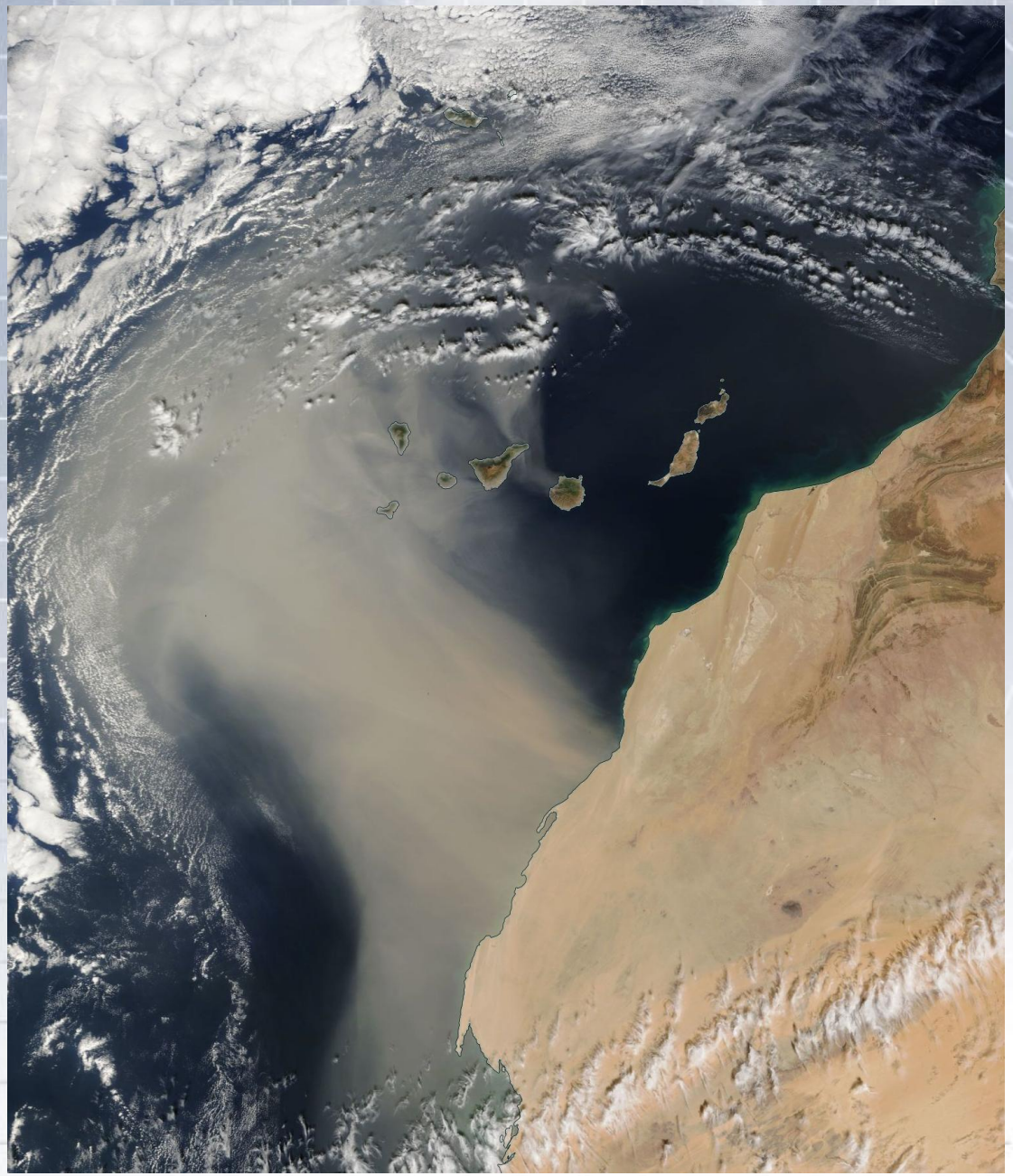


GOBIERNO DE ESPAÑA
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA
AEMet
Agencia Estatal de Meteorología

Airport operations under intense dust storm conditions in Canary Islands

César González Alejandre

Forecast Group of the Canary Islands

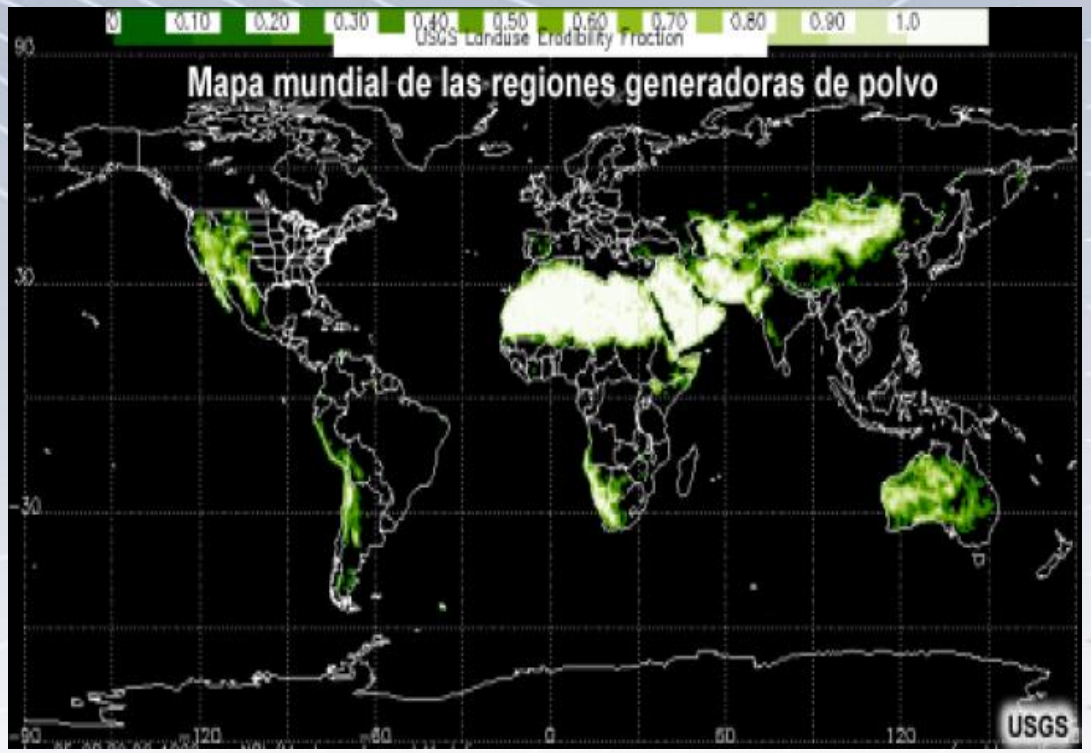
AEMET

OUTLINE

GOBIERNO DE ESPAÑA MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA AEMet Agencia Estatal de Meteorología

1. Introduction
2. Low visibility climatologies due to dust intrusions in airports
3. Synoptic mechanisms
4. Forecast and monitoring tools for dust intrusions. Generated products
5. An extreme event: the case study of 6th January 2002
6. Aeronautic procedures in cases of low visibility
7. Conclusions

INTRODUCTION



Closeness to one of the main dust source regions of the world

CLIMATOLOGIES

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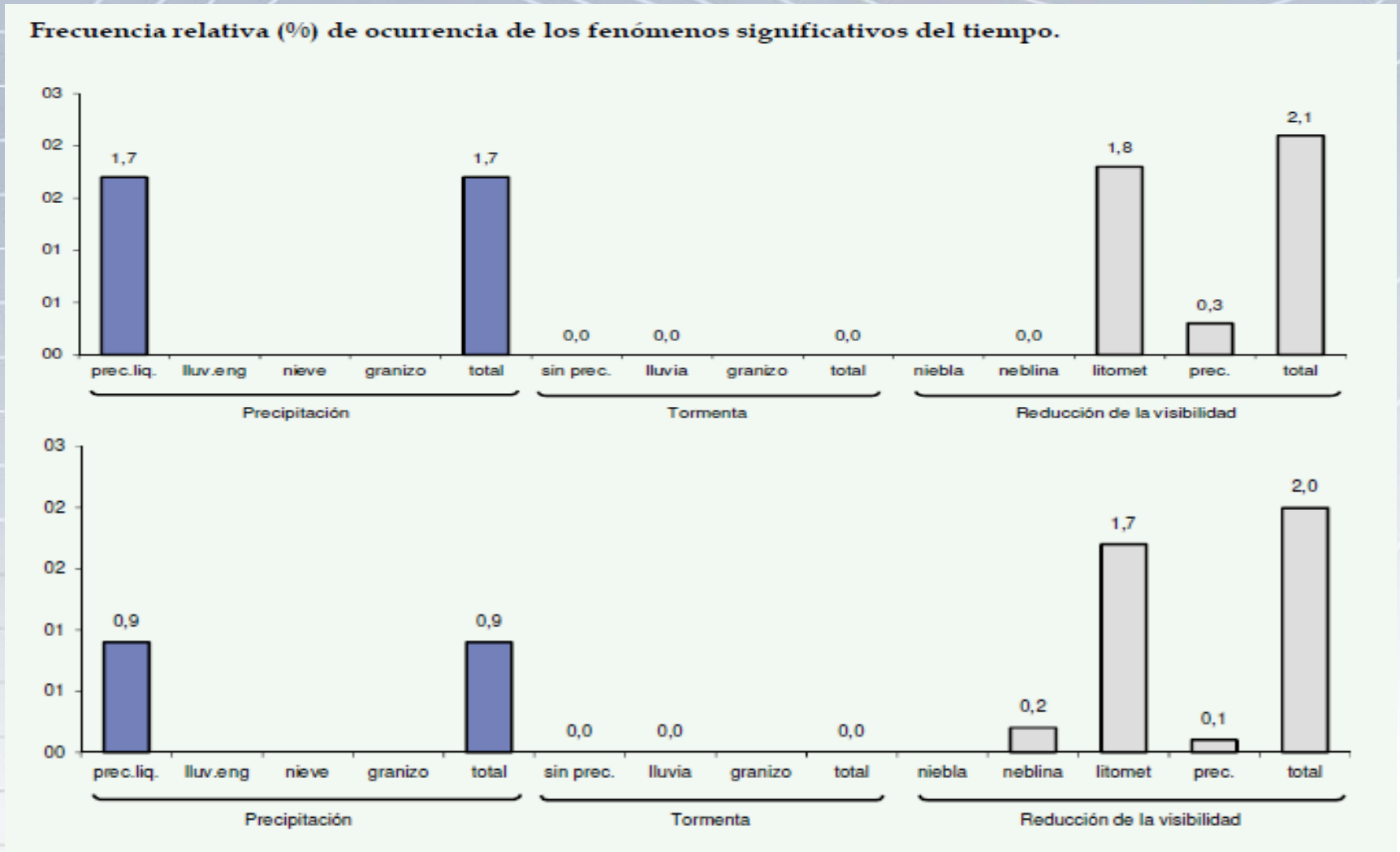

