

# Productos ENS

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VICEPRESIDENCIA  
TERCERA DEL GOBIERNO

MINISTERIO  
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Y EL RETO DEMOGRÁFICO

**Aemet**  
Agencia Estatal de Meteorología

Curso PIB-M. 4ª Edición

# Productos de ECMWF: ENS

HRES  
SST  
D  
D+5  
D+10  
D+15

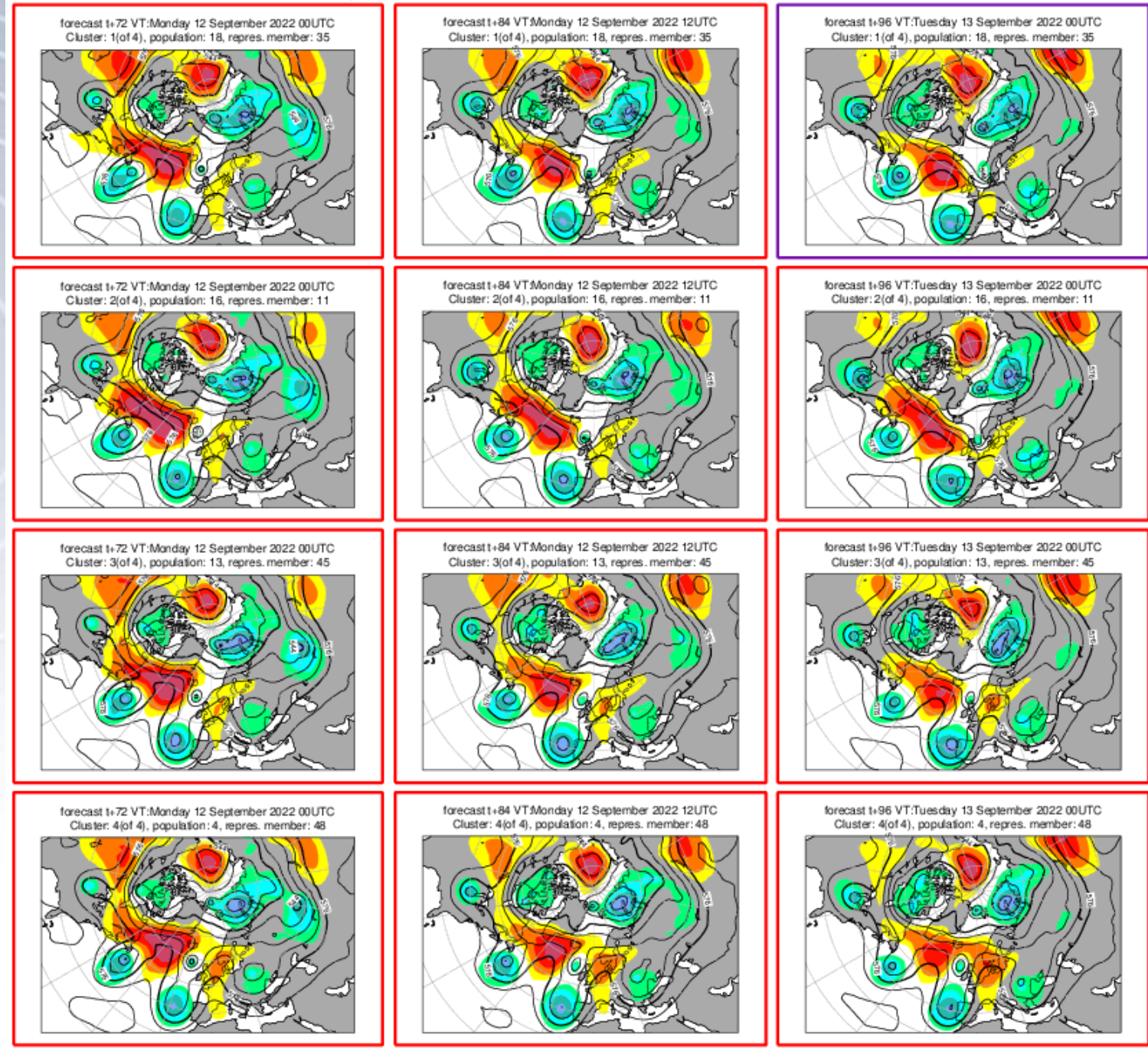
## ENS products



# Productos de ECMWF: ENS

## Grupos

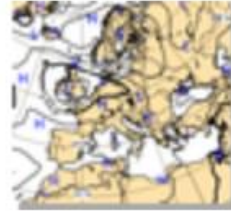
Friday 9 September 2022 00UTC ECMWF EPS Cluster scenario - 500 hPa Geopotential  
Reference step t+72-96 Domain 75/340/30/40 Cont. in cluster=2 Det. in cluster=2



# Productos de ECMWF: Media ENS y dispersión

MSLP, 850 (T, V), 500 Z

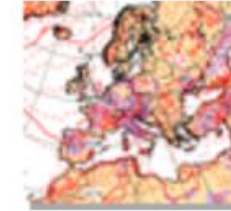
## Ensemble mean and spread



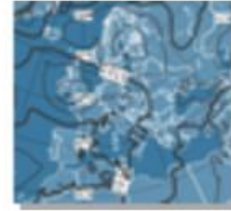
▶ Ensemble mean and spread for



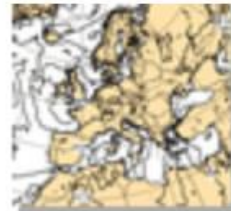
▶ Ensemble mean and spread: four



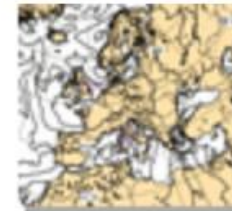
▶ Ensemble mean and spread: 2 m



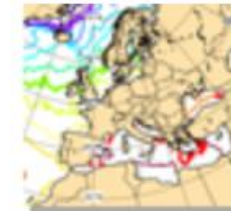
▶ High resolution mean sea level



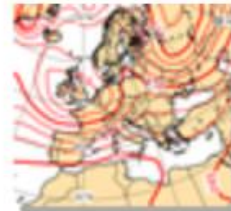
▶ Ensemble mean and spread: 10 m



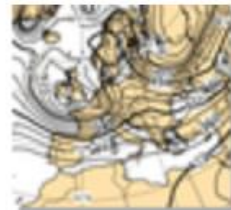
▶ Ensemble mean and spread: 100 m



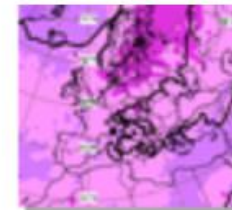
▶ Ensemble mean and spread: sea



▶ Ensemble mean and spread: 500



▶ Ensemble mean and spread: 300



▶ Ensemble mean and spread for 10 hPa

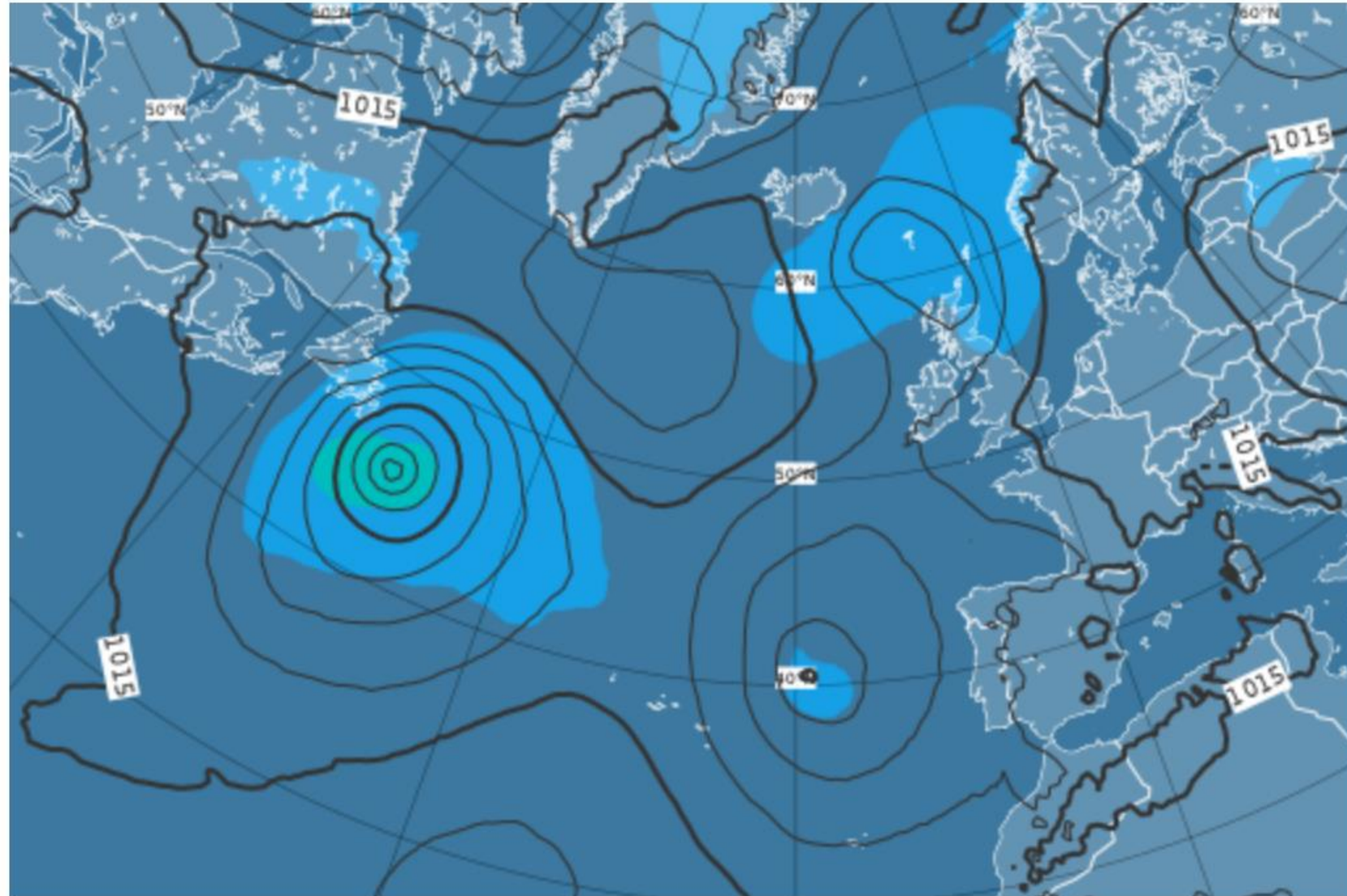
# Productos de ECMWF: ENS y HRES

Dispersión ENS

HRES

Utilidad: evalúa la  
incertidumbre de HRES

Ensemble spread for mean sea level pressure / Mean sea level pressure  
Friday 9 Sep, 00 UTC T+72 Valid: Monday 12 Sep, 00 UTC



