

The contribution of Saharan aerosols on the Mediterranean region

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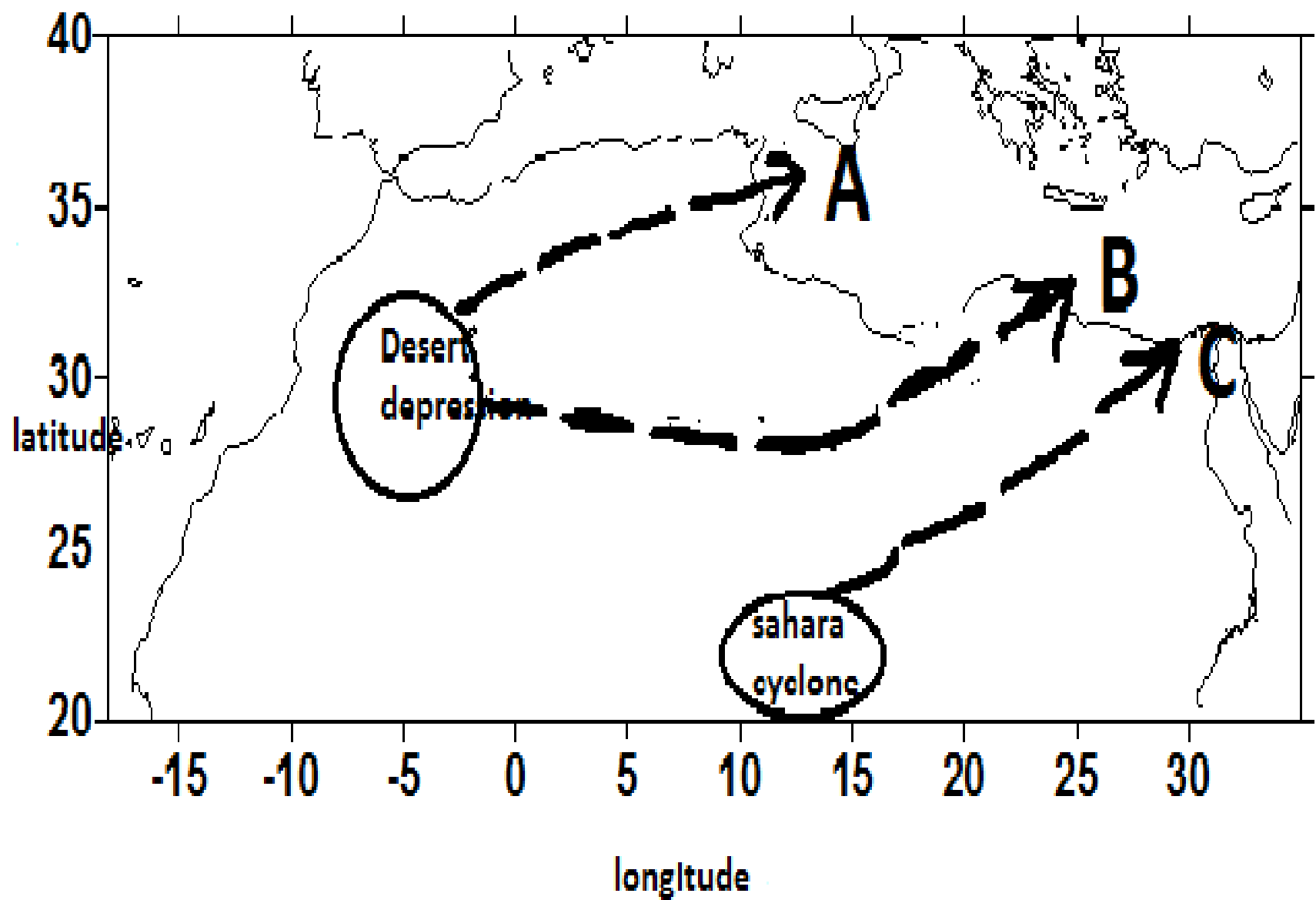
The Egyptian Meteorological Authority