March 2002 - 2016

CLIMATOLOGIES

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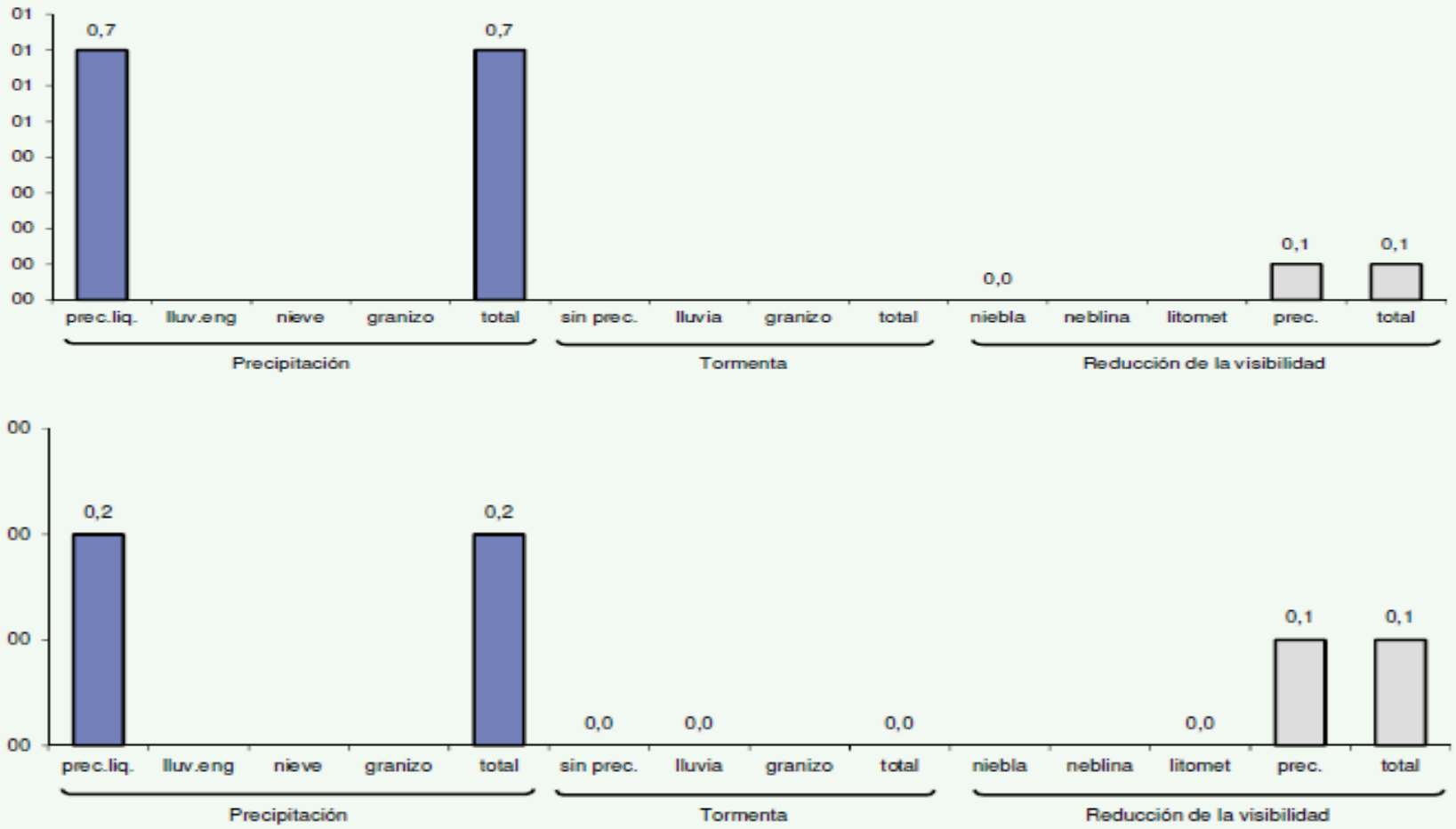
Frecuencia relativa (%) de ocurrencia de los fenómenos significativos del tiempo.



May 2002 - 2016

CLIMATOLOGIES

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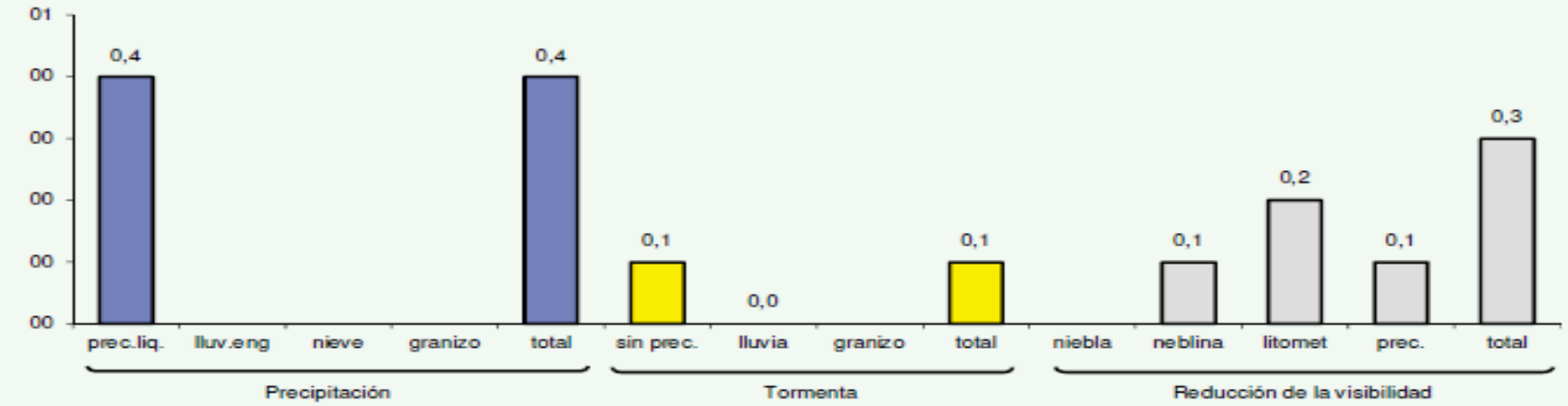
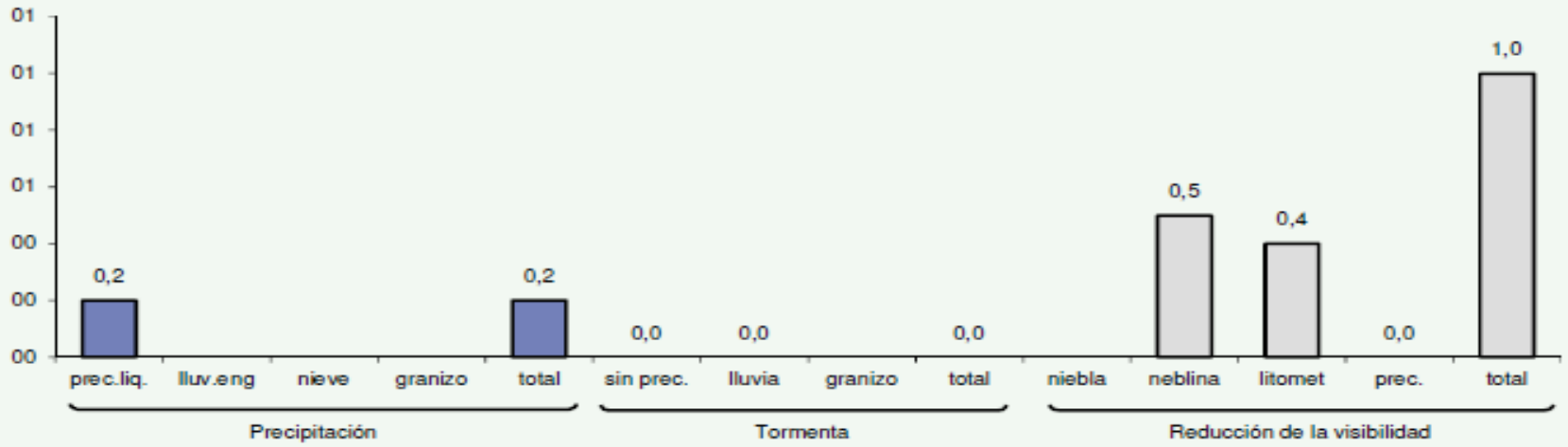
Frecuencia relativa (%) de ocurrencia de los fenómenos significativos del tiempo.