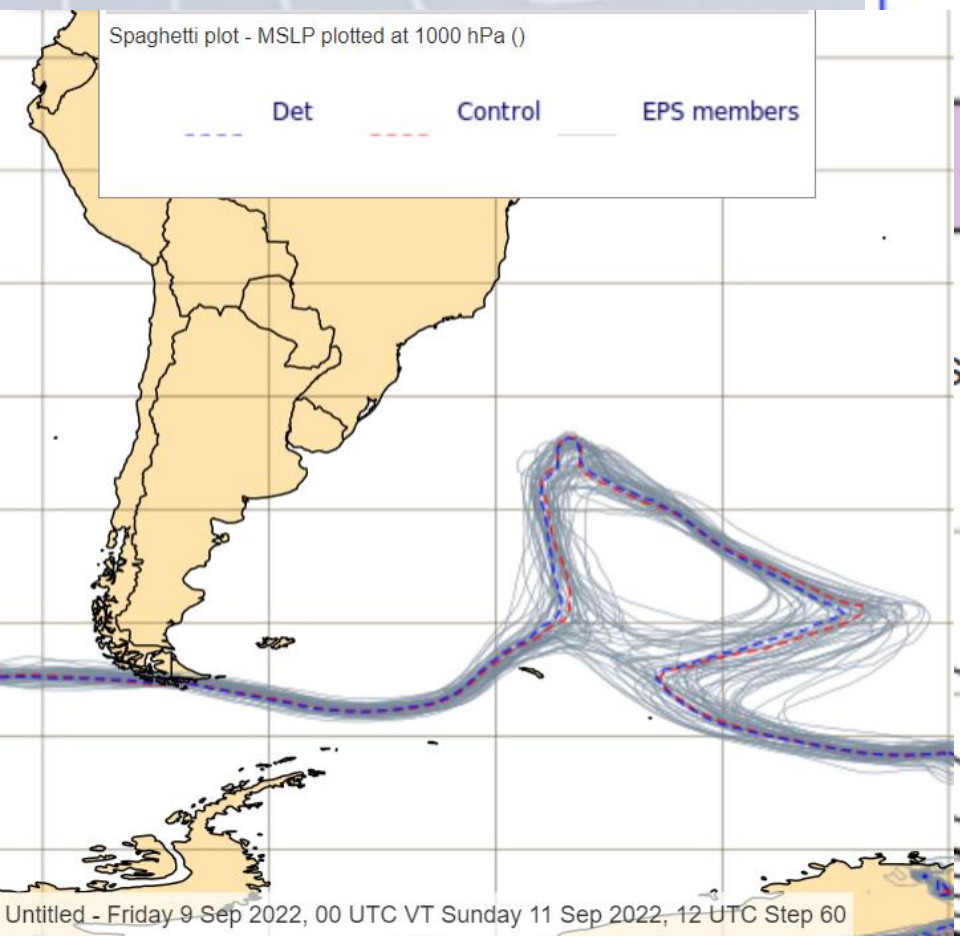
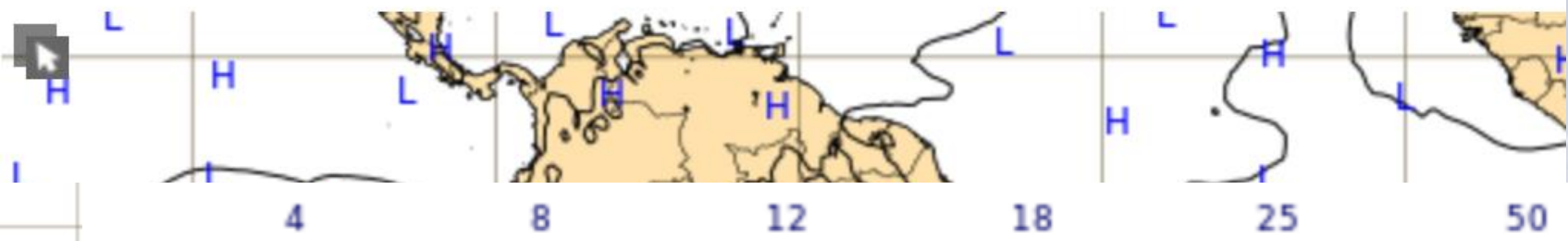
# Productos de ECMWF: Media ENS y dispersión

MSLP, 850 (T, V), 500 Z  
Espaguetis

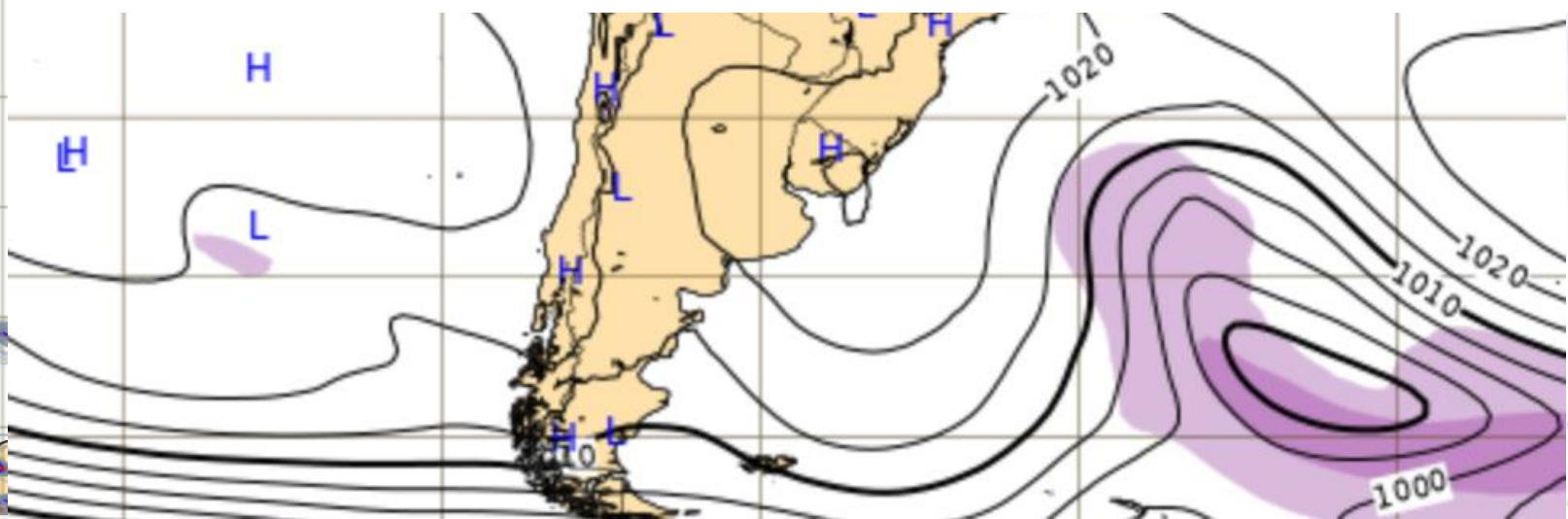
Base time: Fri 09 Sep 2022 00 UTC

Area: South America

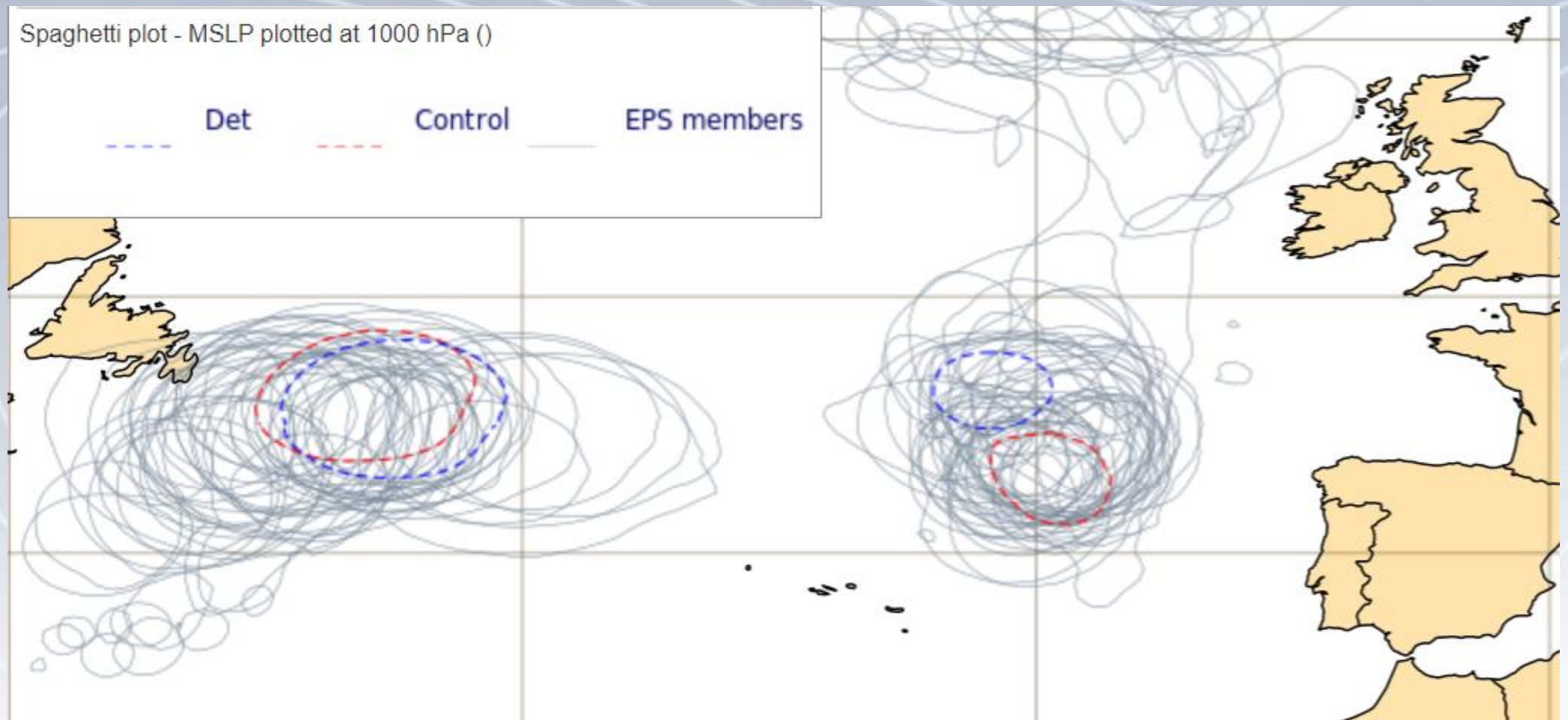
Ensemble spread for mean sea level pressure / Ensemble mean for mean sea level pressure  
Friday 9 Sep, 00 UTC T+60 Valid: Sunday 11 Sep, 12 UTC



Ensemble spread for mean sea level pressure



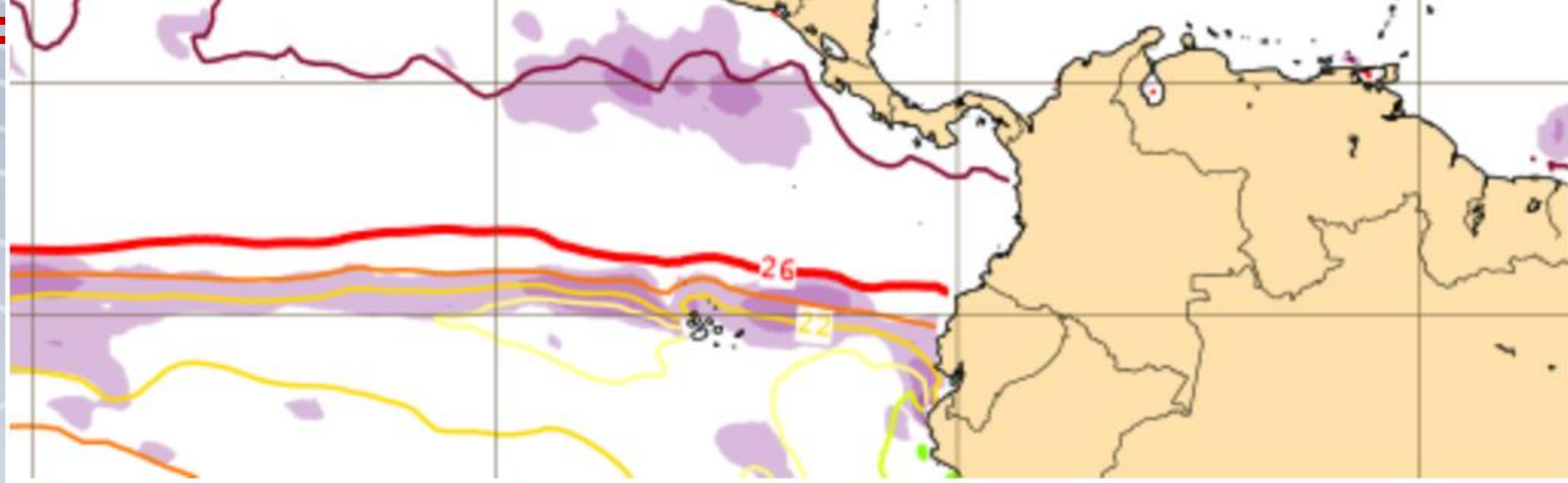
# Productos del *ENS*: espaguetis



- Representación explícita de una única isoclinea del campo

# Productos de ECMWF ENS

SST  
Media  
Dispersión



Ensemble mean for sea surface temperature (SST)