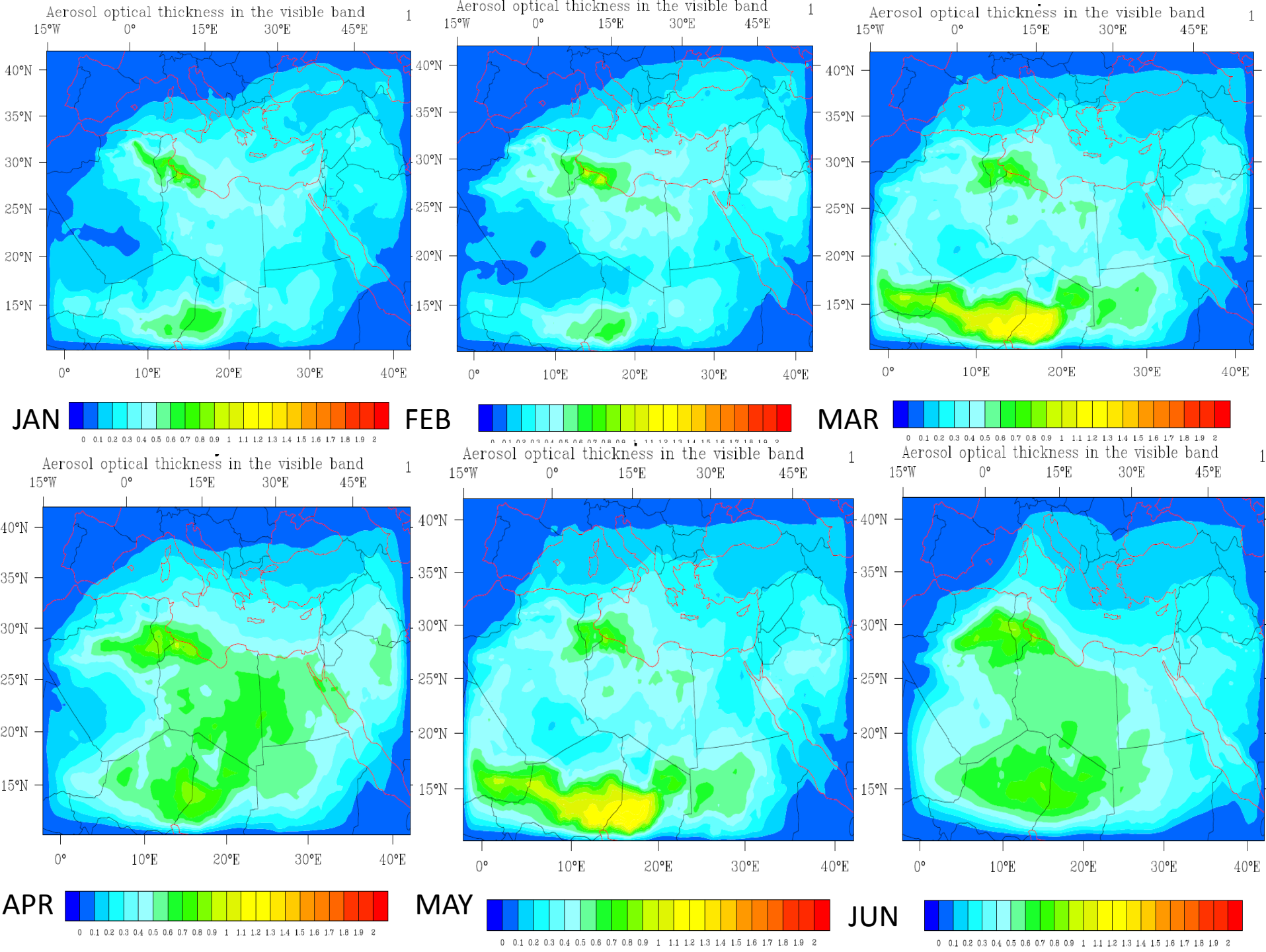
Outline

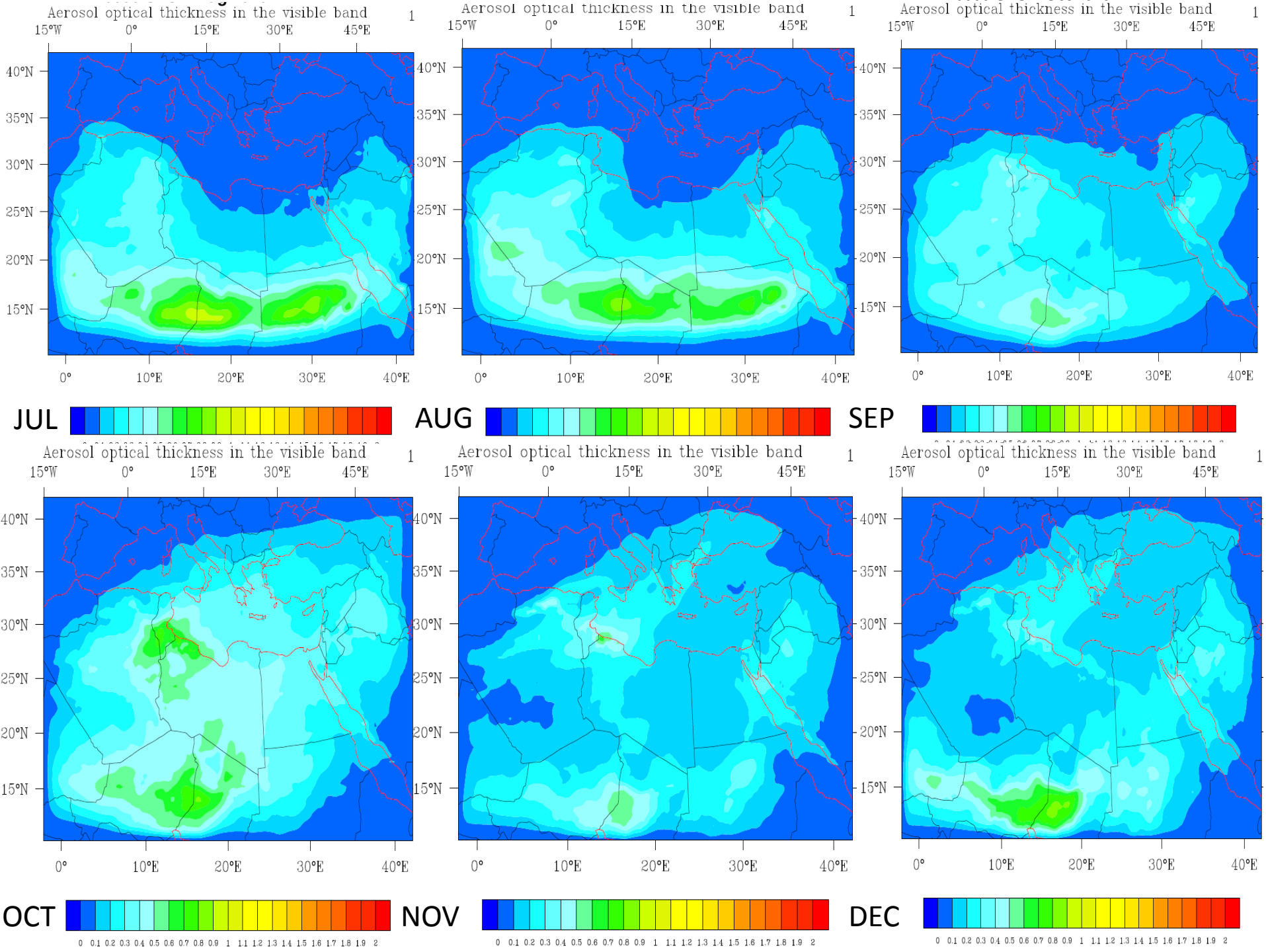
- AOD 2010 over North Africa and Mediterranean Modelling results (RegCM4-CHEM)
- The main pathway of dust activities over Mediterranean
- Dust and Sand storm number of occurrences from 1968-2010 over Egypt
- The Main causes of dust and sand storm over Egypt