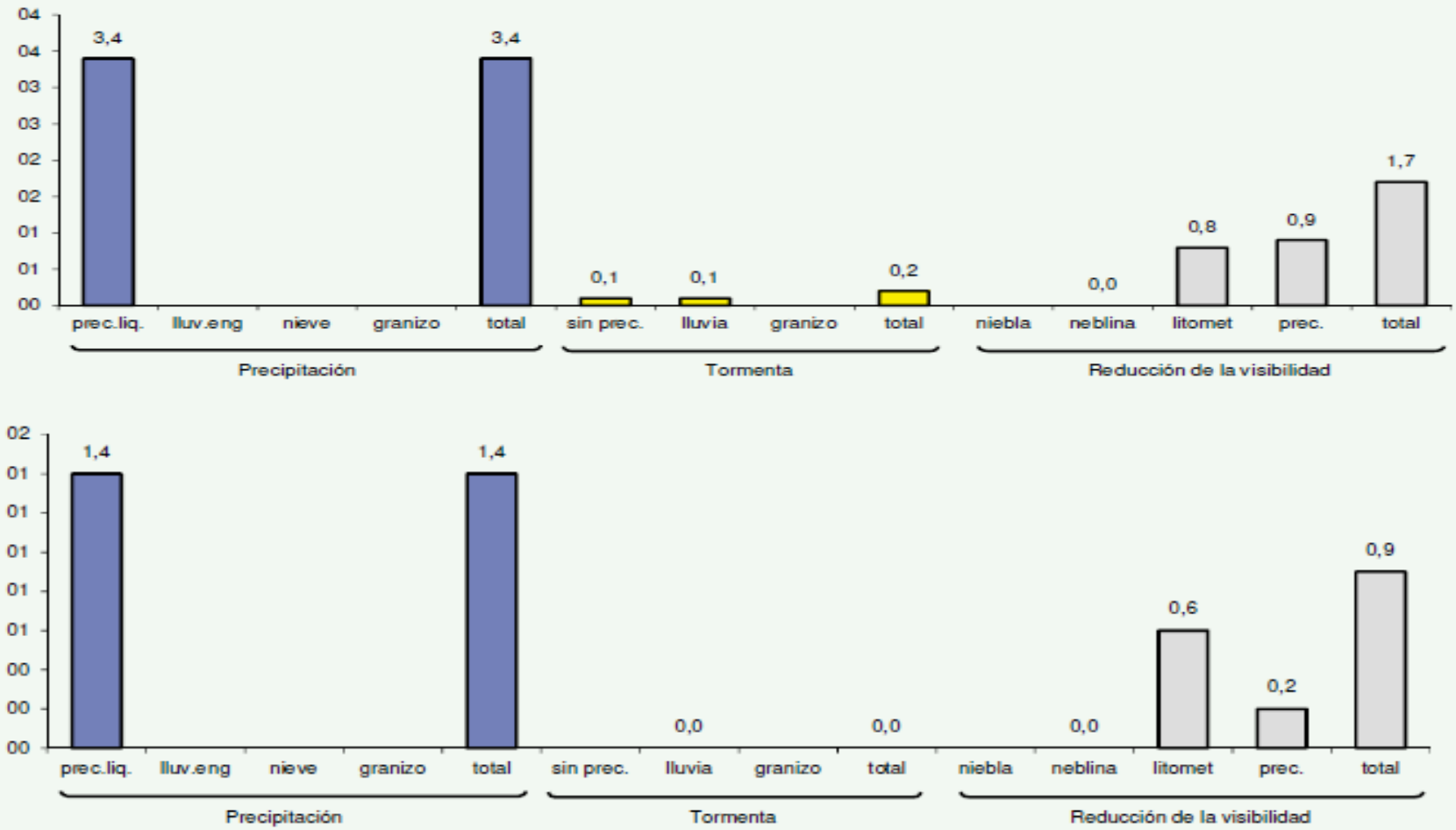


August 2002 - 2016

CLIMATOLOGIES

GOBIERNO DE ESPAÑA · MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA · AEMet Agencia Estatal de Meteorología

Frecuencia relativa (%) de ocurrencia de los fenómenos significativos del tiempo.



December 2002 - 2016

SYNOPTIC MECHANISMS

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Summer situation

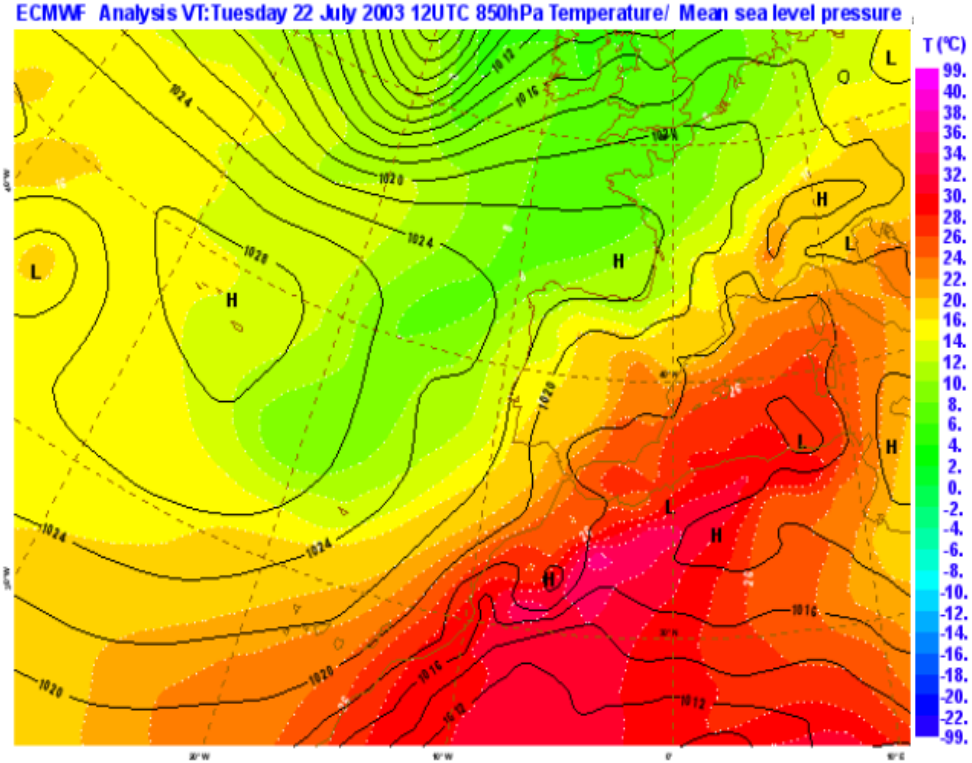


Figura 57: Análisis de superficie, 12 horas del 22 de julio de 2003. (Fuente: AEMET)

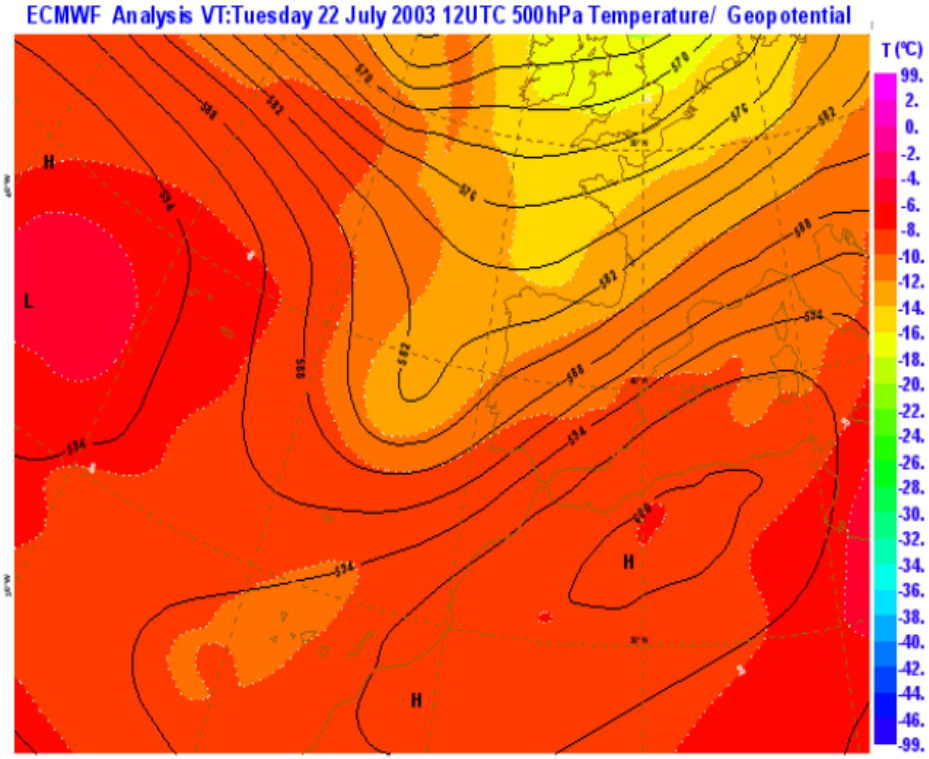


Figura 58: Análisis de 500 hPa, 12 horas del 22 de julio de 2003. (Fuente: AEMET)