Ensemble spread for sea surface temperature (SST)



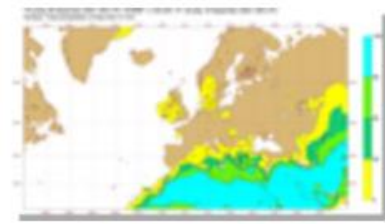
# Productos de ECMWF:

## ENS. Probabilidades de superación de umbrales

### ENS products



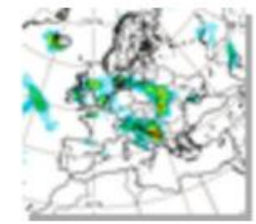
### Probabilities



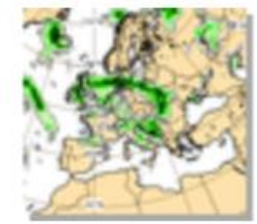
Probabilities: multi-day precipitation



Probabilities: freezing rain during precipitation



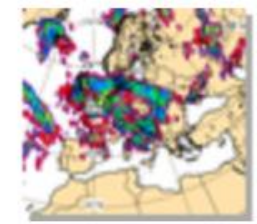
Probabilities: point rainfall during precipitation



Probabilities: precipitation (total / ...)



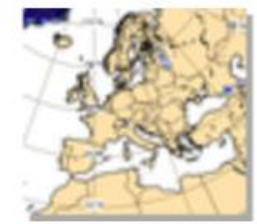
Probabilities: snowfall during last precipitation



Probabilities: precipitation rate



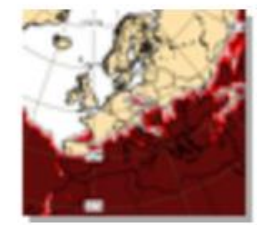
Probabilities: visibility



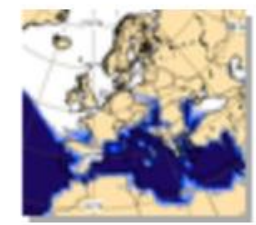
Probabilities: minimum 2 m visibility



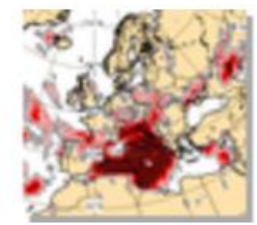
Probabilities: lightning flash



Probabilities: maximum 2 m dew point



Probabilities: 2 m dew point



Probabilities: CAPE

# Productos de ECMWF:

ENS. Probabilidades de superación de umbrales PCP

H 6, 24

D 5-10, 5-7, 7-10

10-15

Probabilidad de intensidad de pcp

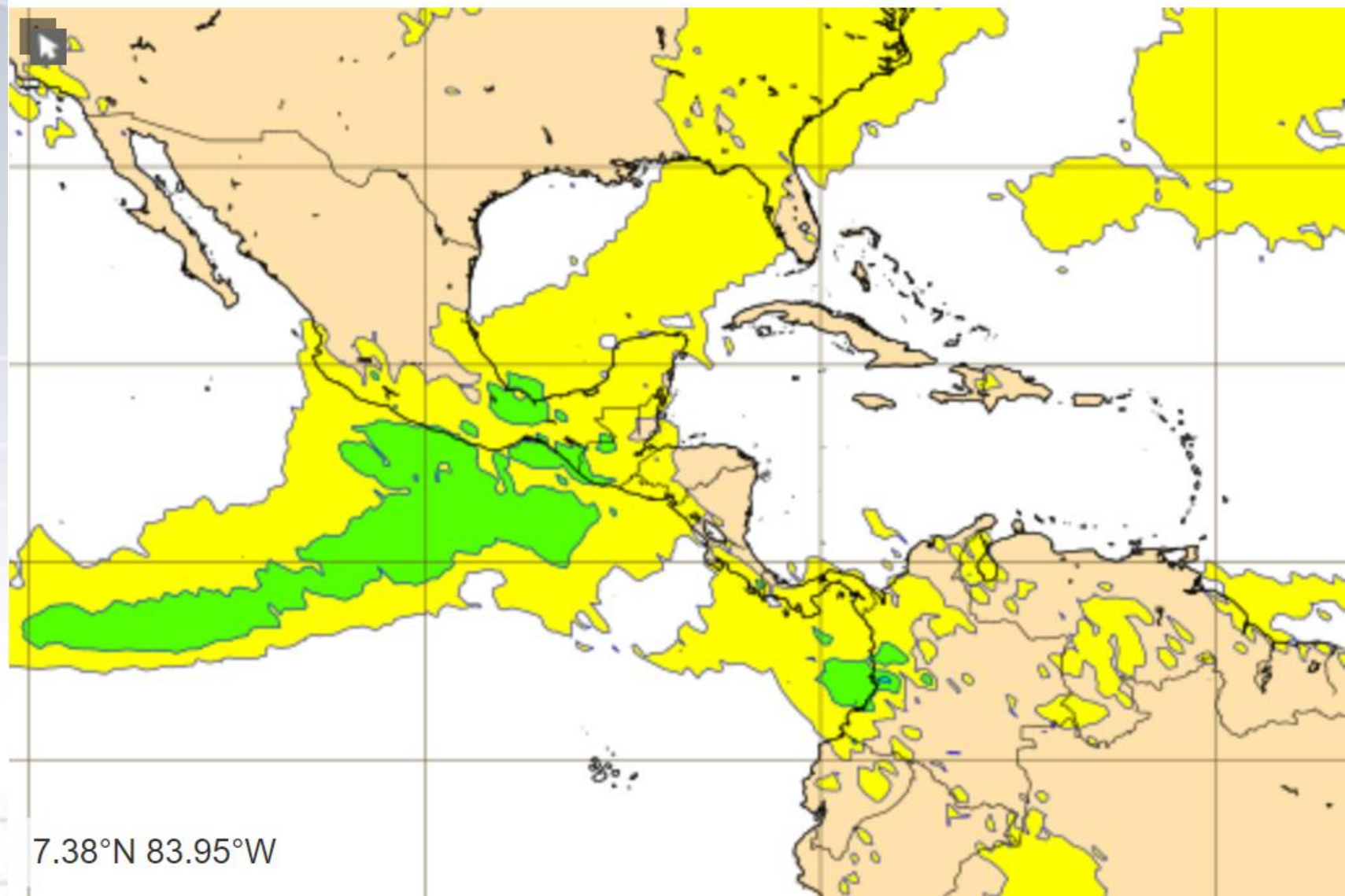
Base time: Mon 05 ...

