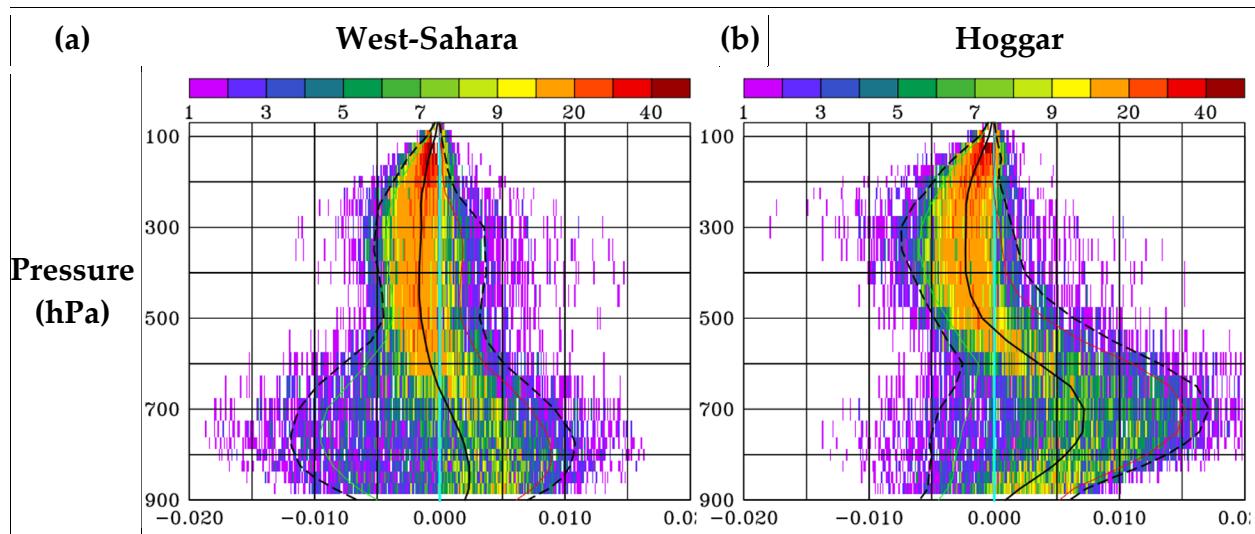


Figure S2. distribution of vertical mass flux values as a function of pressure level for West-Sahara. (b) same as (a) but for Hoggar. The distributions are given in number of days using the color scale shown in the color bar. The solid line and the dotted lines give respectively the value at 50%, 5% and 95% of the cumulative mass flux distributions. The sign of the flux is positive for ascending flux and negative for subsiding flux.