Dust intrusion in high levels

SYNOPTIC MECHANISMS

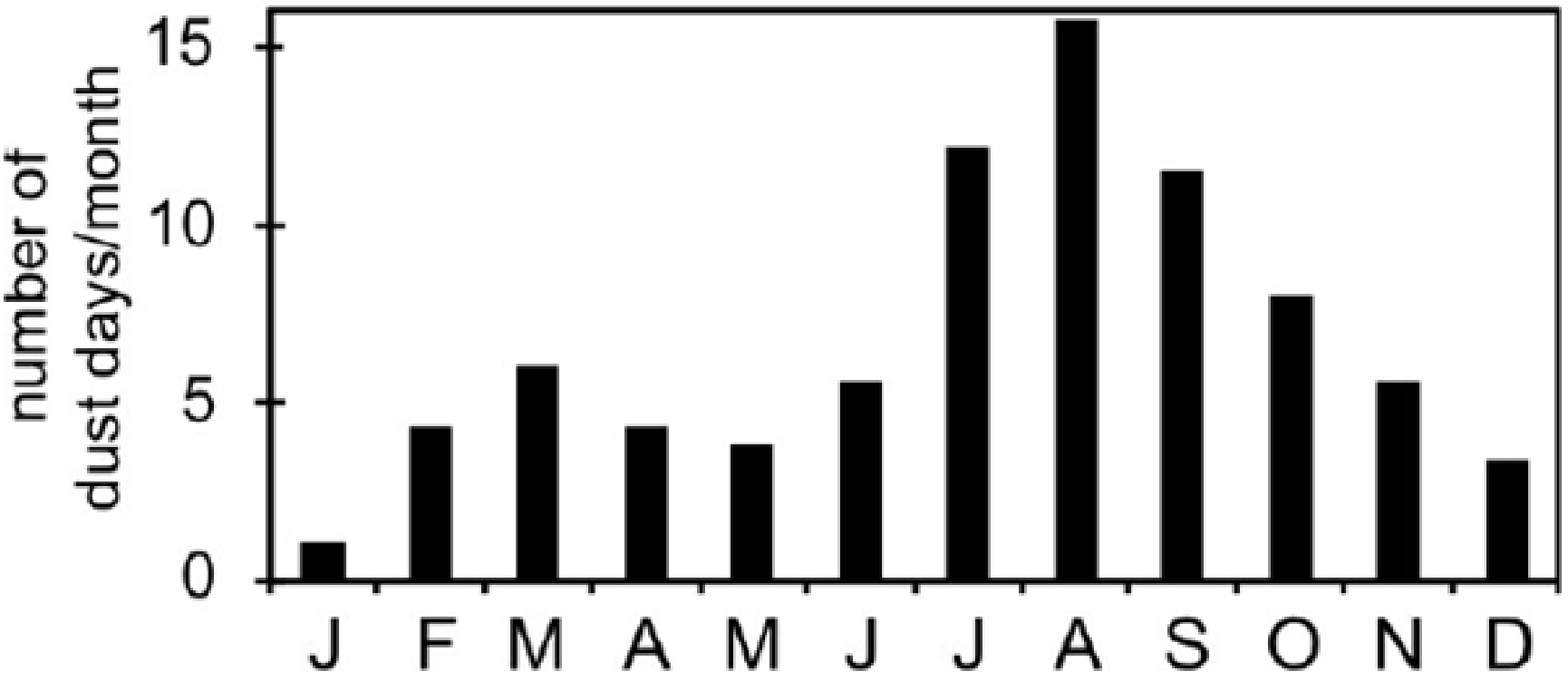
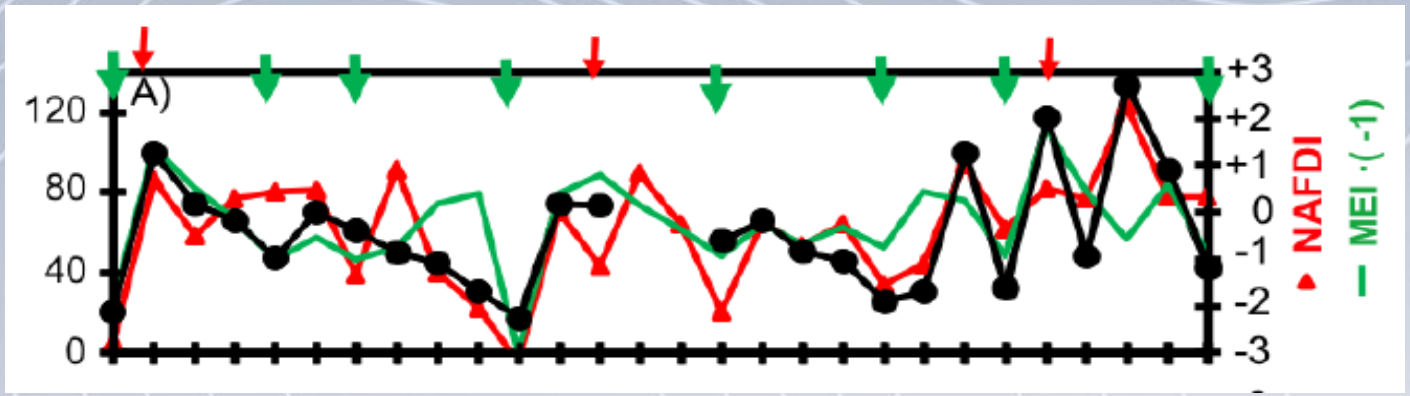
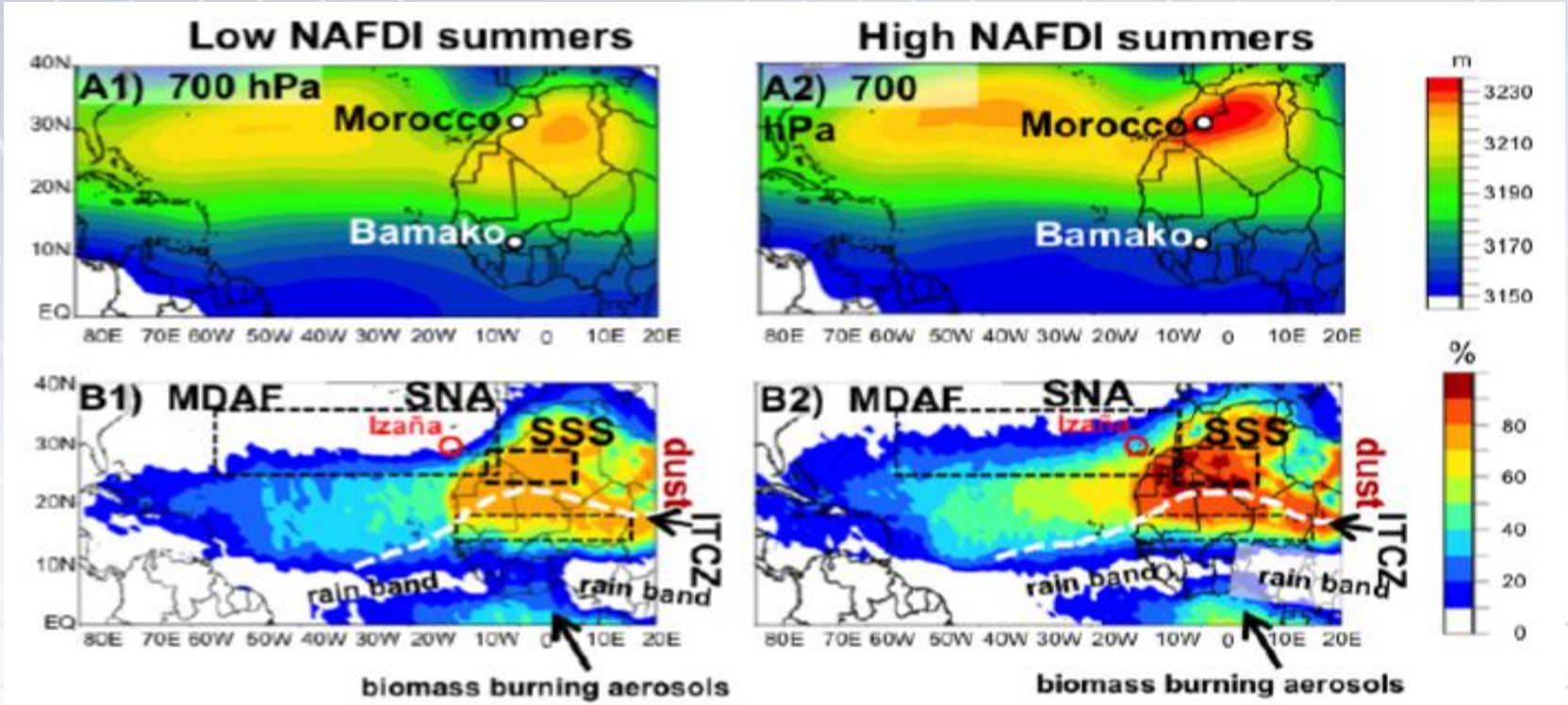


Figura 54: Frecuencia de eventos de polvo (>10 µg/m³) en Izaña en el periodo 1987–2014.

Measurements at 2400 m above sea level

SYNOPTIC MECHANISMS





SYNOPTIC MECHANISMS

Winter situation

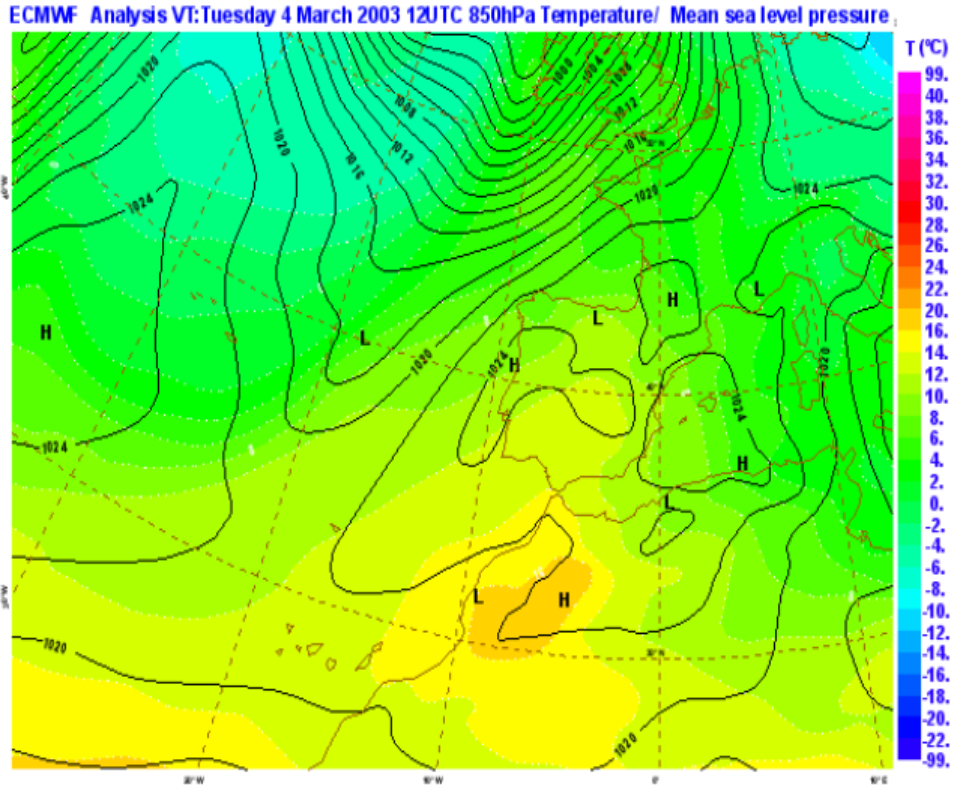


Figura 61: Análisis de superficie, 12 horas del 4 de marzo de 2003. (Fuente: AEMET)