Abstract

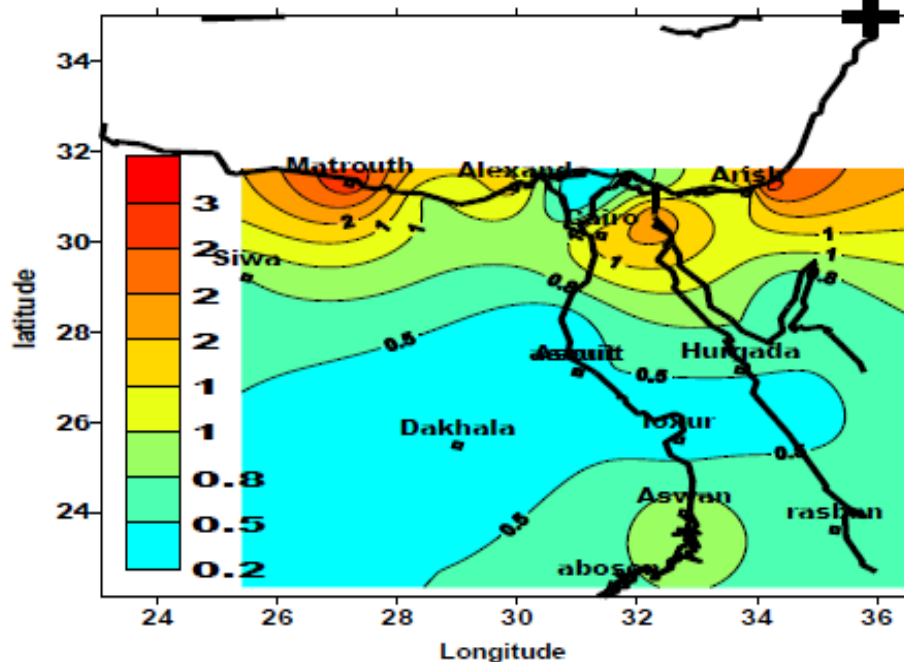
The analysis of dust frequency weather (*sand and dust storm SDS, rising sand RS and haze HZ*) during long-term period from 1968 to 2010 at different stations in Egypt is considered in this work. The results indicate that the dust season starts to be longer than the normal with a maximum frequency and intensity in March and April. More than 89% of the total annual dust is accumulated between December and May. In this study the characterization of extreme dust and sand storm according to their different synoptic patterns are considered in different seasons. Generally, *the annual trend of Sand-Dust Storm Frequencies (SDSF) tends to decrease in the past period with slightly increase at the present period.*