Area: Central America

Threshold: >20

Total precipitation probability >20 mm

Monday 5 Sep, 00 UTC T+168 Valid: Monday 12 Sep, 00 UTC



7.38°N 83.95°W

# Productos de ECMWF:

ENS. Probabilidades de superación de umbrales

PCP

H 6, 24

D 5-10, 5-7, 7-10

D+10-15

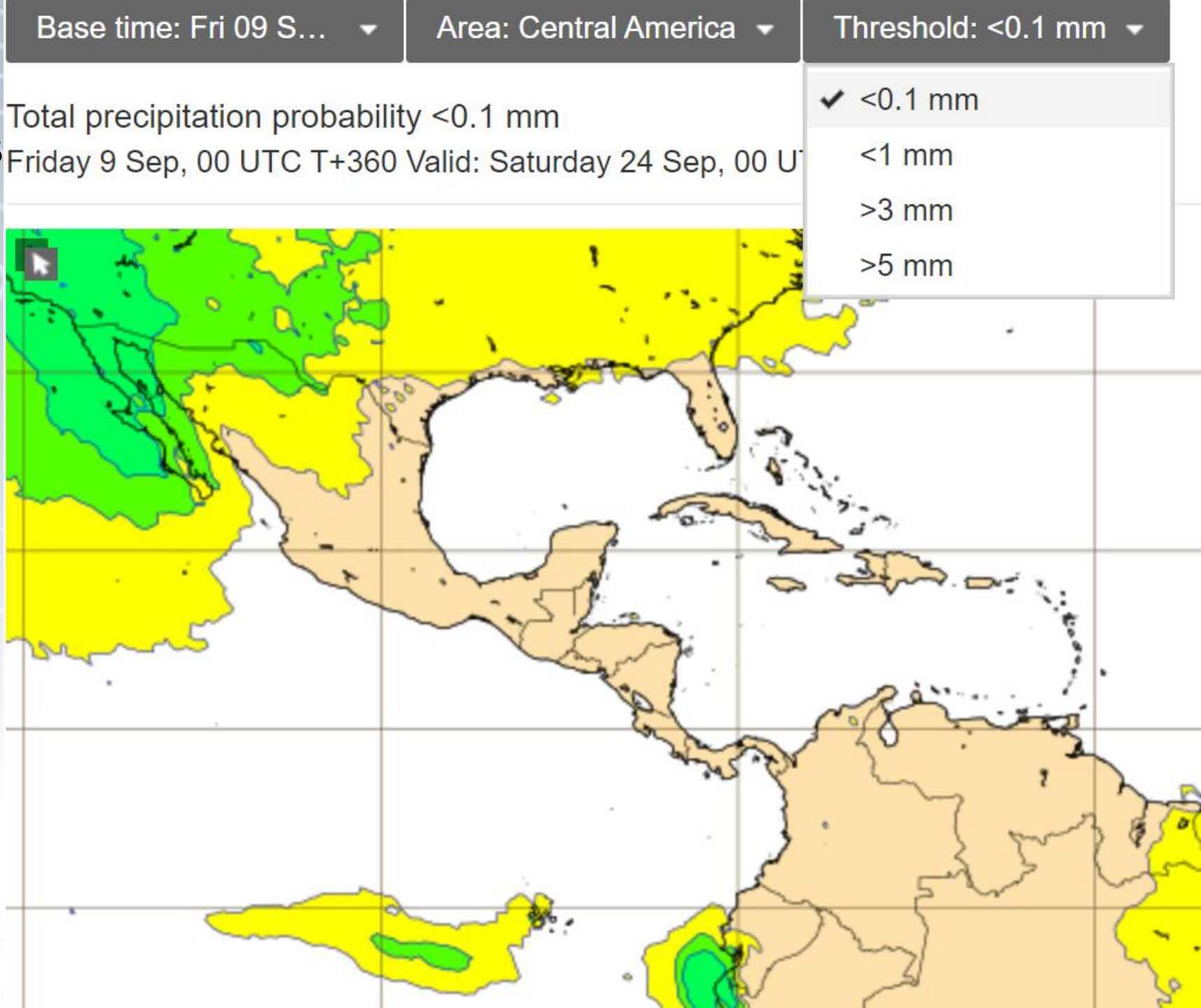
PCP, rachas, olas, T2m

PCP < 0.1 mm

Detección de periodos secos

T2m < 0°C

Heladas

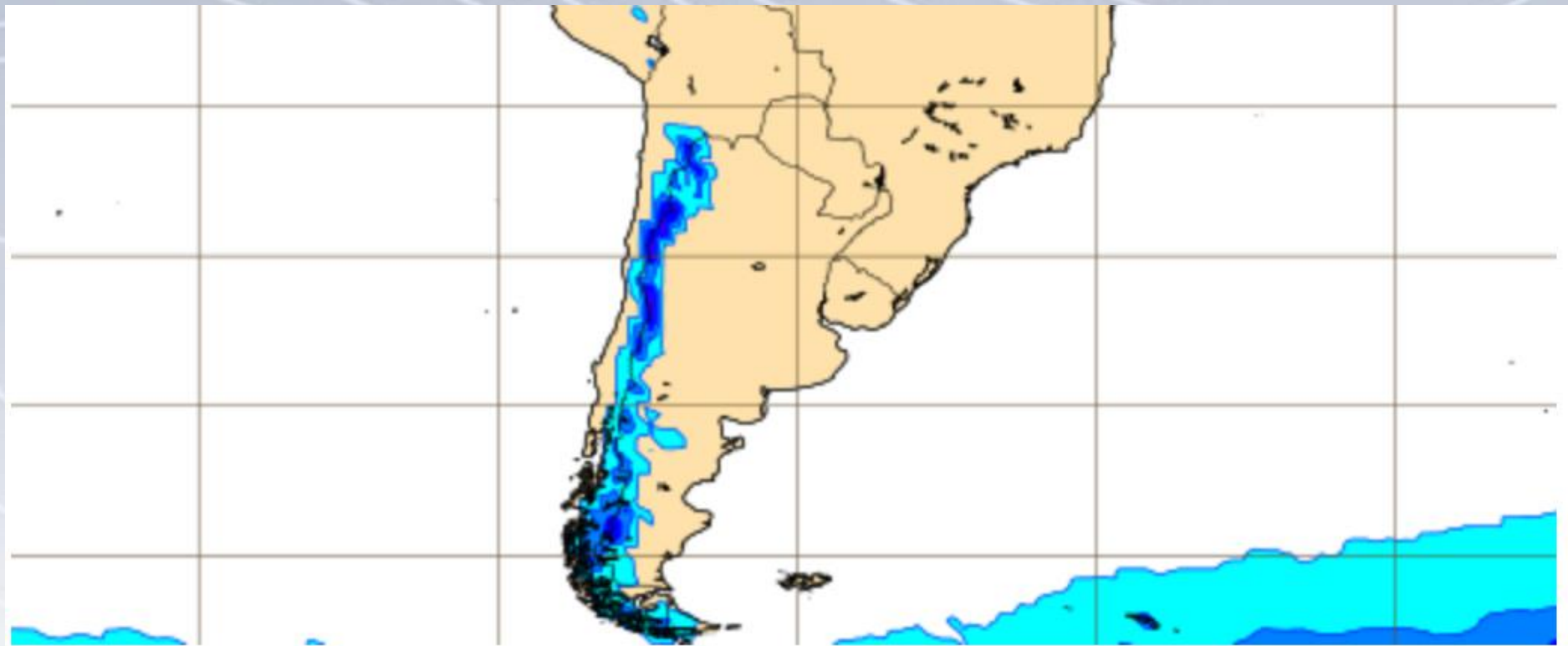


# Productos de ECMWF:

ENS. Probabilidades de superación de umbrales

D+10-15

T2m < 0°C  
Heladas



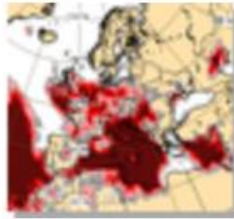
< > VT:

5% 35 65 95 100%

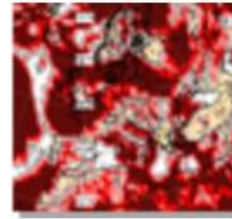


2m temperature

# Productos de ECMWF: ENS. Probabilidades de superación de umbrales



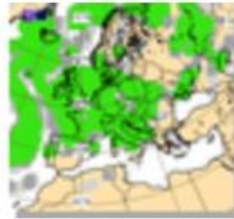
Probabilities: MU...



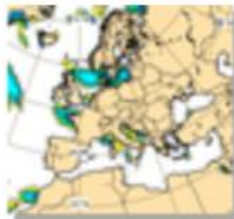
Probabilities: 100  
m wind speed



Probabilities: 2 m  
temperature below



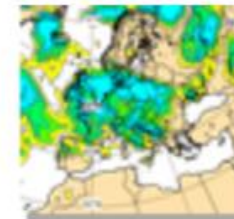
Probabilities:  
most probable



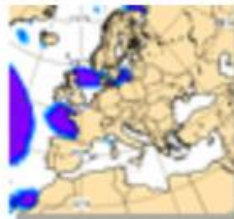
Probabilities: 10  
m wind speed



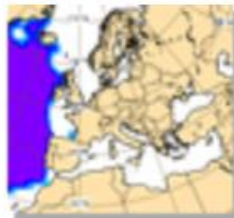
Probabilities:  
maximum of 10 m



Probabilities:  
total precipitation,



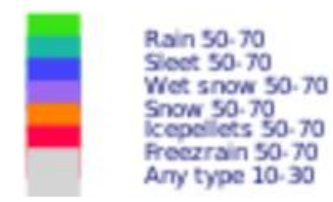
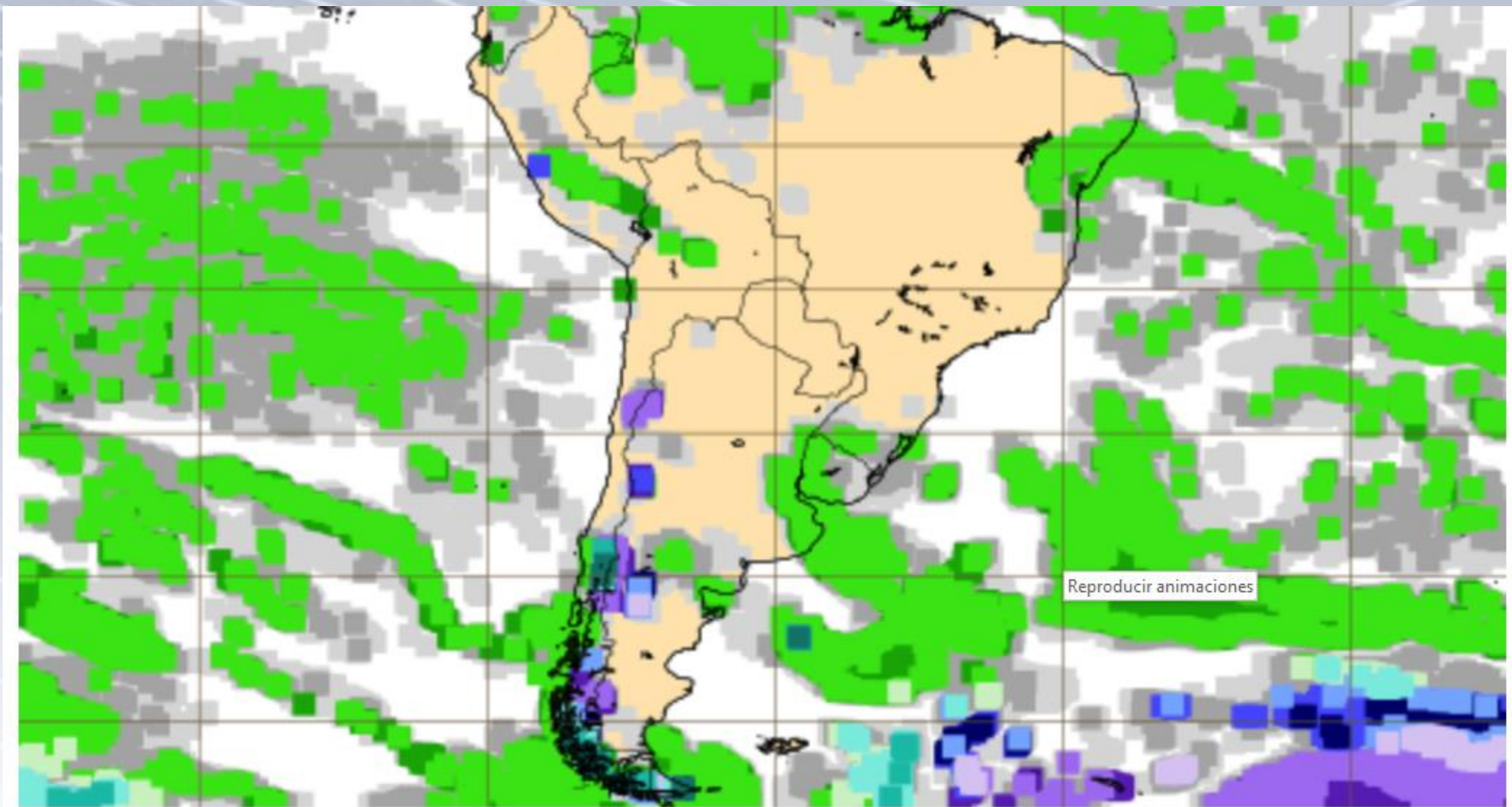
Probabilities:  
significant wave



Probabilities:  
mean wave period

# Productos de ECMWF: ENS

Clasificación de los tipos de precipitación en categorías de probabilidad



Most pro

# Productos de ECMWF:

ENS.