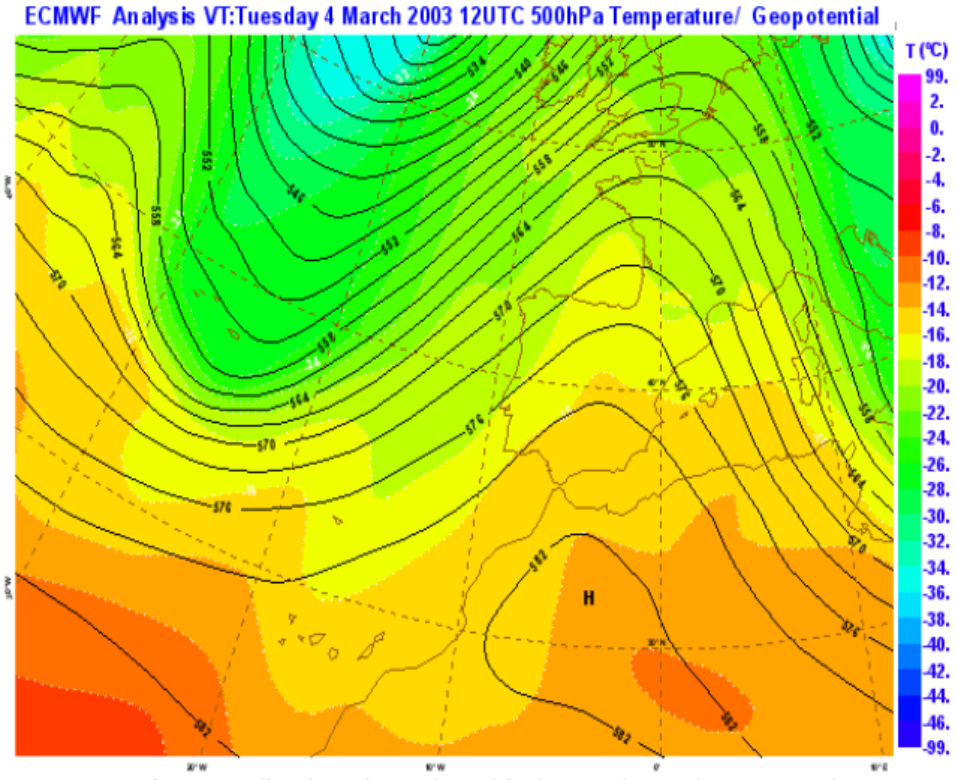
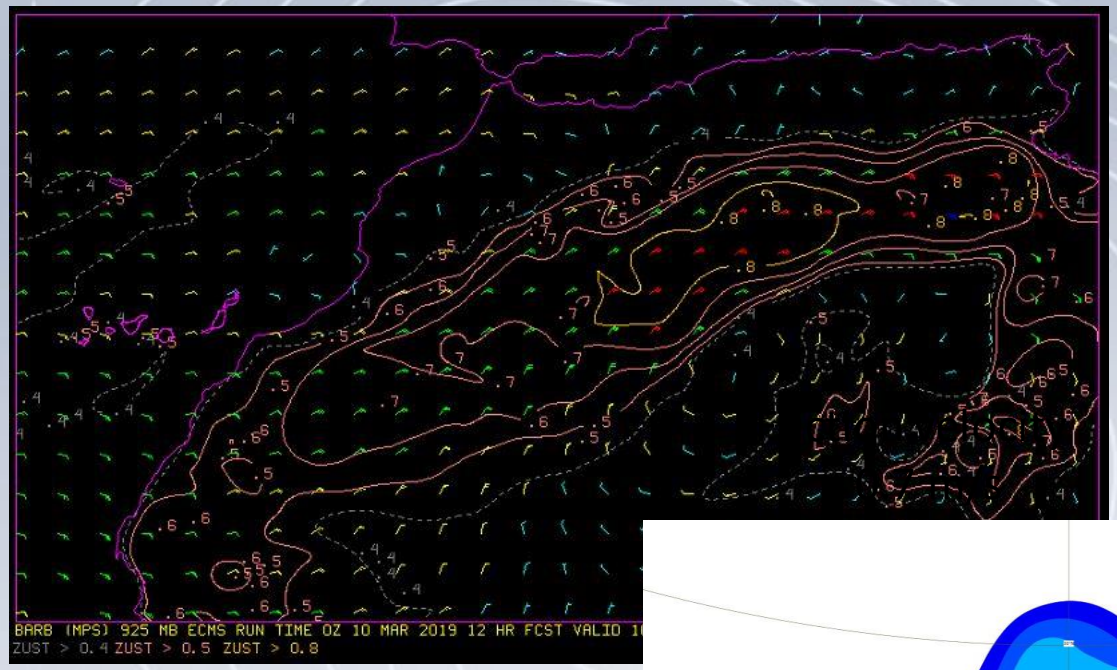


Figura 62: Análisis de 500 hPa, 12 horas del 4 de marzo de 2003. (Fuente: AEMET)

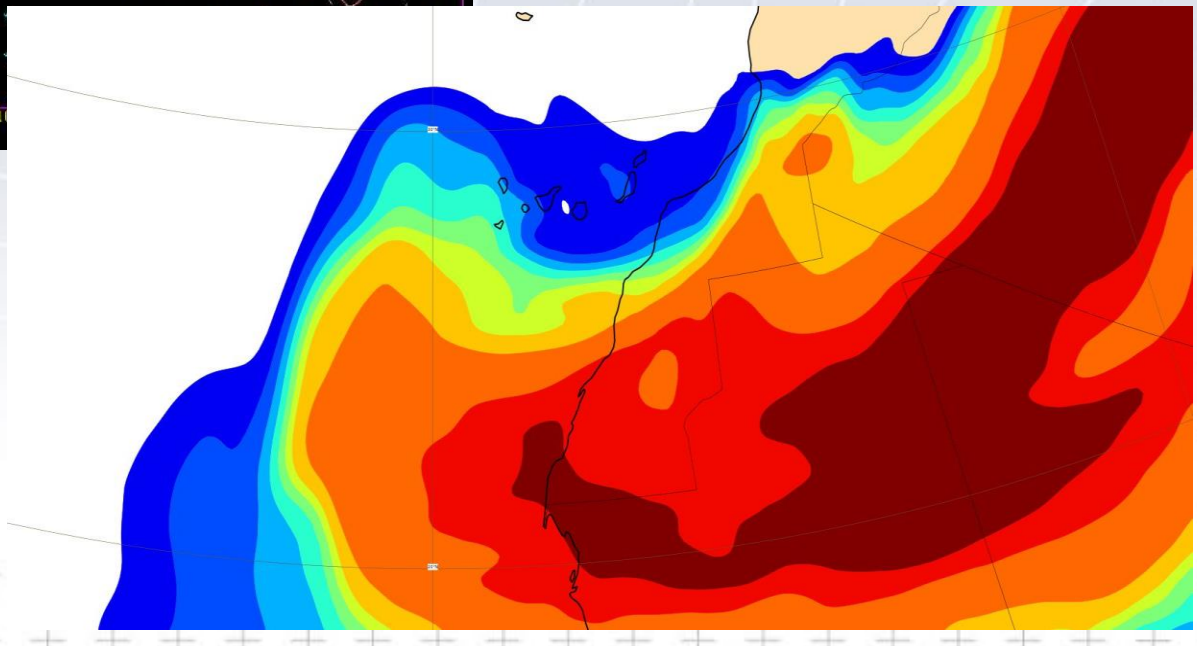
Dust intrusion in low levels

FORECAST TOOLS



Friction velocity
> 0.7 m/s
(ECMWF)

Aerosol Optical Depth,
AOD
(CAMS)



FORECAST TOOLS

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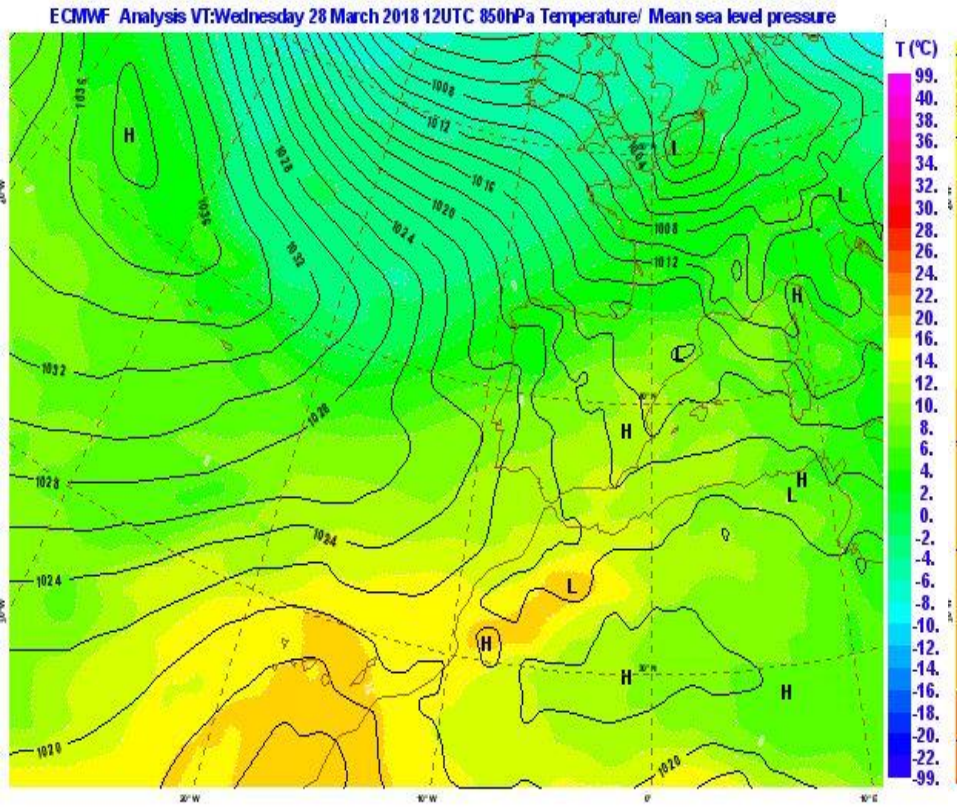
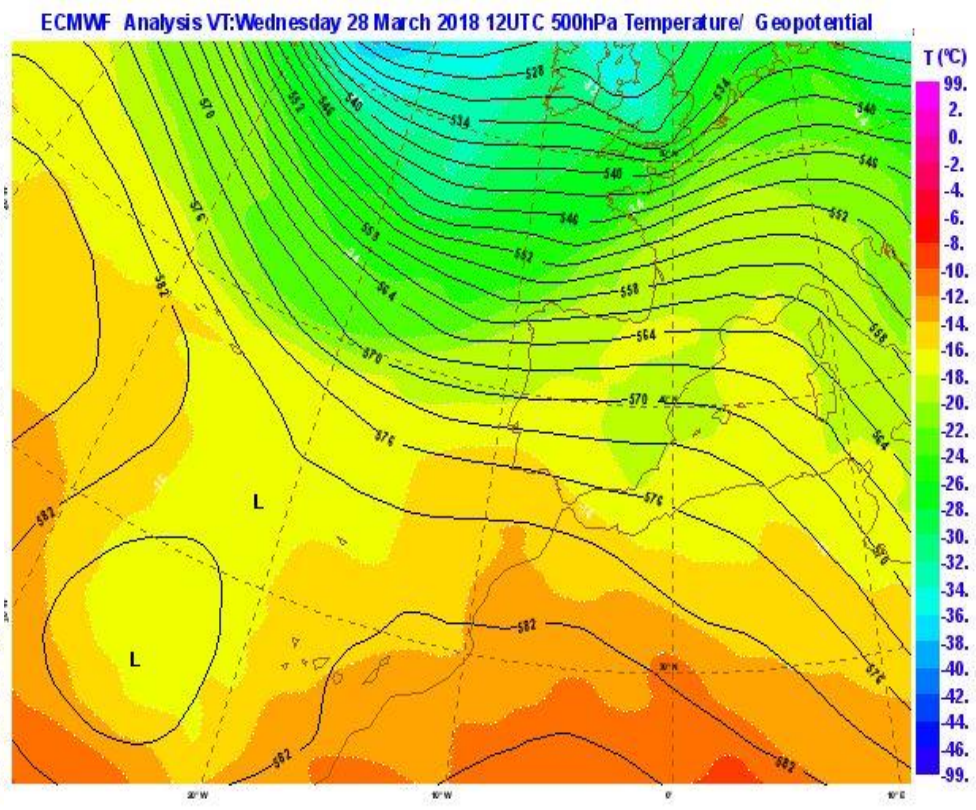
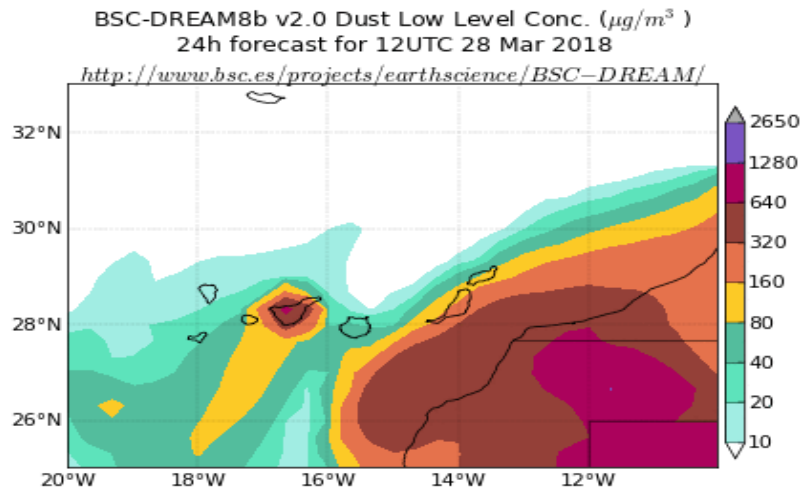
28th March 2018