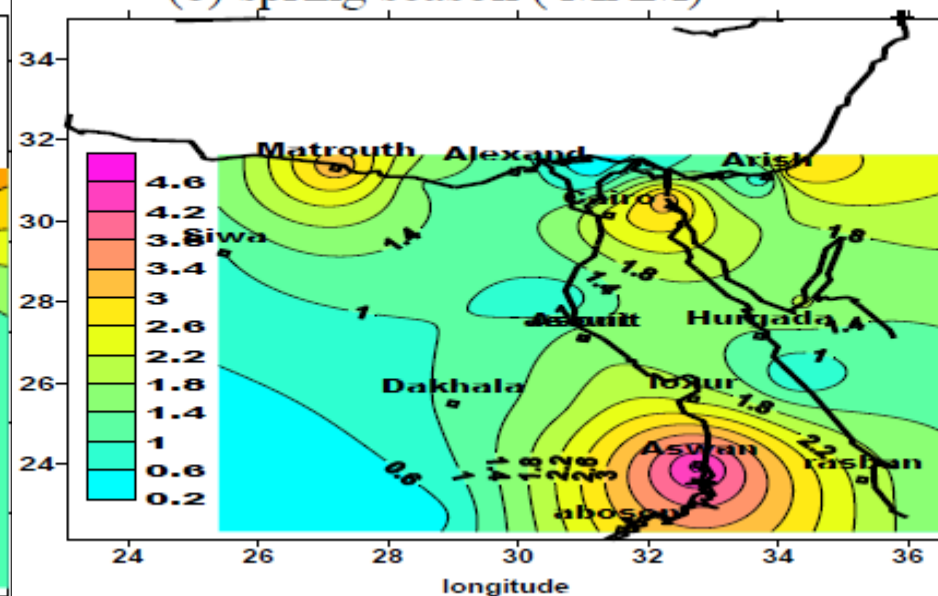




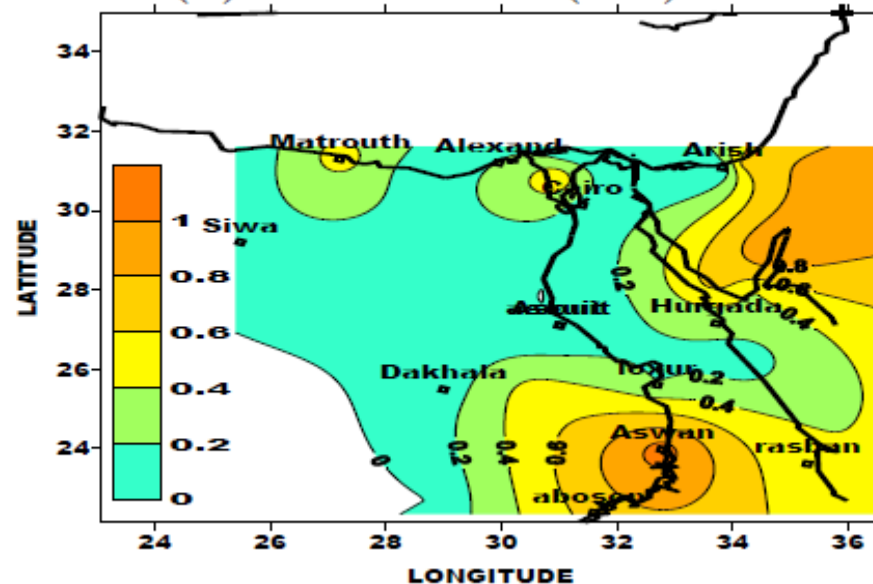
(a) winter season (DJF)



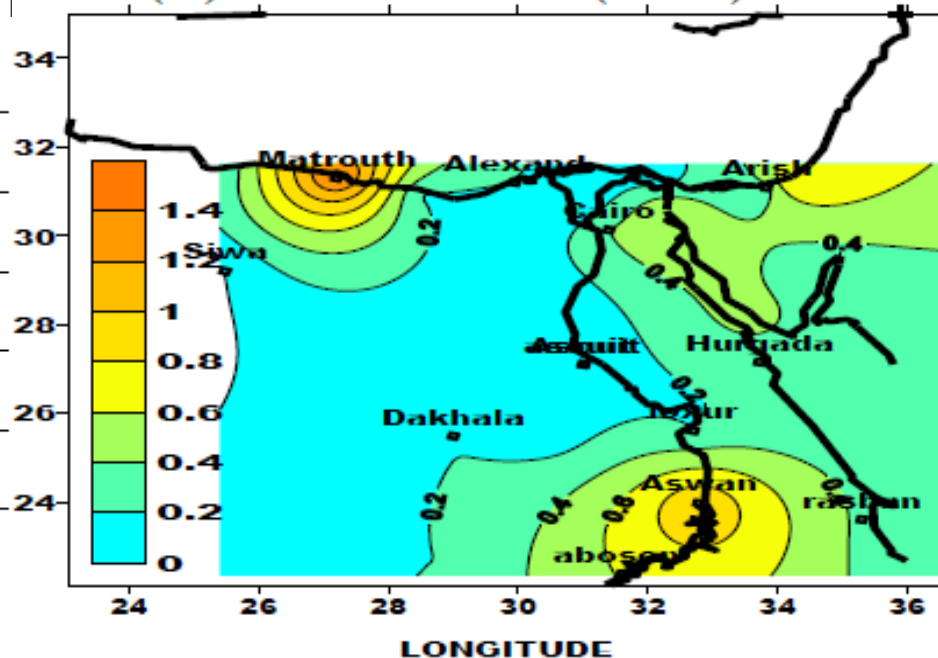
(b) spring season (MAM)