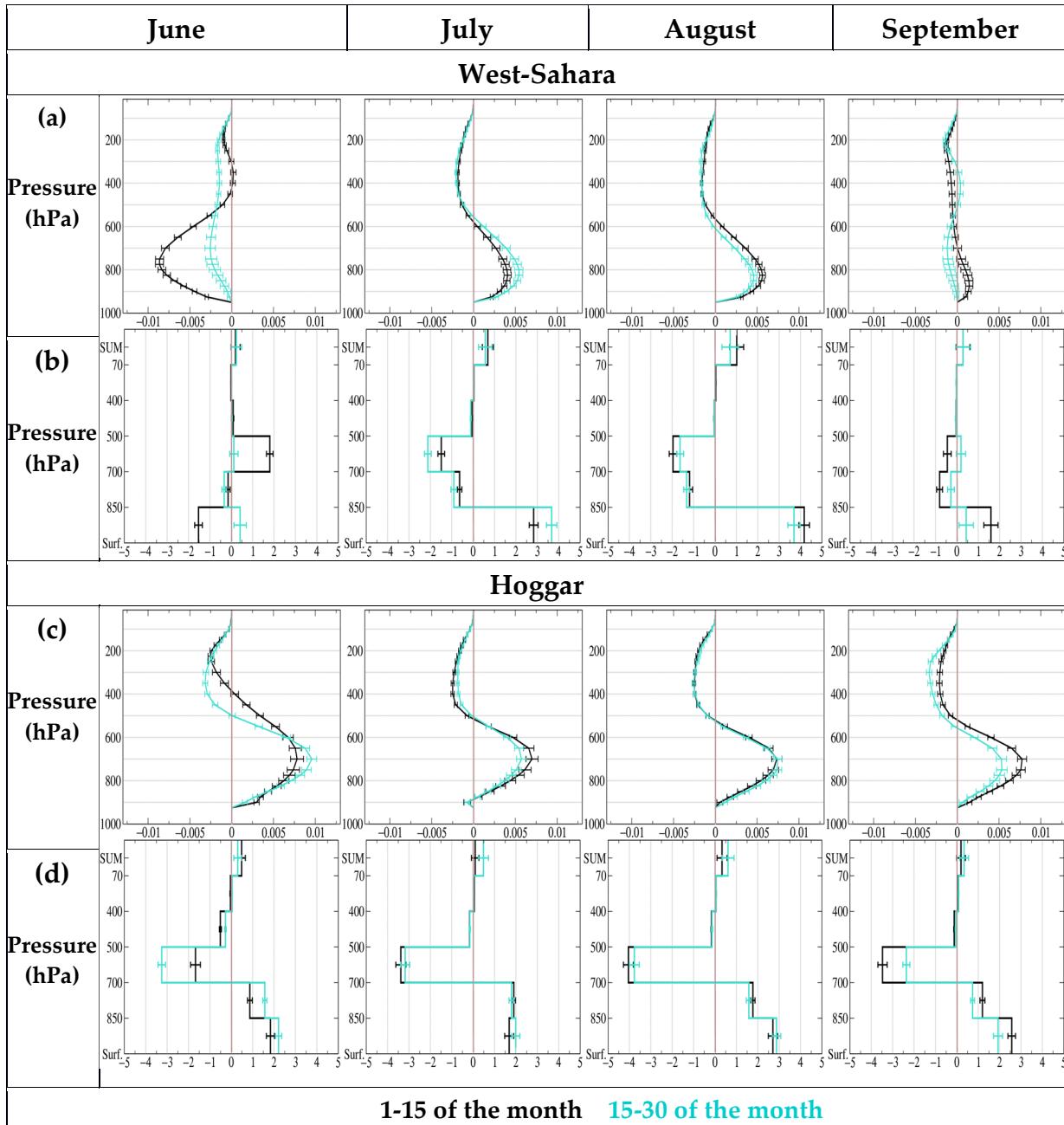


Figure S3. (a) Mean vertical profile of vertical mass flux in kg/m²/s for West-Sahara. (b) Mean vertical profile of horizontal water vapor flux convergence in kg/m²/d and at the top of Y axis the convergence integrated over the whole vertical column (surface to 70hPa; SUM) for West-Sahara. (c) as (a) but for Hoggar. (d) as (b) but for Hoggar. Statistical uncertainty of the mean values represented by the horizontal bars. Average of 00UTC, 06UTC, 12UTC and 18UTC profiles per 15-day period. In (a) et (c) the sign of the flux is positive for ascending flux and negative for subsiding flux. In (b) and (d) the sign of the flux rate is positive for convergence and negative for divergence.