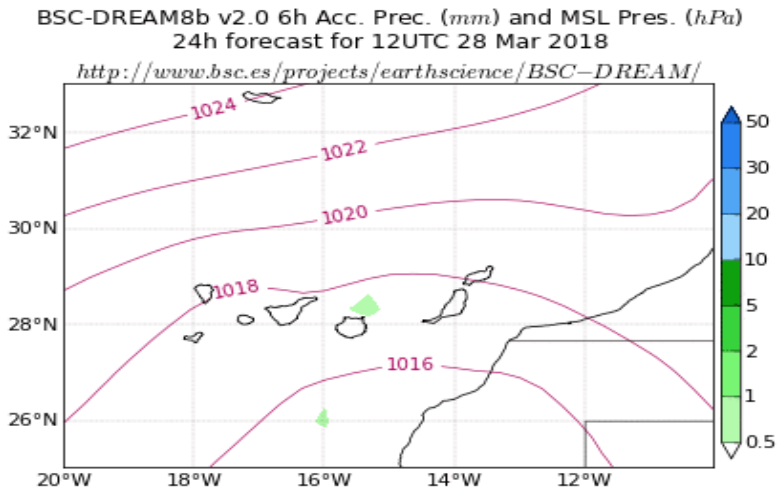


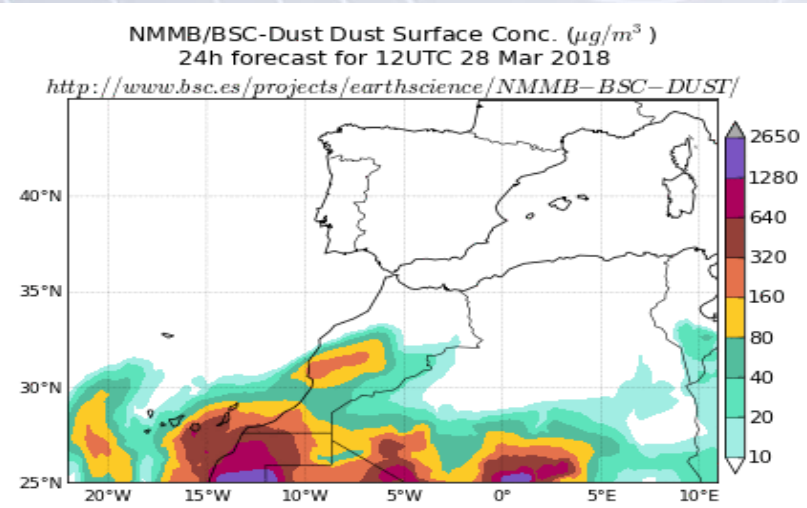


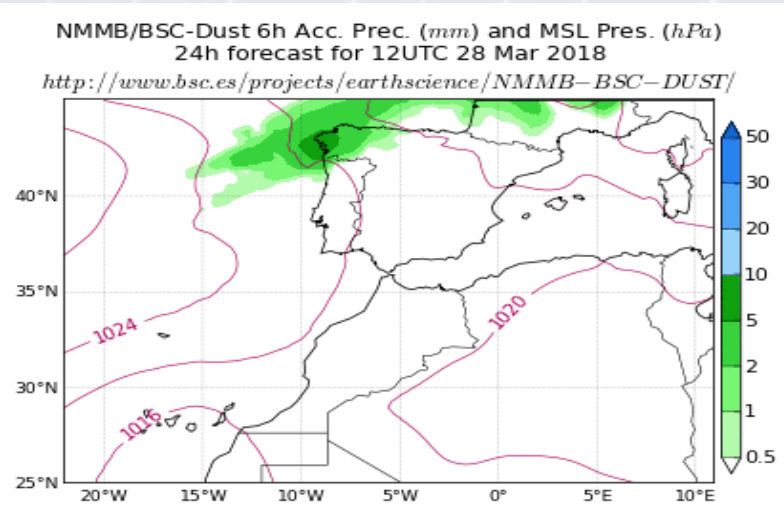
Will there be low visibility in the airports due to dust?