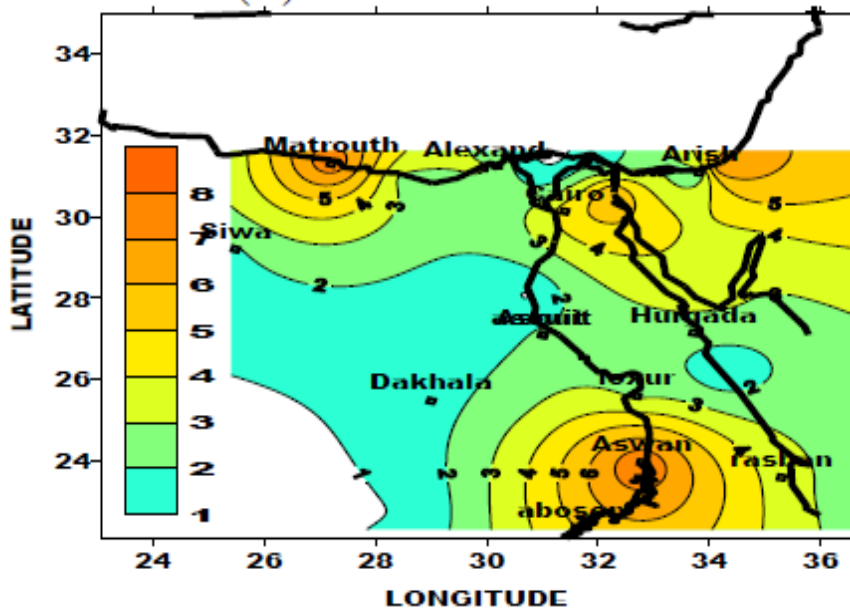
(c) summer season (JJA)



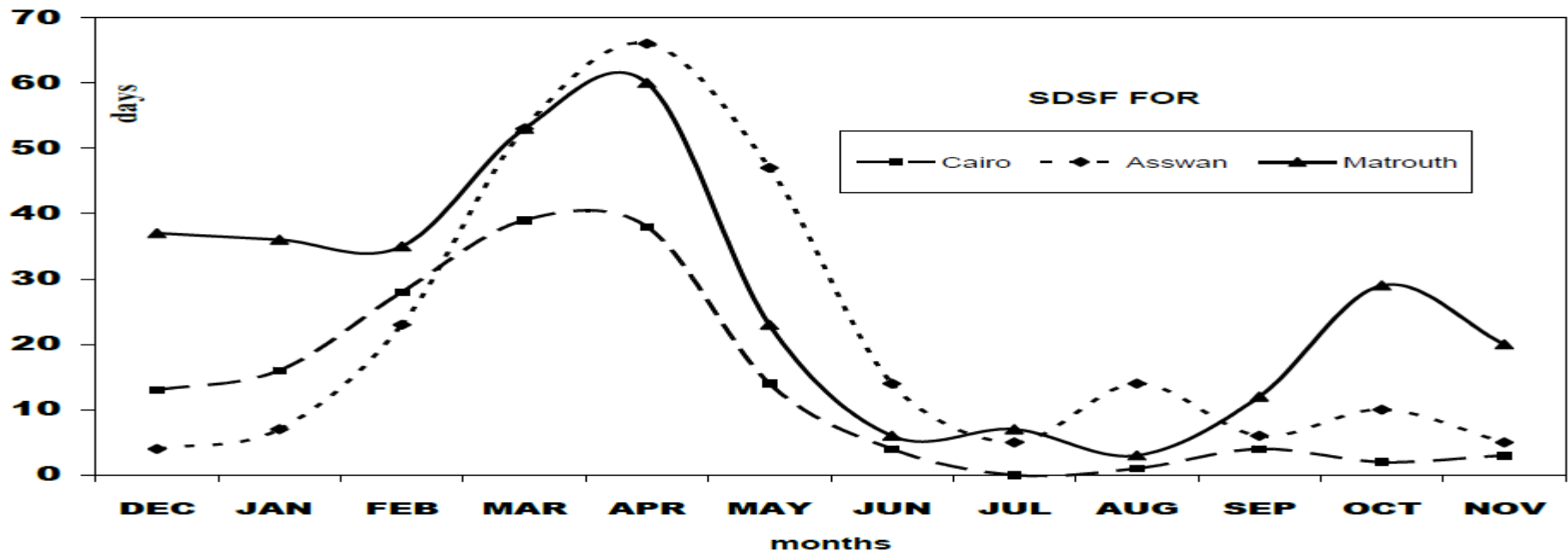
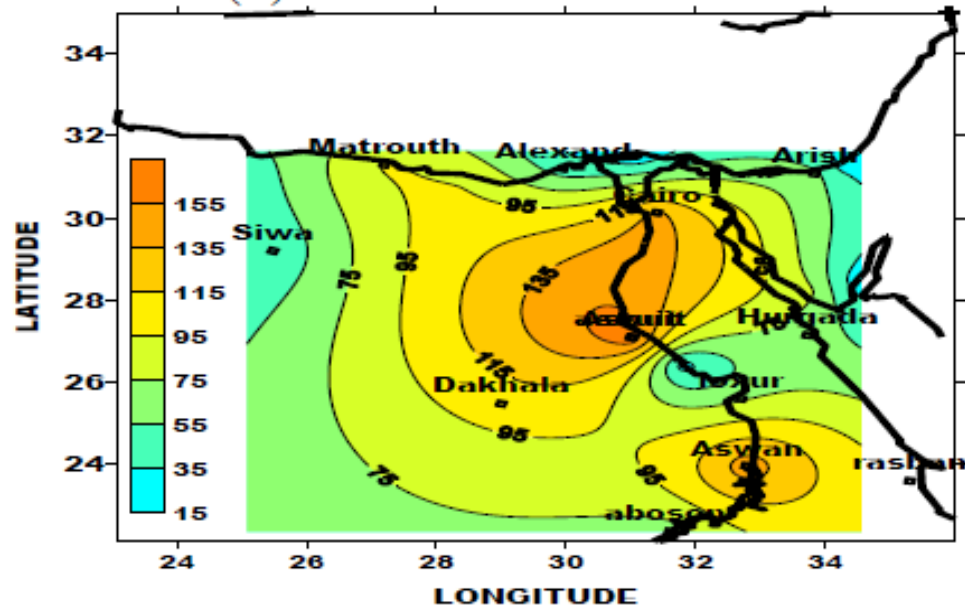
(d) Autumn season (SON)