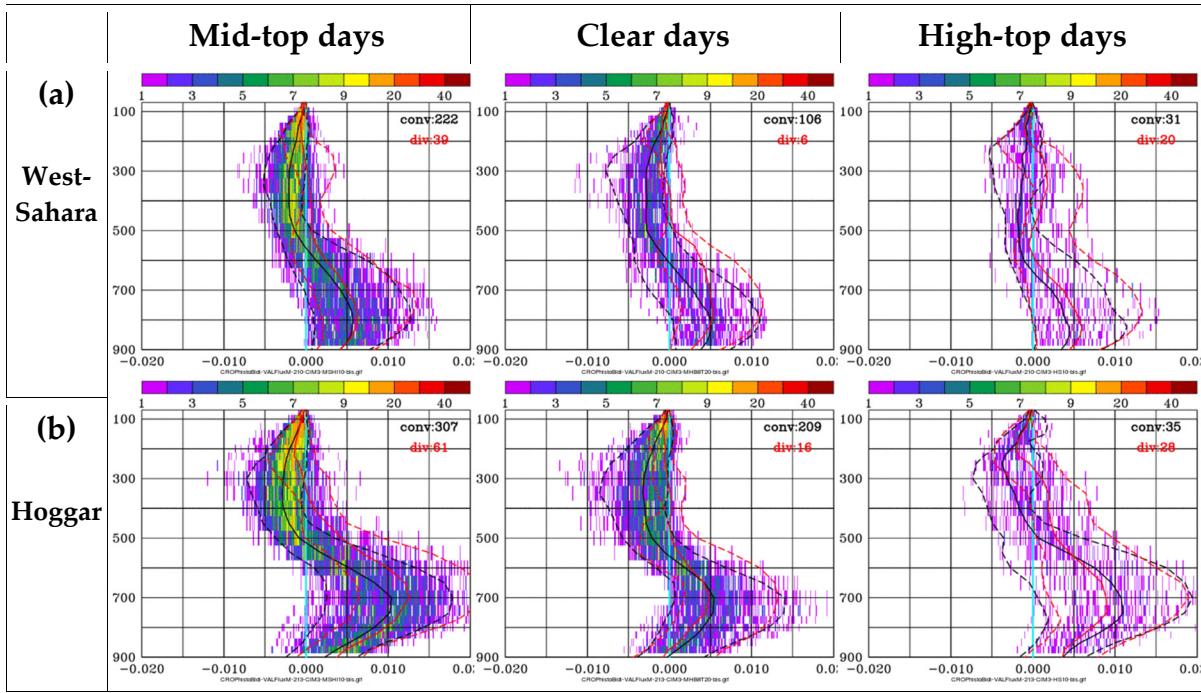


Figure S4. (a) For mid-top days (left), clear days (center) and high-top days (right) distribution of vertical mass flux values as a function of pressure level for the SABL profiles for West-Sahara. (b) same as (a) but for Hoggar. The distributions are given in number of days using the color scale shown in the color bar. The solid line and the dotted lines give respectively the value at 50%, 5% and 95% of the cumulative mass flux distributions for the profiles with positive convergence in the upper troposphere (black line) and negative convergence in the upper troposphere (red line). The numbers in black and red in the upper right corner give the number of days in these two classes of profiles. The sign of the flux is positive for ascending flux and negative for subsiding flux.

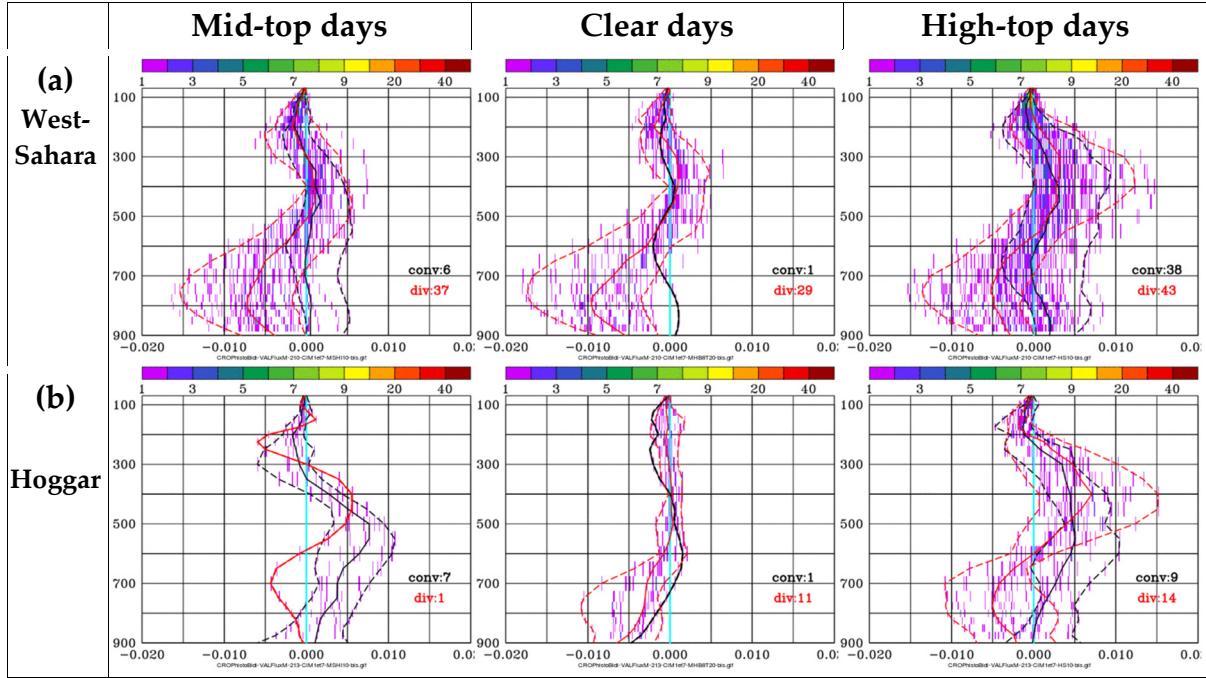


Figure S5. (a) For mid-top days (left), clear days (center) and high-top days (right) distribution of vertical mass flux values as a function of pressure level for the upper ascending profiles for West-Sahara. (b) same as (a) but for Hoggar. The distributions are given in number of days using the color scale shown in the color bar. The solid line and the dotted lines give respectively the value at 50%, 5% and 95% of the cumulative mass flow distributions for the profiles with positive convergence in the lower SABL (black line) and negative convergence in the upper troposphere (red line). The numbers in black and red in the upper right corner give the number of days in these two classes of profiles. The sign of the flux is positive for ascending flux and negative for subsiding flux.