FORECAST TOOLS

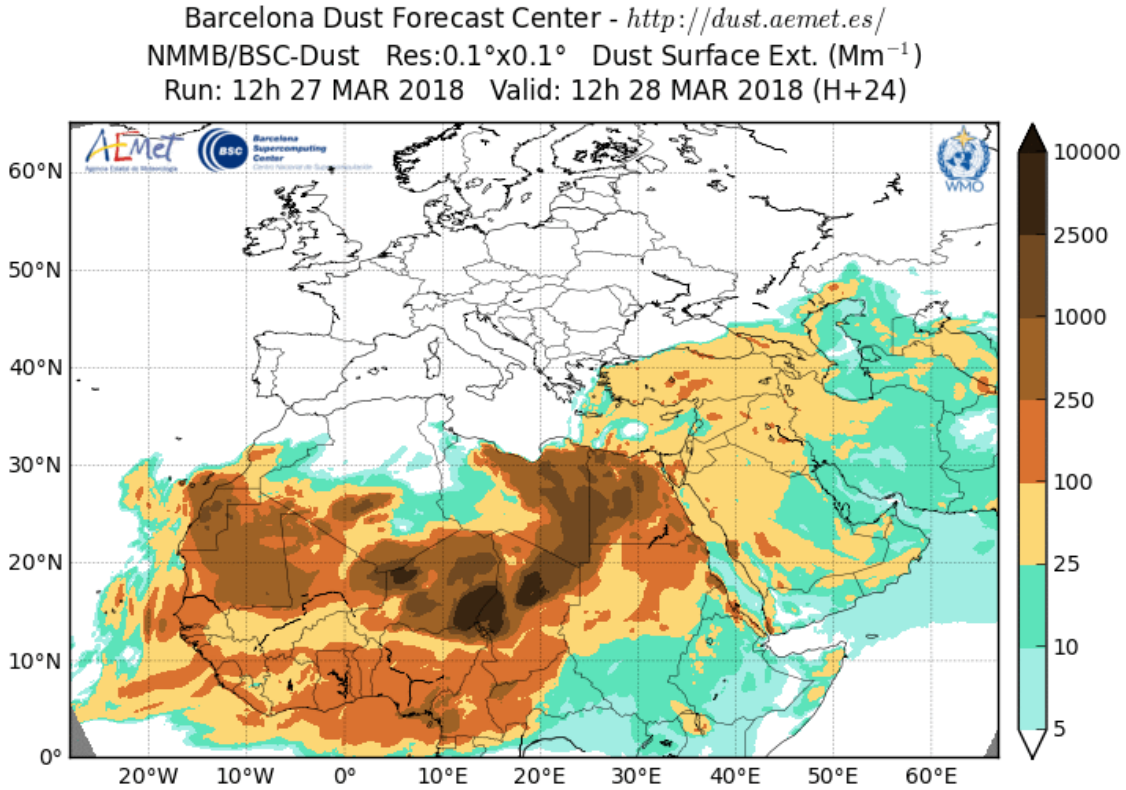


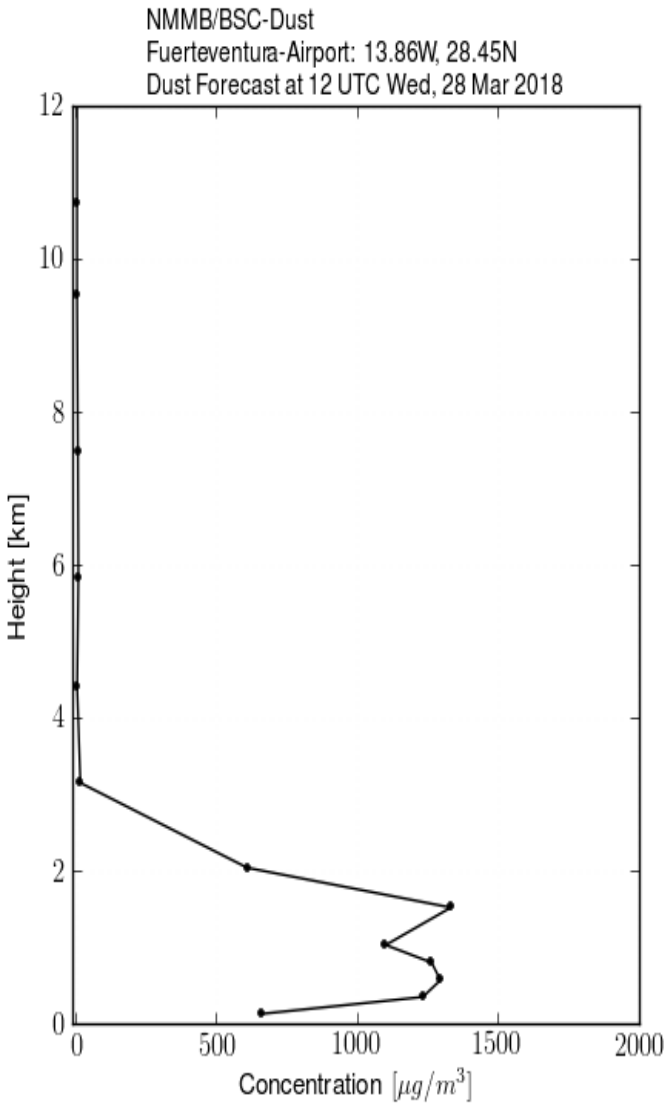






FORECAST TOOLS

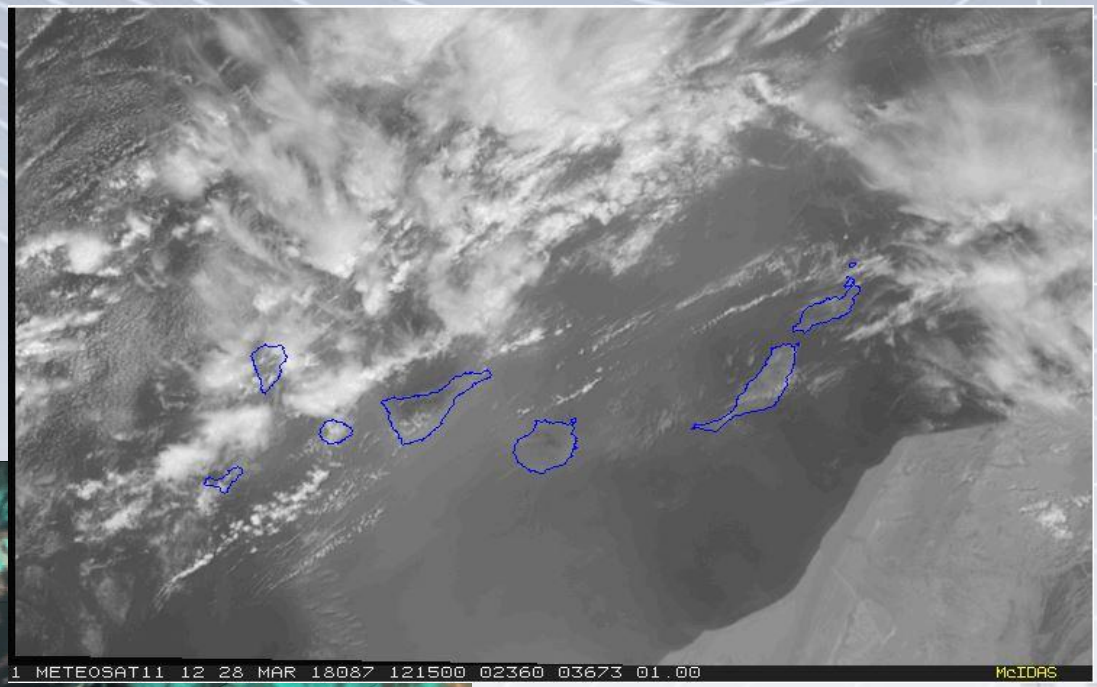


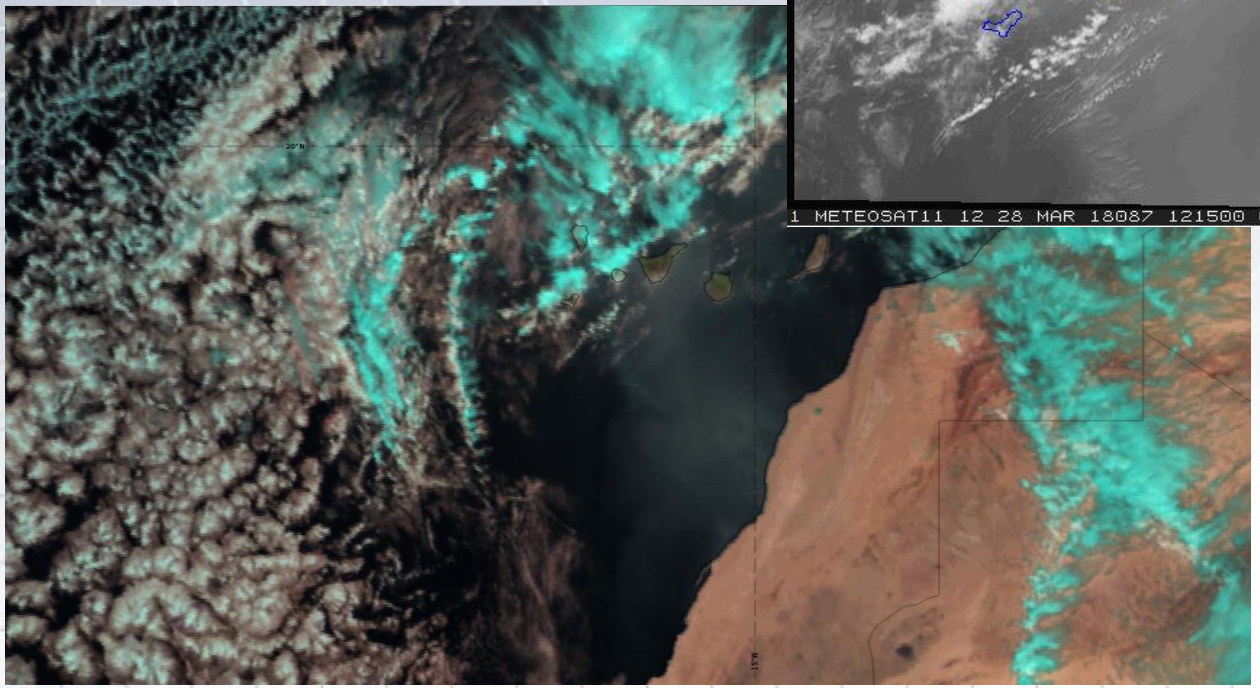


Good predictor of surface visibility

MONITORING TOOLS

HRV Satellite Image





Natural RGB

GENERATED PRODUCTS

TAF GCRR 280800Z 2809/2909 05016KT **6000 NSC** TX24/2814Z TN17/2906Z
PROB40 TEMPO 2809/2821 3000 HZ
PROB40 2810/2816 12009KT=

TAF GCFV 280800Z 2809/2909 VRB05KT **7000 NSC** TX23/2814Z TN17/2906Z
PROB40 TEMPO 2809/2821 3000 HZ=

TAF GCLP 280800Z 2809/2909 VRB05KT **7000 NSC** TX24/2814Z TN17/2906Z
PROB40 TEMPO 2809/2903 3000 HZ
BECMG 2819/2821 35012KT=

TAF GCXO 280800Z 2809/2909 14009KT **7000 NSC** TX24/2814Z TN13/2906Z
PROB40 TEMPO 2809/2909 3000 HZ
PROB30 TEMPO 2809/2816 14015G25KT=

TAF AMD GCXO 281159Z 2811/2909 14009KT 7000 NSC TX24/2814Z TN13/2906Z
PROB40 TEMPO 2811/2909 3000 HZ
PROB30 TEMPO 2811/2821 1500 HZ
PROB30 TEMPO 2811/2816 14015G25KT=

TAF GCTS 280800Z 2809/2909 05009KT **7000 NSC** TX25/2814Z TN19/2906Z
PROB40 TEMPO 2809/2909 3000 HZ=

TAF AMD GCTS 281135Z 2811/2909 05009KT 7000 NSC TX25/2814Z TN19/2906Z
PROB40 TEMPO 2811/2909 3000 HZ
PROB30 TEMPO 2811/2821 1500 HZ=

TAF GCGM 280800Z 2809/2909 VRB05KT **7000 NSC** TX24/2814Z TN18/2906Z
PROB40 TEMPO 2809/2909 3000 HZ=

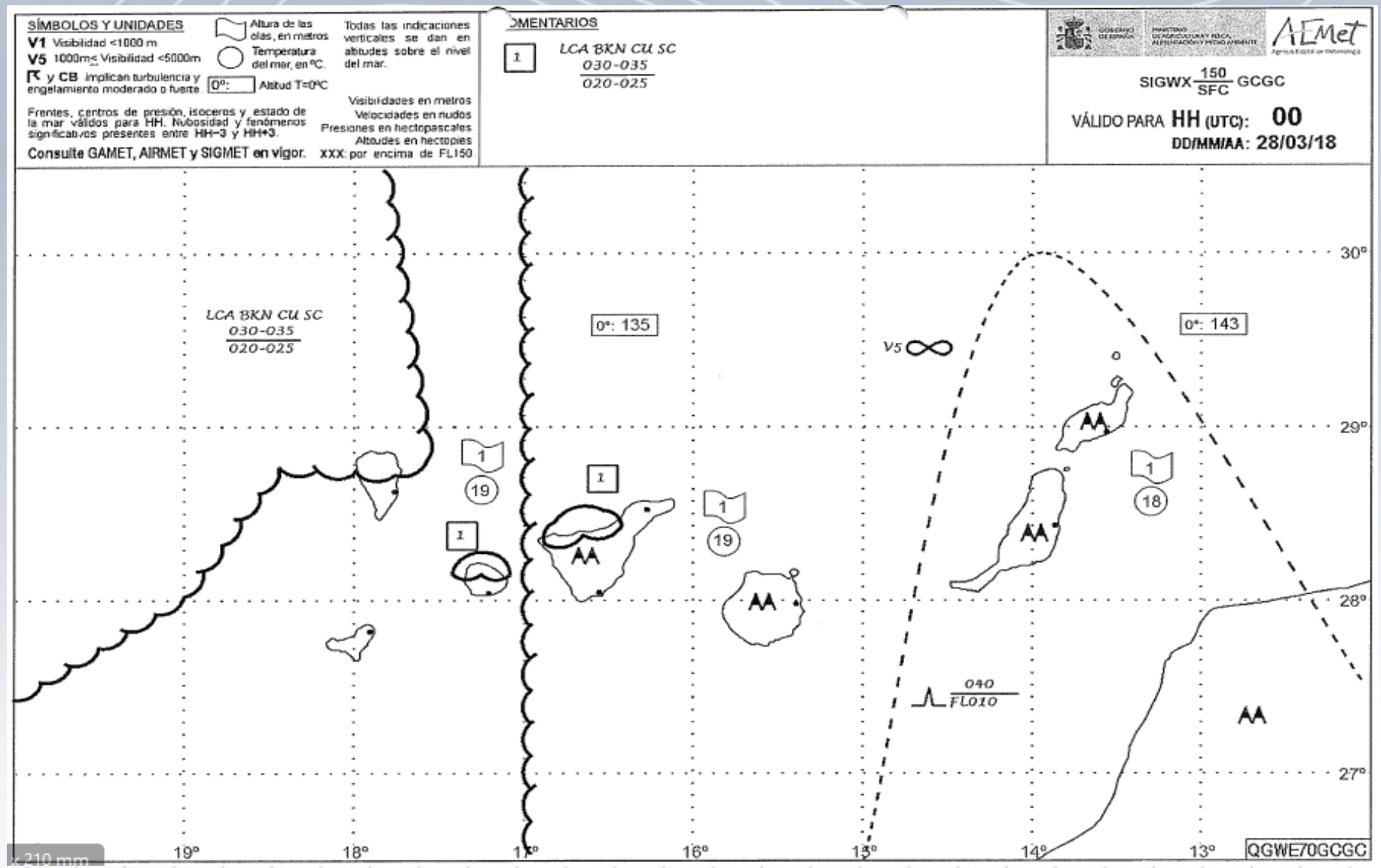
TAF COR GCLA 280801Z 2809/2909 02011KT **8000 NSC** TX25/2814Z TN19/2906Z
BECMG 2818/2820 32007KT
PROB40 TEMPO 2809/2909 3000 HZ=