(e) Annual SDSF



(f) Annual dust weather



Dust and Sand Storm Freq. Over three locations in Egypt

Station	DJF(SDS)	MAM(SDS)	JJA(SDS)	SON(SDS)	DJF(RS)	MAM(RS)	JJA(RS)	SON(RS)
Matrouth	118	136	16	61	773	1170	1054	632
Cairo	57	91	5	9	961	868	164	364
Aswan	34	166	33	21	823	1434	242	645
Hurghada	19	60	12	4	441	839	527	339
Average	57	113.25	16.5	23.75	749.5	1077.75	496.75	495

Seasonal days of SDSF and RSF During the period (1968-2010)

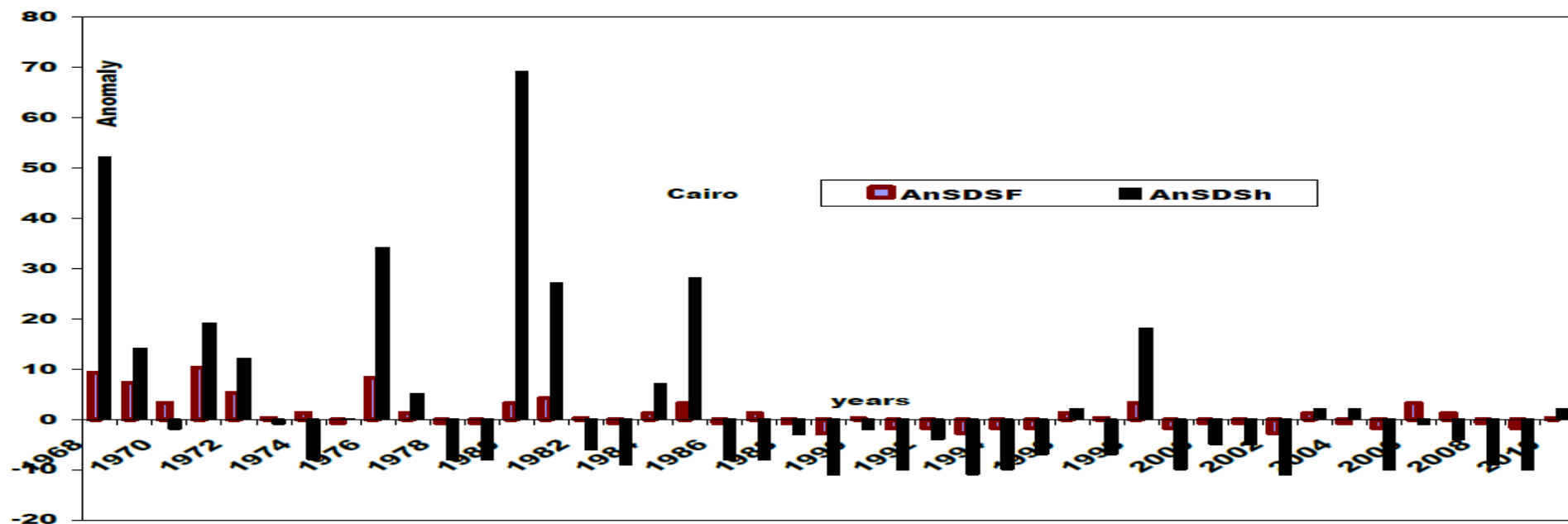
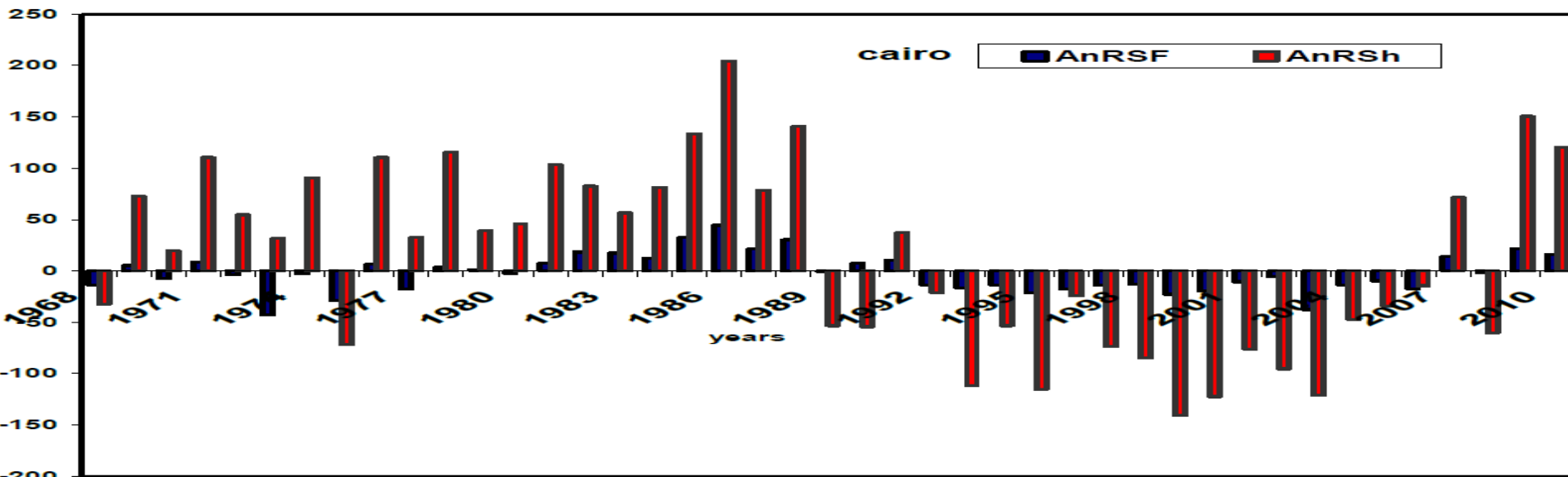
Station	Matrouth	Alexandria	Cairo	Asouit	Aswan	Hurghada	Siwa
SDS	323: 2%	100: 0.63%	164:1%	128 :0.8 %	256 :1.6%	95 :0.6%	51: 0.32%
RS	3628:23%	707: 4.5%	2476:15.7%	3724: 23.7%	3747:23.9%	2146:13.7	1253:8%
HZ	1888:12%	991:6.3%	8018: 51%	1725:11%	2056:13%	538:3.4%	338: 2.2%