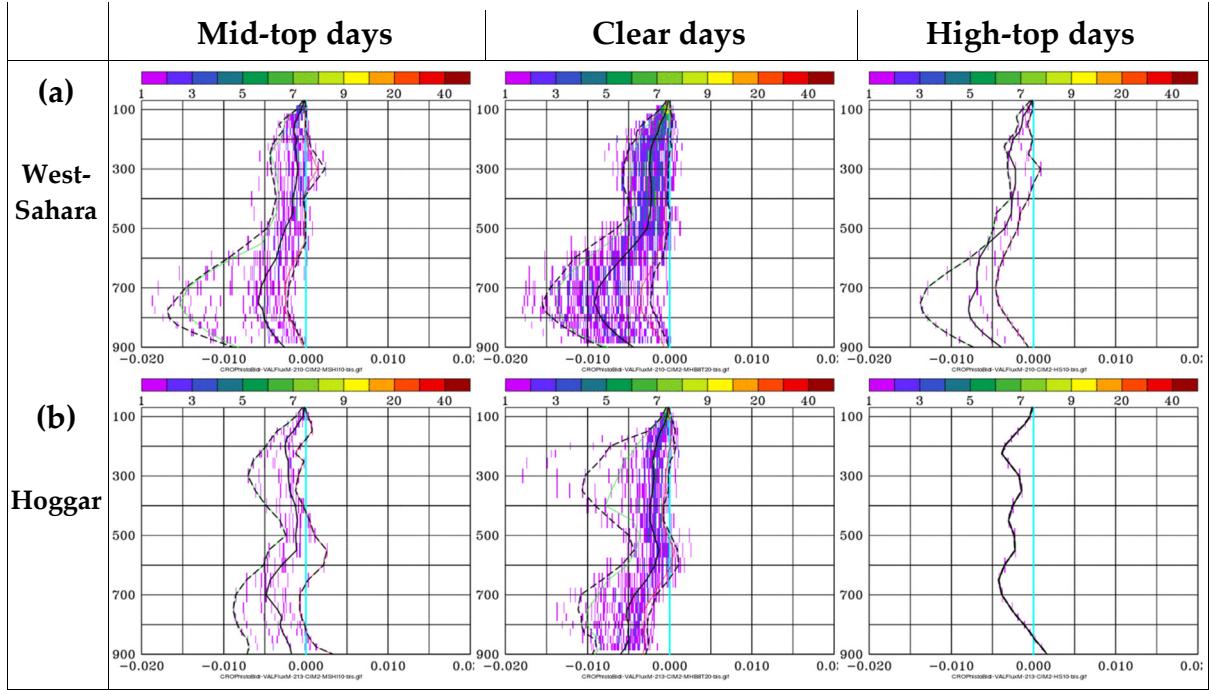


Figure S6. (a) For mid-top days (left), clear days (center) and high-top days (right) distribution of vertical mass flux values as a function of pressure level for the subsiding profiles for West-Sahara. (b) same as (a) but for Hoggar. The distributions are given in number of days using the color scale displayed in the color bar. The solid line and the dotted lines give respectively the value at 50%, 5% and 95% of the cumulative mass flux distributions. The sign of the flux is positive for ascending flux and negative for subsiding flux.