TAF GCHI 280800Z 2809/2909 02011KT **8000 NSC** TX22/2814Z TN18/2906Z
PROB40 TEMPO 2809/2909 3000 HZ=

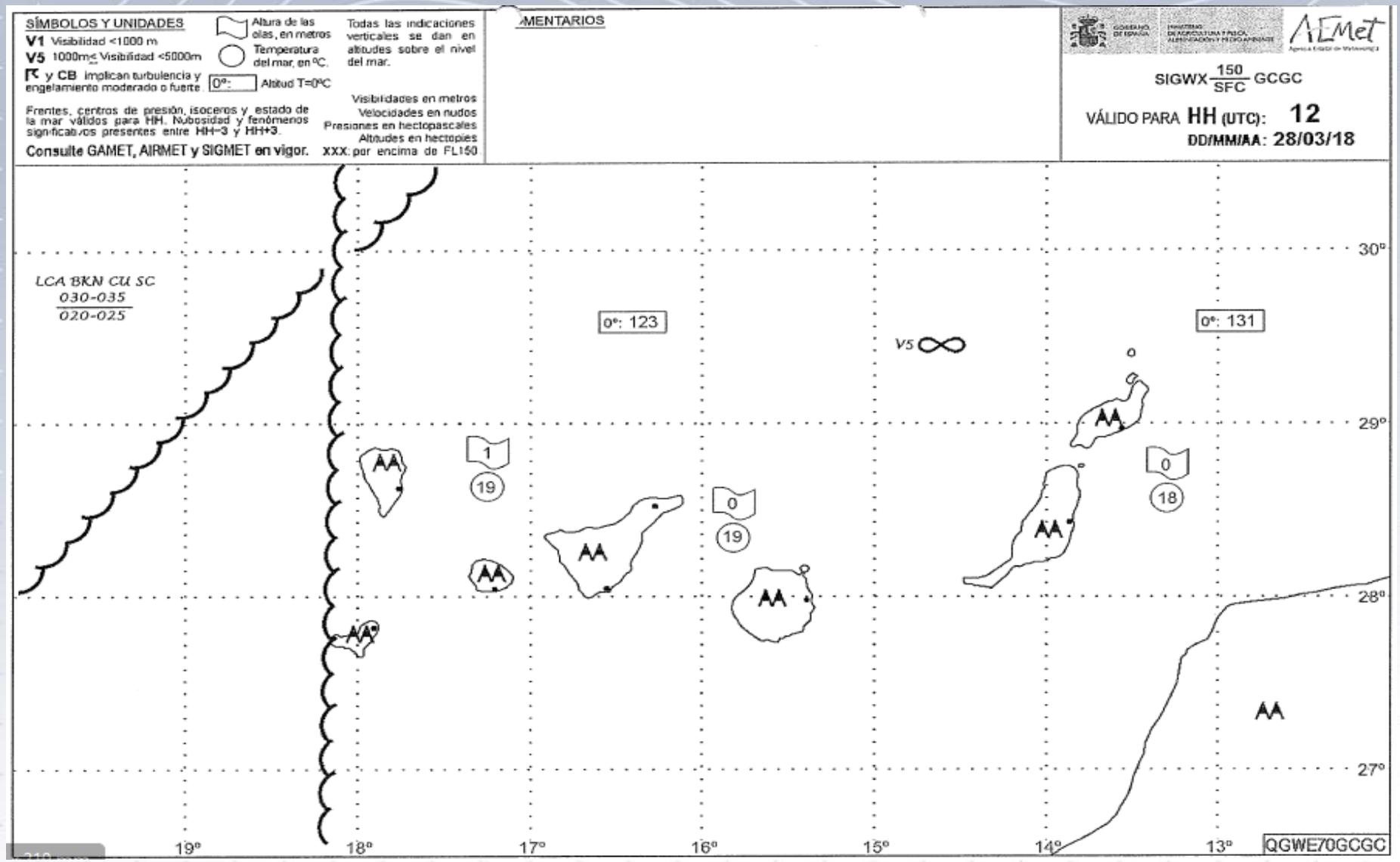
METAR GCXO 281400Z 16008KT 120V210 1100 R30/1600N R12/1500N HZ VV011 24/01 Q1019 NOSIG=

METAR GCTS 281400Z 09009KT 060V130 1400 1100SW HZ NSC 29/M00 Q1016 NOSIG=

GENERATED PRODUCTS



GENERATED PRODUCTS



AN EXTREME EVENT

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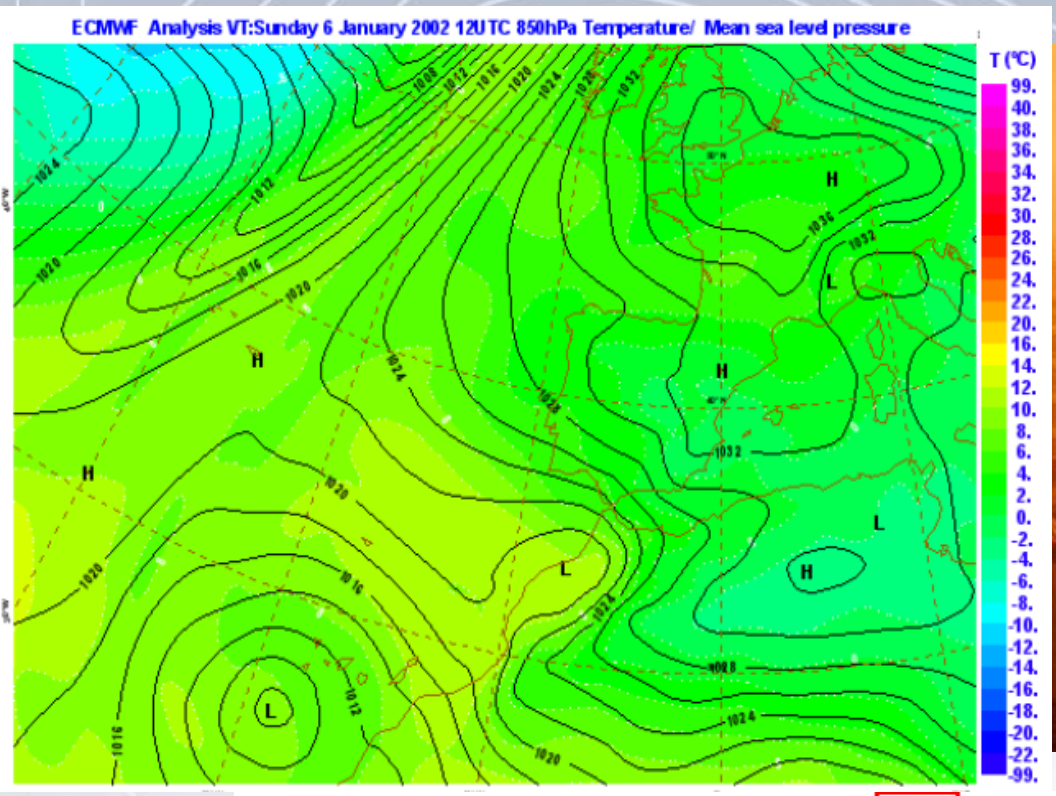

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SA 06/01/2002 16:30-> GCLP 061630Z 10004KT 0050 R03/0650N HZ VV250 20/11 Q1011=
SA 06/01/2002 17:30-> GCLP 061730Z 10015KT 0050 R03/0800N HZ VV250 21/09 Q1011=
SA 06/01/2002 18:00-> GCLP 061800Z 10015KT 0050 R03/0900U HZ VV300 21/10 Q1011=
```

AERONAUTIC PROCEDURES

Fase I – PREAVISO	≤900 m y tendencia a empeorar.
Fase II – PARALIZACIÓN DE OPERACIONES	< 800 m
Fase III – REANUDACIÓN DE OPERACIONES	>=900 m y tendencia a mejorar.

Lanzarote - GCRR

RESUMEN DE FASES DE ACTIVACIÓN DEL PROCEDIMIENTO	
FASES	Inicio: RVR / visibilidad (m)
Fase 0 – Prealerta.	≤ **1.000**
Fase 1 – Cancelación de aterrizajes.	≤ **600**
Fase 2 – Cancelación de despegues.	≤ **400**
Fase 3 – Cancelación de Procedimiento PPOAM600.	≥**1000**

Fuerteventura - GCFV

CONCLUSIONS

- Dust intrusions are favored in Canary Islands due to its closeness to one of the largest dust source regions of the world. The characteristic synoptic configuration for these episodes to happen is a high pressure over North Africa (easterly – southeasterly winds)

- In summer, dust intrusions tend to occur in high levels. The mechanism that controls such situations is the intensification of the African Dipole in 700 hPa (high correlation between dust concentration and the NAFDI index)

- In winter, the situations that may cause a significant visibility reduction in the airports occur. The position of the high pressure generates a more continental flow over the islands and in addition, the higher variability of the humid surface layer enhances the presence of dust in the low troposphere

CONCLUSIONS

- Even if dust intrusions are very common in Canary islands, extreme episodes are quite infrequent. In fact, in the last 5 years we have only had 7 situations in which surface visibility was reduced below 3000 m (warning)

- Friction velocity is a proper index to quantify the lifting of dust from the desert, but transport is necessary afterwards. The extinction coefficient is a good predictor of surface visibility

- The Forecast Group of the Canary Islands is responsible of the alerts concerning severe dust intrusions, as well as the monitoring of such situations. In order to provide this service, we use some resources such as numeric models or satellite images, generating a series of products (low level maps, TAFs and warnings)

- In the event of a great surface visibility reduction, a series of procedures are started up in the airports of the Canary Islands. These may differ between airports, but usually a phase of pre – alert is declared when RVR < 1000 m

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AEMet
Agencia Estatal de Meteorología

THANK YOU VERY MUCH

Contact: cgonzaleza@aemet.es