Number of days and percentage ratio of Sand Dust Storm (SDS), Rising Sand (RS) and Dust haze (HZ) during the period (1968-2010) over many surface stations

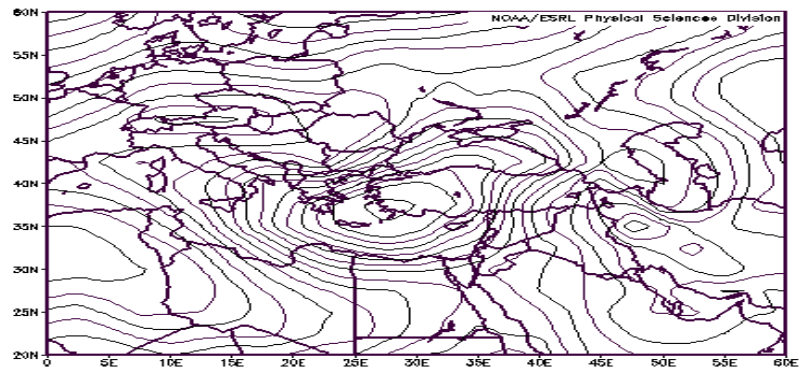
Number of dust storm Days (Per year)	Ranking
≤ 1.0	Very Low Frequency
1.1 to 2.5	Low Frequency
2.6 to 4	Moderate Frequency
4.1 to 8	High Frequency
≥ 8.1	Very High Frequency

Ranking number of Sand and Dust Storm Frequencies (SDSF/year)

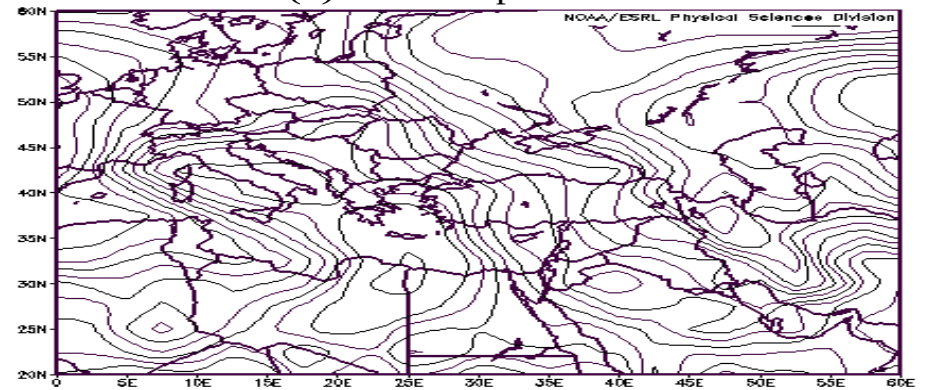
Anomaly of (A) SDSF days and SDS duration (hours) , (B) RSF days and RS duration (hours) at Cairo during period (1968-2010).