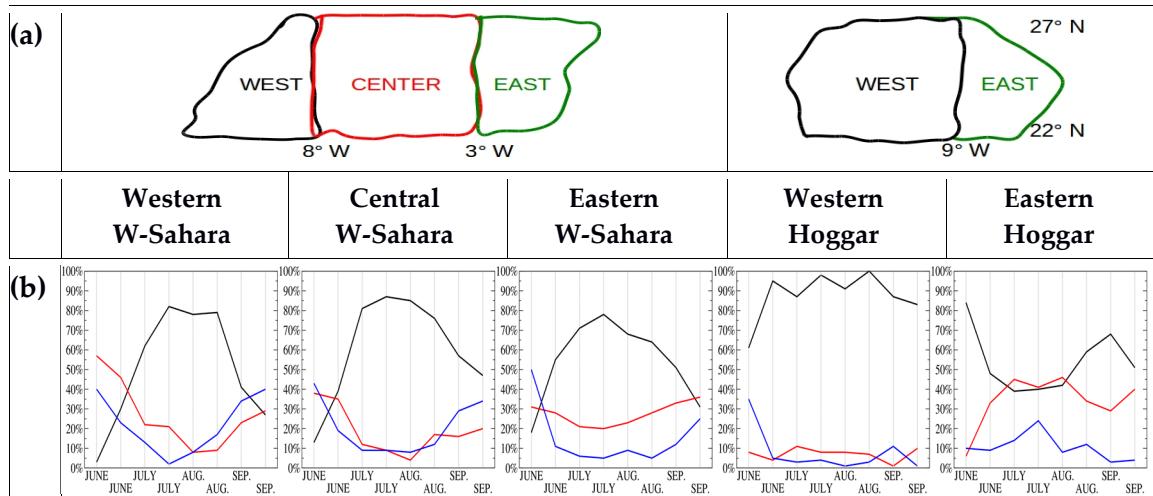


Figure S7. (a) Maps of the division of the West-Sahara in 3 sub-regions and of the Hoggar in 2 sub-regions. (b) Frequencies of SABL profiles (black line), subsiding profiles (red line) and ascending profiles (blue line) for each sub-region and for 15 day periods.

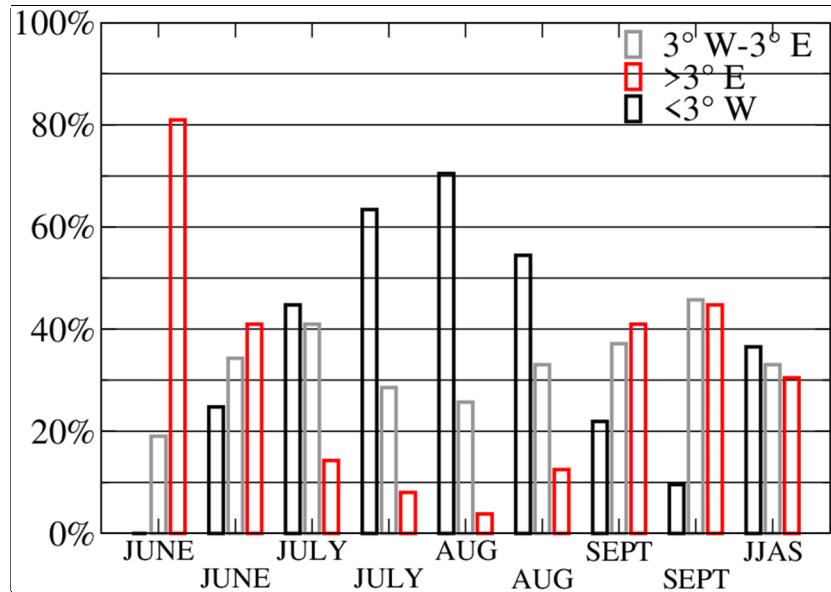


Figure S8. Occurrence frequency of the longitude of SHL barycenter on the west of 3° W (black), between 3° W and 3° E (gray) and on the East of 3° E (red). Data estimated over 15 day periods.

Table S1. First column, the parameters for which the most representative area is searched. Second column and third column, longitude and latitude of the domain to define the search region. Fourth column, frequency threshold in the cumulative distribution of instantaneous field values within the search domain to define a zone at each time step. Fifth column, value of the final isoline to determine the area retained in the frequency map constructed from the zone defined at each time step. For the SHL the potential temperature field at 850 hPa is used and for the anticyclones, the geopotential fields. For the SAC, the field at 600hPa is used.

	Domain	Longitude	Latitude	Threshold	Isoline
SHL		13° W-15° E	15° N-35° N	Value at 97%	15%
SAC		15° W-15° E	0° N-35° N	Value at 95%	15%
100hPa and 200hPa Anticyclone		35° W-55° E	0° N-50° N	Value at 90%	12%
900hPa Anticyclone		25° W-25° E	0° N-45° N	Value at 95%	10%

Table S2. Occurrence frequencies of days where most frequent clouds are either high-top clouds, either mid-top clouds or very-partial cloud cover for West-Sahara and Hoggar and for the period 2008-2014. Only days with a total daily COF greater than 5% are taken into account.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
West-Sahara												
High	87%	79%	58%	64%	52%	26%	3%	16%	27%	53%	81%	82%
Mid.	3%	3%	21%	10%	32%	59%	82%	75%	67%	33%	2%	3%
Very	10%	18%	21%	25%	16%	14%	14%	9%	6%	15%	17%	14%
Hoggar												
High	80%	73%	52%	63%	38%	13%	3%	5%	6%	44%	73%	78%
Mid.	7%	14%	29%	24%	52%	83%	90%	87%	86%	46%	7%	6%
Very	14%	13%	18%	13%	10%	4%	7%	7%	8%	10%	20%	16%