Probabilidad de combinación de fenómenos

## Combined probabilities



Combined probabilities 2 m

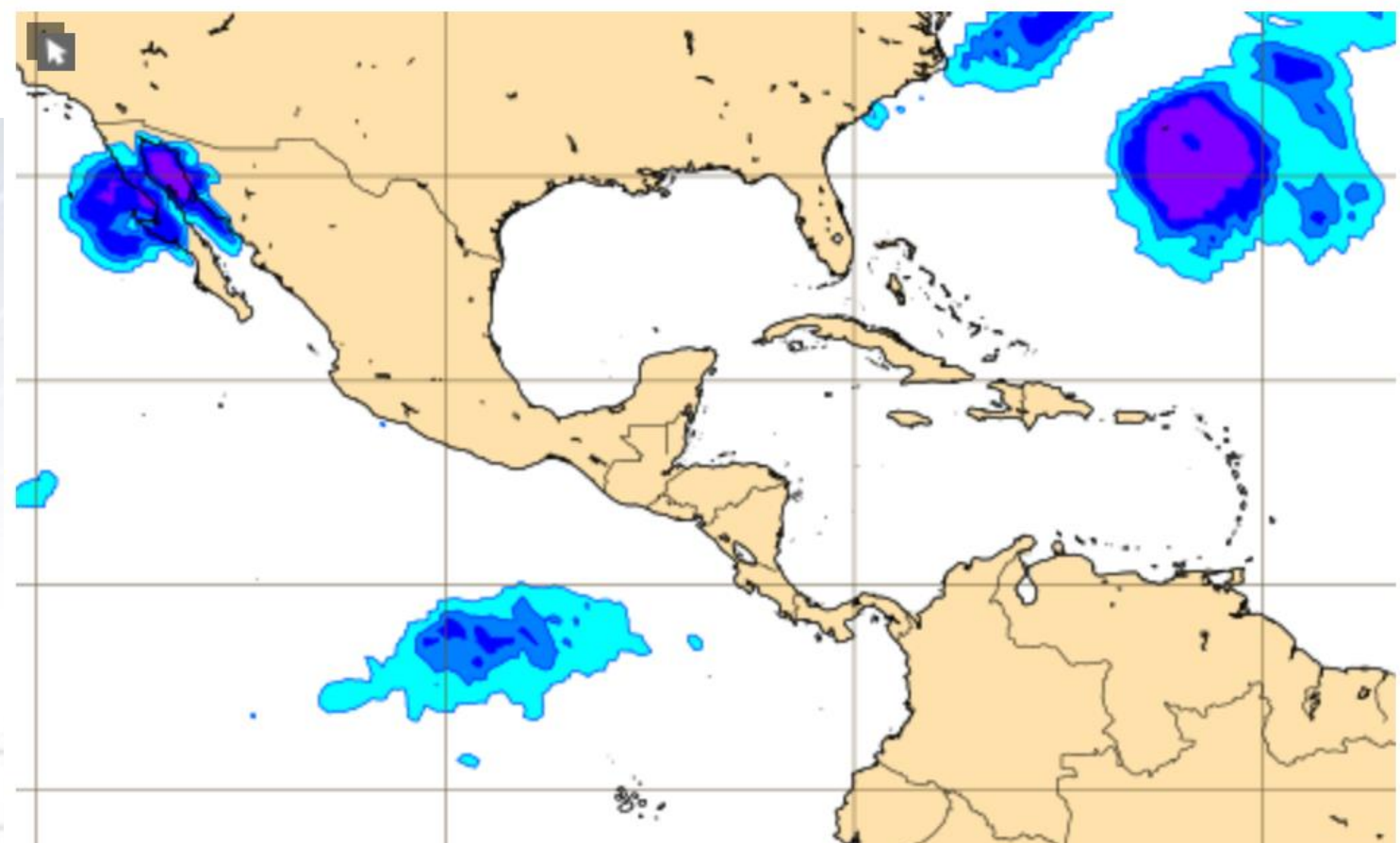


Probability of combined events of wind speed  $\geq 10 \text{ ms}^{-1}$  and total precipitation  $\geq 1 \text{ mm}$

Friday 9 Sep, 00 UTC T+6 Valid: Friday 9 Sep, 06 UTC



Combined probabilities wind



# Productos de ECMWF:

## ENSgramas

10 días

- Comparar con HRES
- Res = 6h

Base time: Fri 09 S...

Meteogram type: 10...

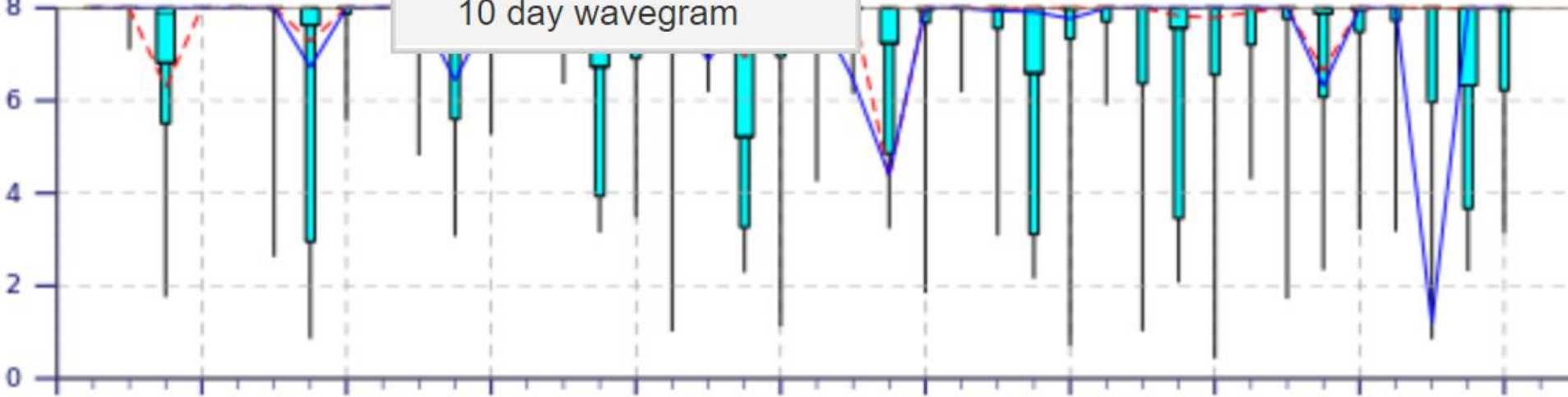
Location ...

ENS Meteogram  
Antigua Guatemala  
High Resolution For

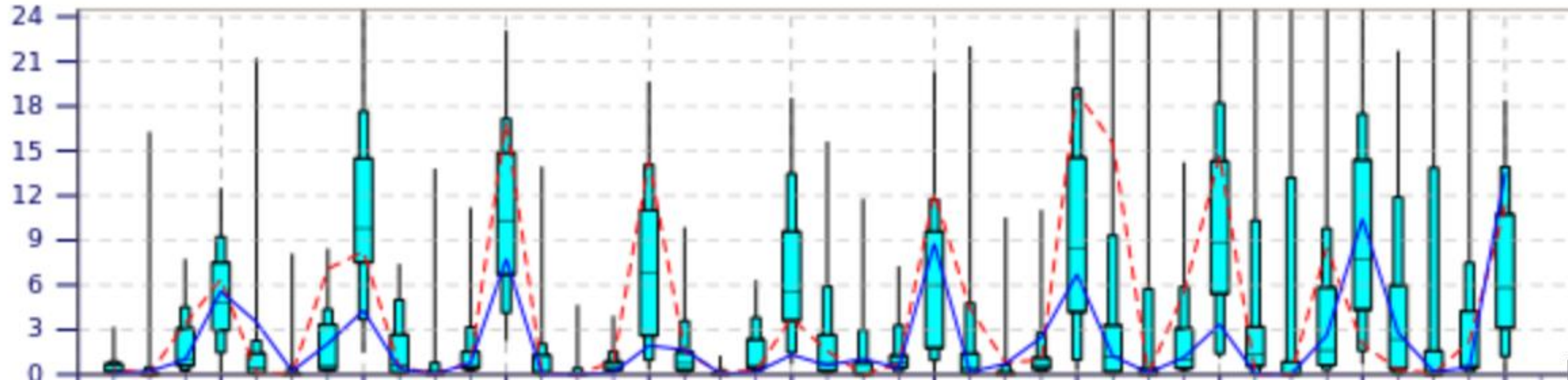
.67°W (ENS land point) 1578 m  
on Friday 9 September 2022 00 UTC

- ✓ 10 day
- 15 day
- 15 day with climate
- Plumes
- 10 day wavegram

Total Cloud Cover (okta)



Total Precipitation (mm/6h)





# Productos de ECMWF: ENSgramas

15 días  
- Comparar con Clima

Valor más alto de todos los miembros

Percentil del 90%

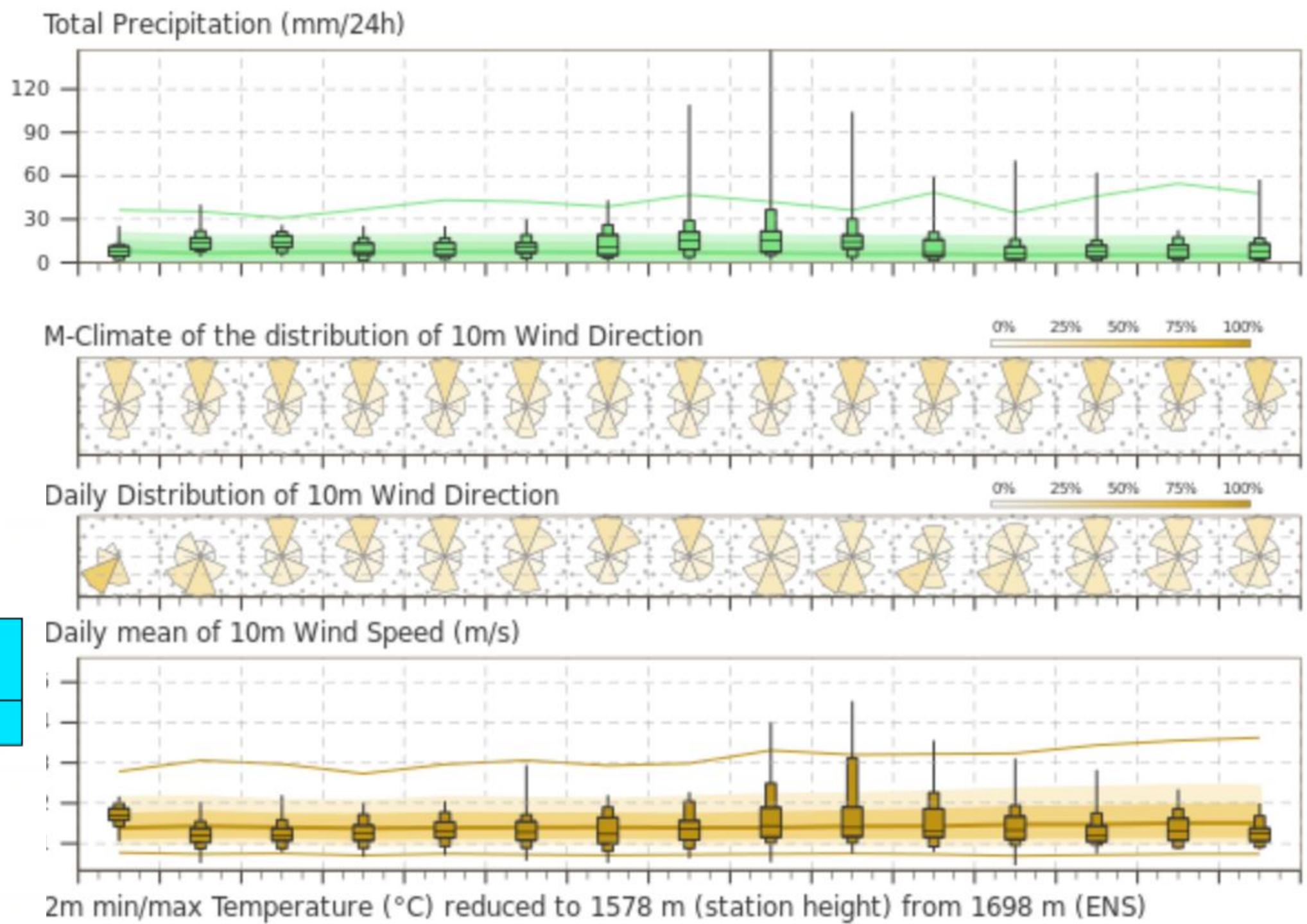
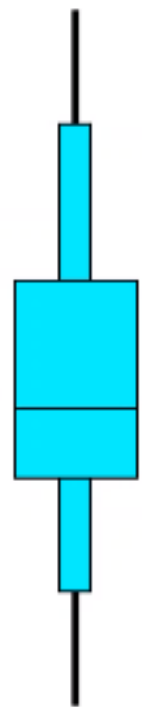
Percentil del 75%