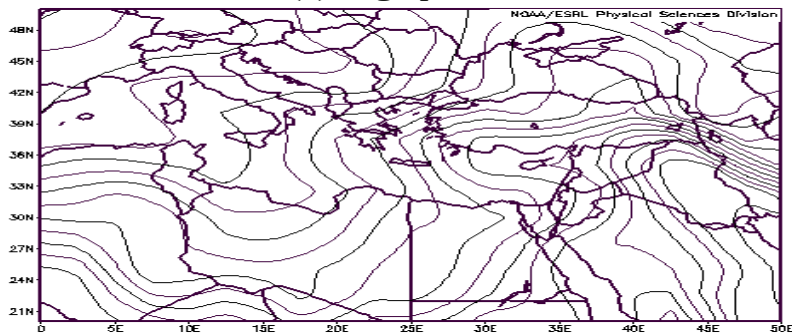
(a) Mediterranean depression (Cyprus low)



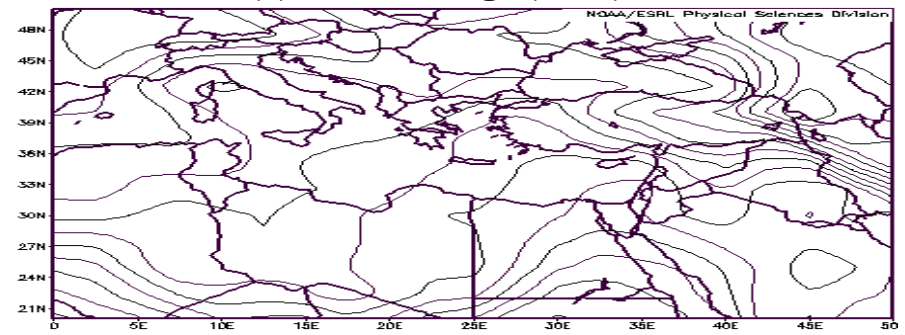
(b) Desert depression



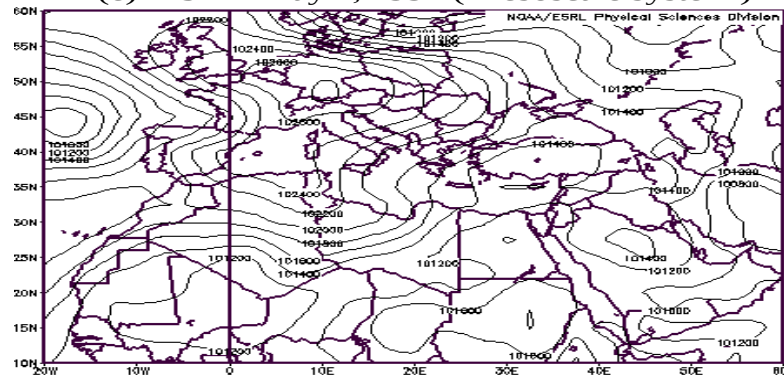
(c) High pressure



(d) Red sea trough (RST)



(e) MSLP May 2, 1997 (mesoscale system)



(f) Wall of dust near Cairo May 2, 1997 1200 UT



Characteristics of surface pressure systems cause SDS over Egypt

Pressure system	Type of pressure system	Surface wind	Origin of SDS system	Duration of lasting	<i>Time of occurrence</i>
Mediterranean depression	Prefrontal system	SE, SW (20-25)kt max 30kt	West europe, or Atlantic ocean	One day (6-12) hours	<i>Winter and spring seasons</i>
	Past frontal system	NW,SW(22-30kt,max 40kt	North or east Europe	2-4 days	<i>Winter season</i>
Desert depression	Extratropical khamasin extend to upper level with PJ, STJ	NW, SW (20-30) kt max 34 kt	West Africa south Atlas mountain	1-2 days	<i>Spring season</i>
	Subtropical Khamasin not extend to level 700hpa with STJ .	SW,SE(18-25)kt , max 30kt	African desert or west desert	6-12 hours	<i>Spring season</i>
Red sea trough	RST as extention of Sudan monsoon low to north red sea	SE, NE (16-25 kt) t max 35kt	South Egypt from Sudan monsoon low	3-6 hours	<i>Winter ,Autumn .spring Seasons</i>
High pressure	Subtropical high with high pressure gradient	NW, NE (15-25 kt) max 30kt	Atlantic ocean, west europe	3- 6 hours	<i>Summer Season</i>
Mesoscale system	<i>Mesoscale system Strong turbulance in small area includes gap winds, convective downbursts, down slope winds</i>	<i>SE,SW or var (23-35)kt Max 50kt</i>	<i>African desert , tropical region</i>	<i>6-12 hours</i>	<i>Late spring and early summer (may- june)</i>

Categories of Dust Casues

The main synoptic patterns causes dust or sand storm during the dusty/sandy period are classified into five categories:

- (1) Mediterranean depression with percentage ratio 46%**
- (2) Desert depression with percentage ratio 24%**
- (3) High pressure system at south of Egypt (strong northerly wind) with percentage ratio 6%**
- (4) Red sea trough over south Egypt in autumn season with percentage ratio 14%**
- (5) Meso-scale system from late spring to early summer 10% .**

Conclusion — get on board (the 'bit' has left the station)

Any Questions

Thank You