Mediana

Percentil del 25%

Percentil del 10%

Valor más bajo de todos los miembros



# Productos de ECMWF:

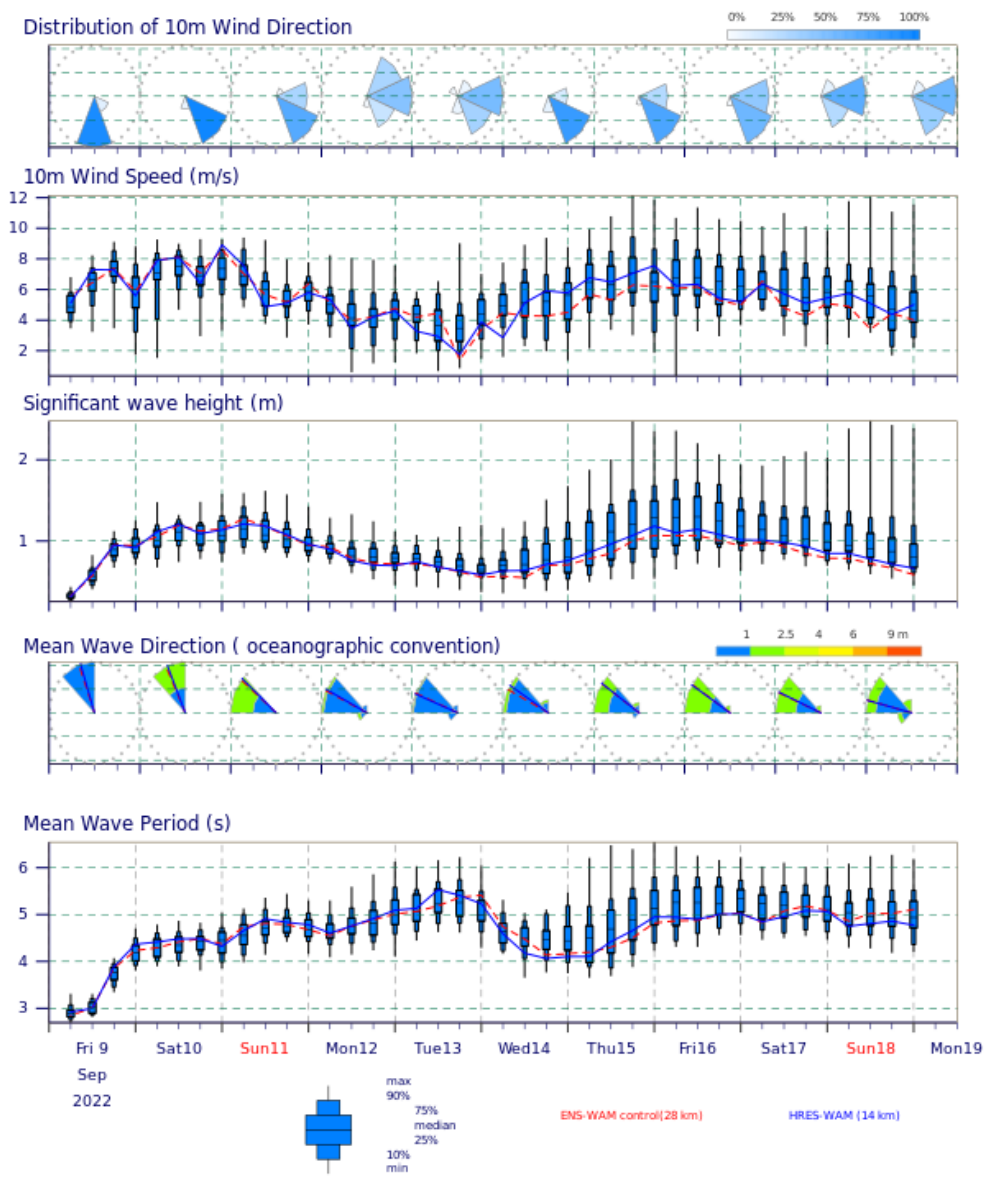
## ENSgramas

Penachos a 10 días

- Evaluar la dispersión
- Comparar con HRES

Olas

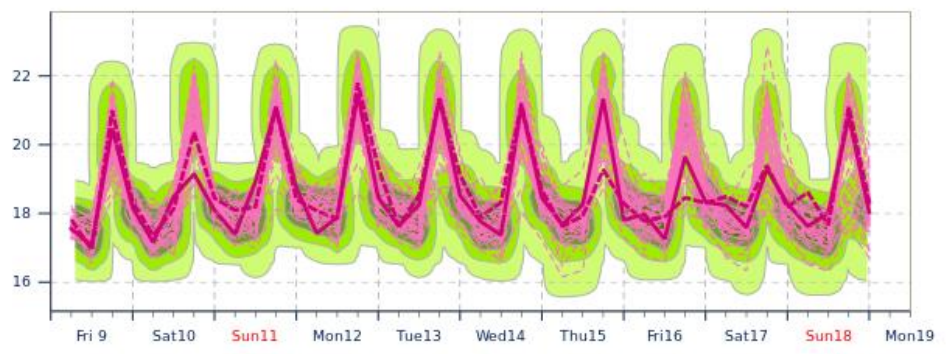
20.17°N 84.07°W (ENS land point)  
High resolution forecast and ENS distribution Friday 9 September 2022 00 UTC



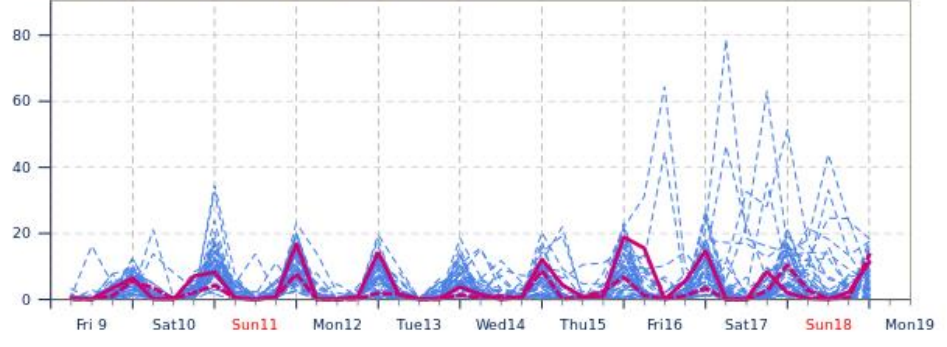
ECMWF Ensemble forecasts  
Antigua Guatemala, Guatemala 14.55°N 90.67°W (ENS land point) 1578 m  
High Resolution Forecast and ENS Distribution  
Friday 9 September 2022 00 UTC



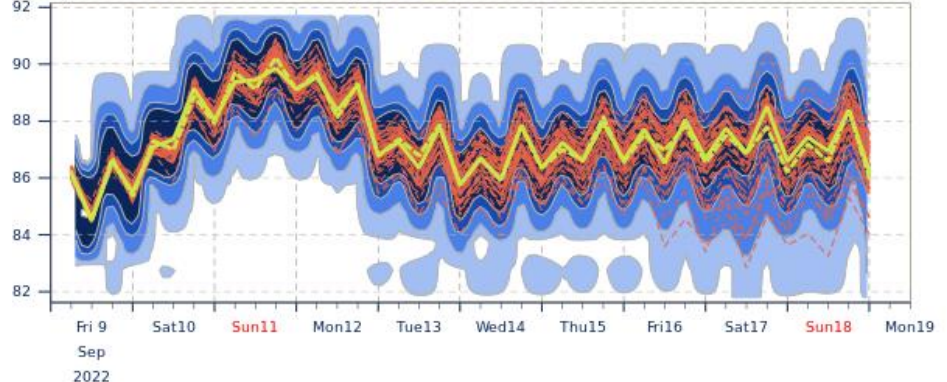
Temperature at 850 hPa - Probability for 1°C intervals



Ensemble members of Total Precipitation (mm/6h)



Geopotential at 500 hPa -- Probability for 2.5dam intervals



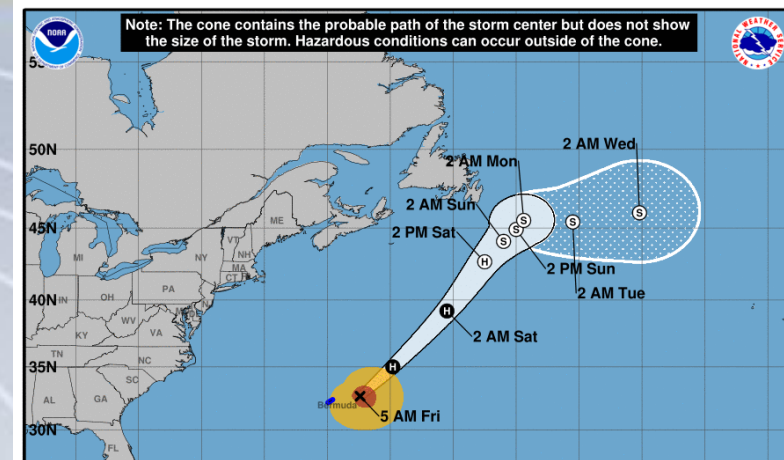
# Productos de ECMWF:

## Ciclones extratropicales HRES y ENS

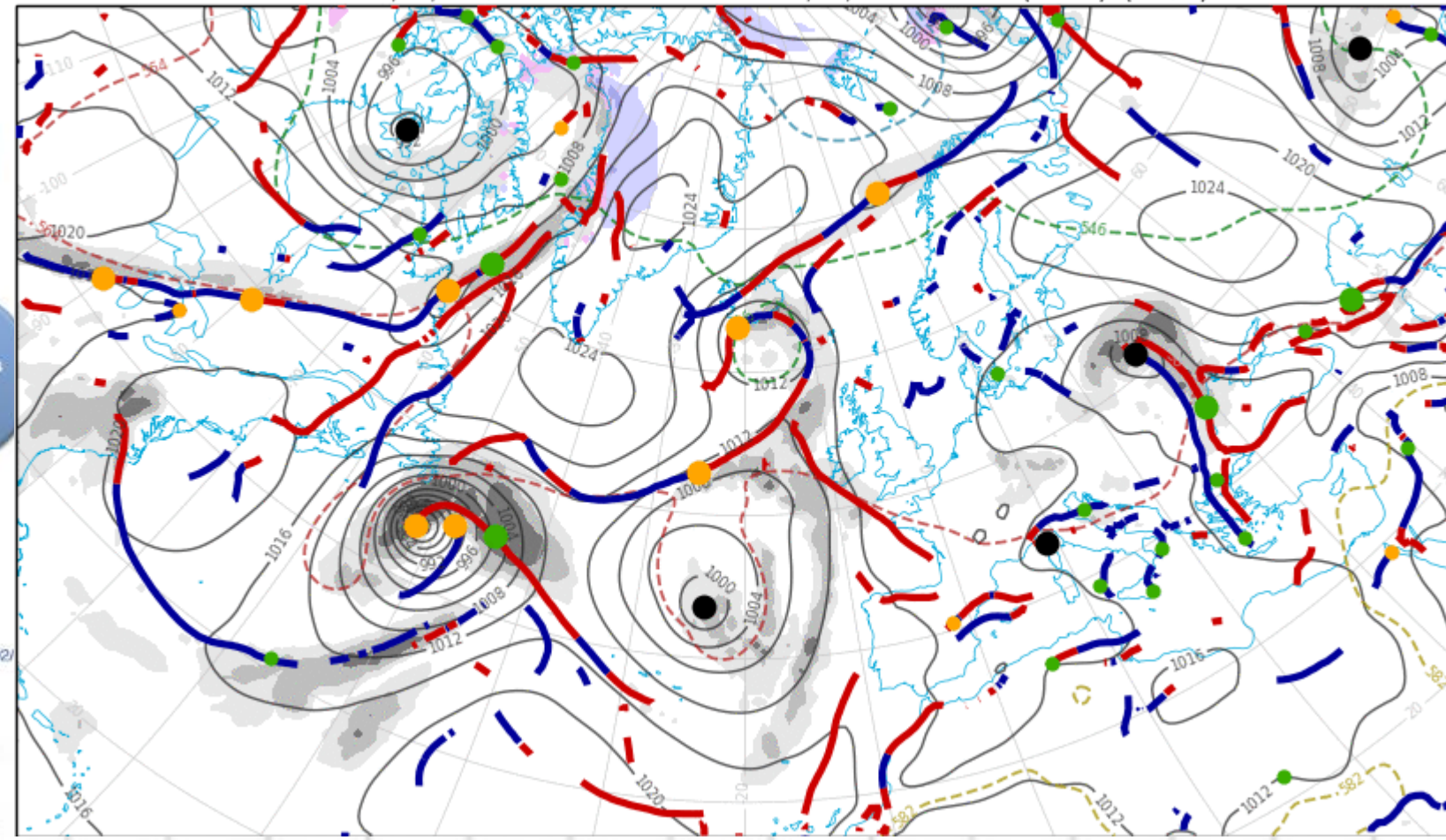
### ENS products



ECMWF EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

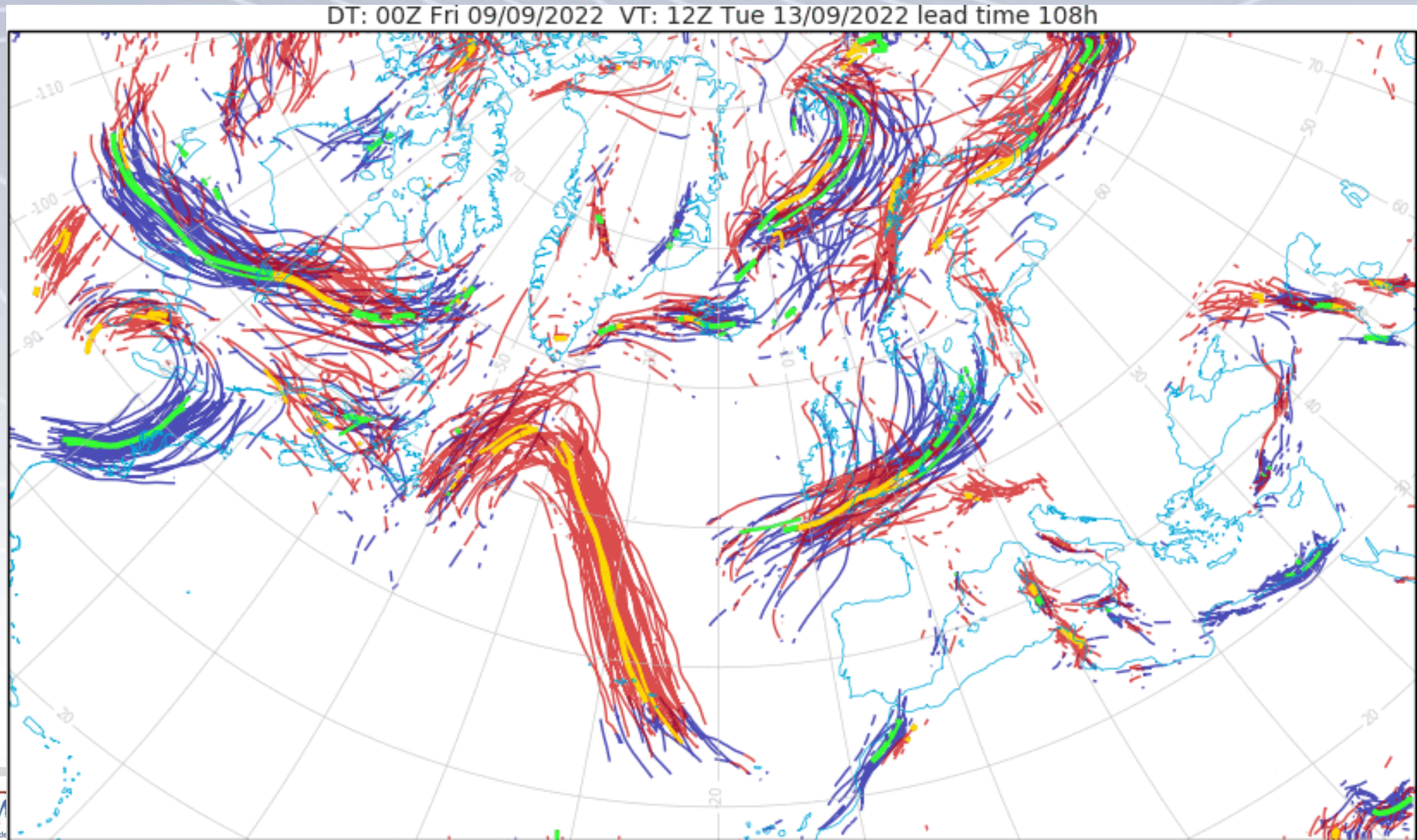


VT Sun 11/09/2022 00UTC from DT Fri 09/09/2022 00UTC (T+48) (HRES)



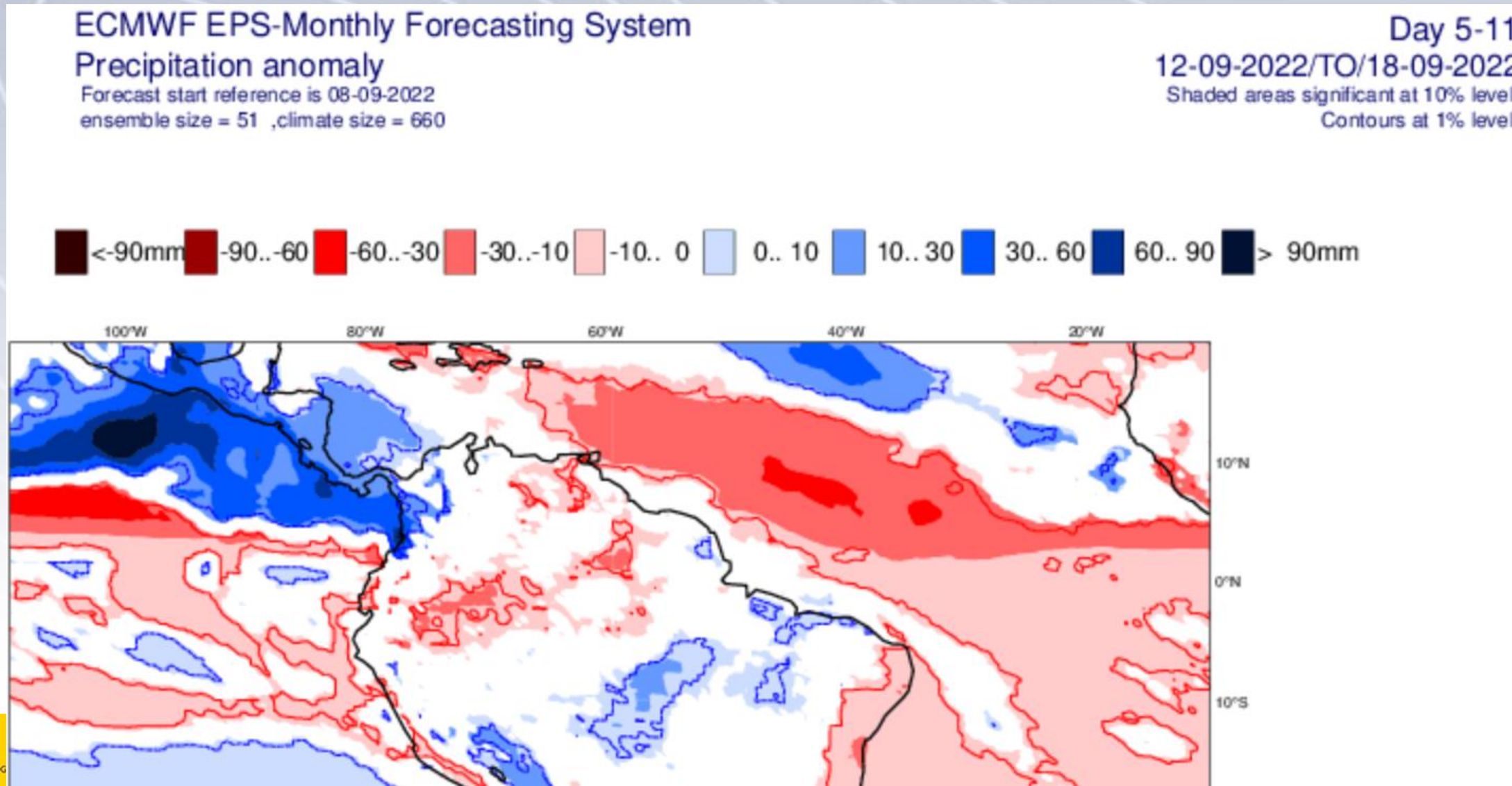
# Productos de ECMWF: Ciclones extratropicales

ENS:  
Frentes  
Objetivos



# Productos de ECMWF. ENS: Predicción mensual. "Extended Forecast"

Predicción de  
ANOMALÍAS  
T2m  
PCP

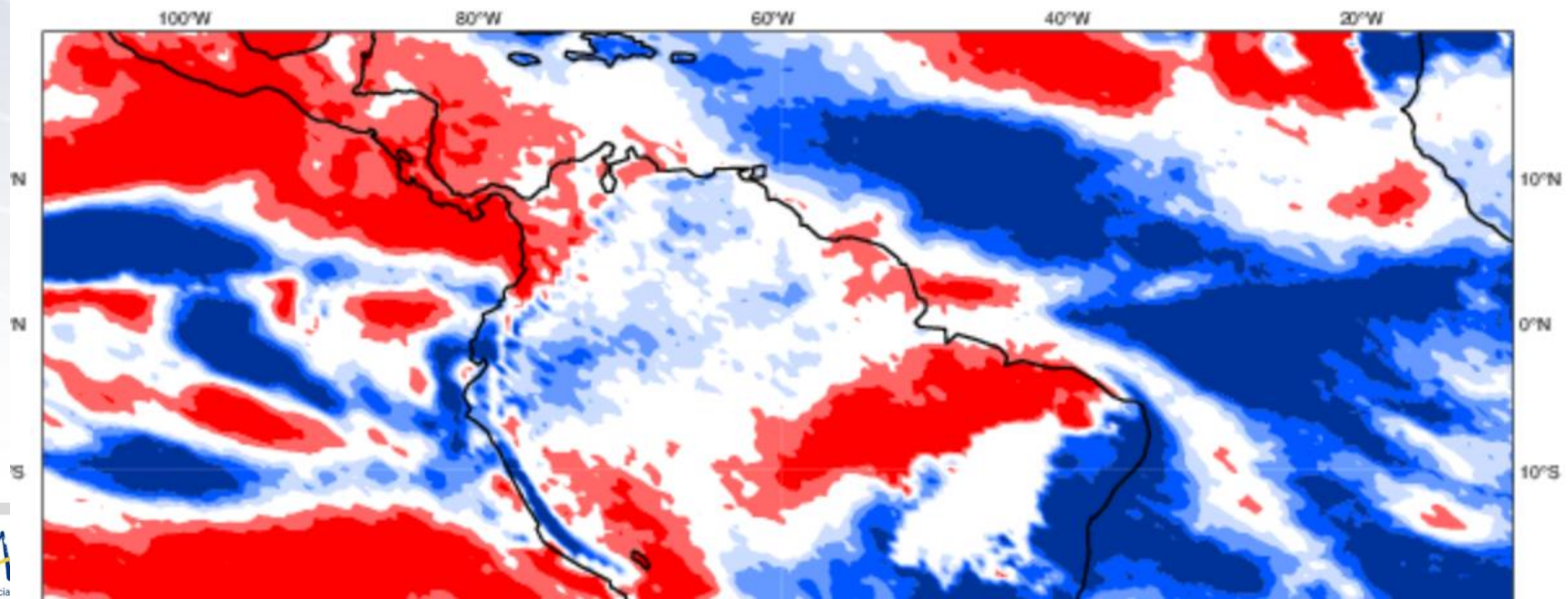


# Productos de ECMWF. ENS: Predicción mensual. "Extended Forecast"

Predicción  
Probabilidad de  
ANOMALÍAS  
T2m  
PCP

ECMWF EPS-Monthly Forecasting System  
(Prob Precip. anom below 33%)  
Forecast start reference is 08-09-2022  
ensemble size = 51 ,climate size = 660

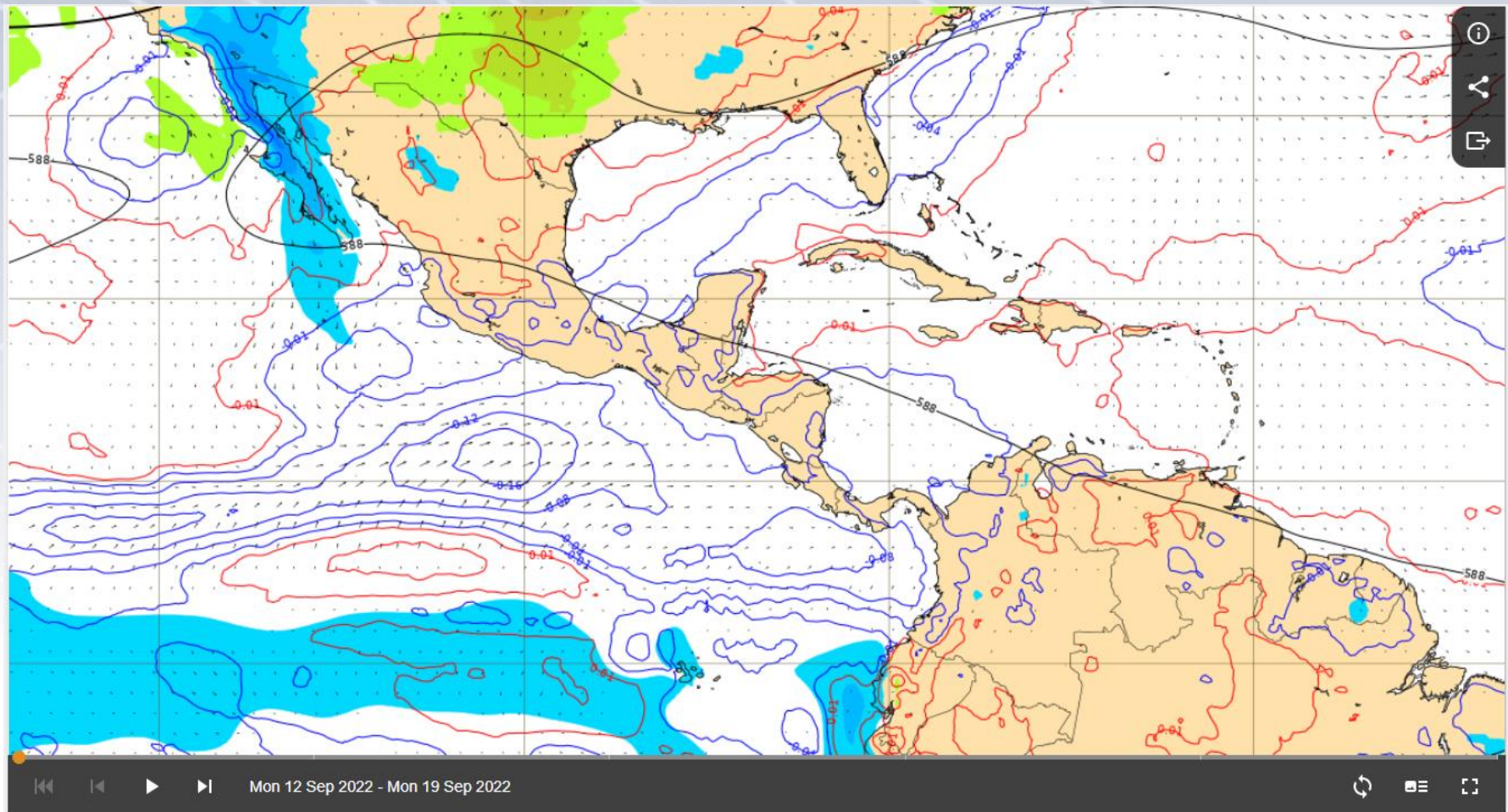
Day 5-11  
12-09-2022/TO/18-09-2022



# Productos de ECMWF. ENS: Predicción mensual. "Extended Forecast"

Predicción de ANOMALÍAS Multiparámetro

T2m: áreas coloreadas  
Viento 10m: flechas  
Z 500



# Productos de ECMWF. ENS: Predicción mensual. "Extended Forecast"

## Verificación de ANOMALÍAS

Base time: Mon 22 ...

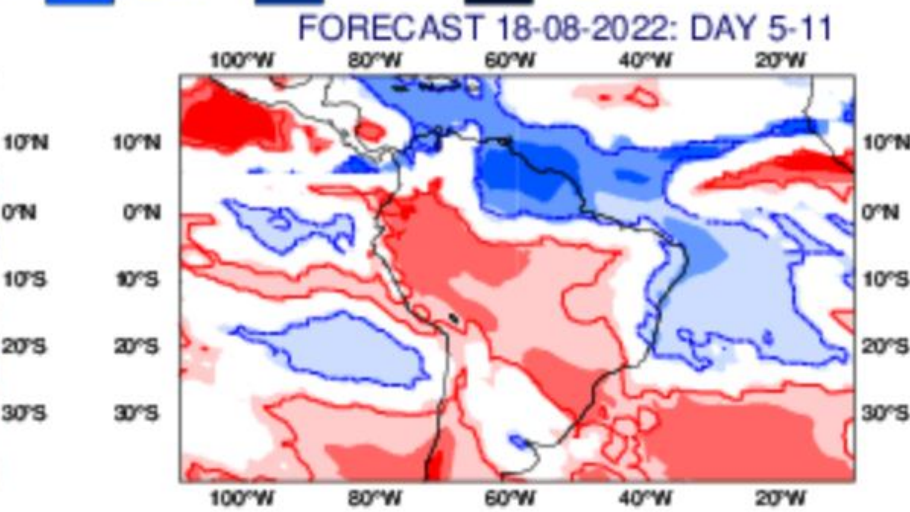
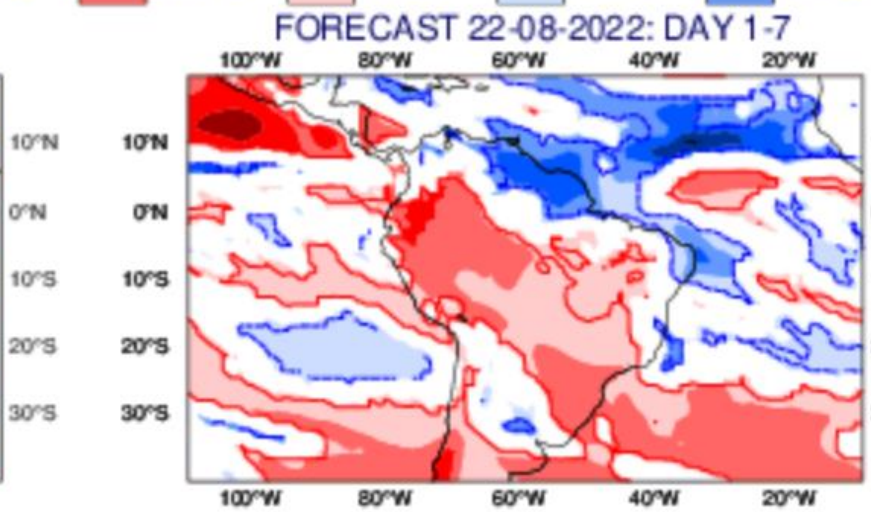
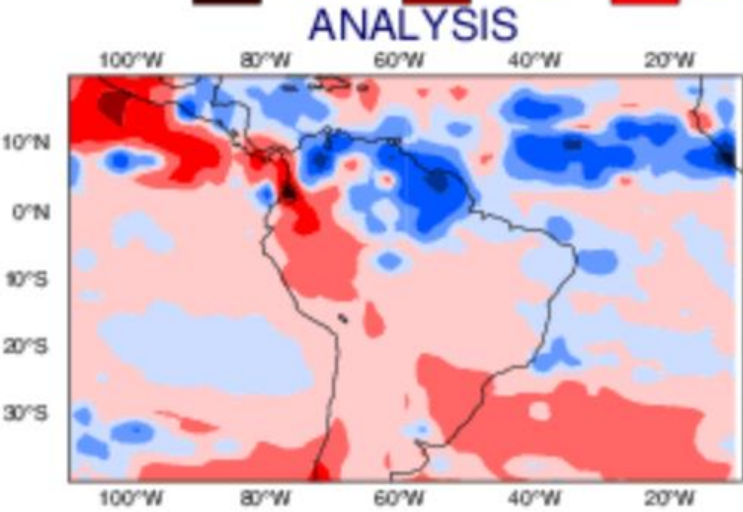
Parameter: Precipit...

Area: South America



- ✓ Precipitation
- Surface temperature
- Two meter temperature
- Mean sea level pressure

Analysis and ECMWF ENS Forecasting System  
Precipitation anomaly  
Verification period: 22-08-2022/TO/28-08-2022  
ensemble size = 51 , climate size = 660  
shaded areas significant at 10% level, Contours at 1% level





# Productos HRES y ENS. Uso en la predicción operativa

- HRES o ENS? Uso combinado de ambos
  - Los rangos de la predicción meteorológica
  - Papel del predictor
- Modelo ENS: la predicción probabilística
  - Características
  - Limitaciones



# Características de los productos del

Ejemplo de producto probabilístico:  
Katrina

ZCZC MIASPFAT2 ALL  
TTAA00 KNHC DDHMM  
HURRICANE KATRINA PROBABILITIES NUMBER 15  
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL  
11 PM EDT FRI AUG 26 2005

PROBABILITIES FOR GUIDANCE IN HURRICANE PROTECTION  
PLANNING BY GOVERNMENT AND DISASTER OFFICIALS

AT 11 PM EDT...0300Z...THE CENTER OF KATRINA WAS LOCATED NEAR  
LATITUDE 24.6 NORTH...LONGITUDE 83.6 WEST

CHANCES OF CENTER OF THE HURRICANE PASSING WITHIN 65 NAUTICAL MILES  
OF LISTED LOCATIONS THROUGH 8PM EDT MON AUG 29 2005

LOCATION	A	B	C	D	E	LOCATION	A	B	C	D	E
25.0N 86.0W	46	X	X	X	46	BURAS LA	X	2	11	6	19
26.0N 87.5W	20	10	X	X	30	NEW ORLEANS LA	X	X	8	9	17
27.0N 89.0W	1	15	6	1	23	NEW IBERIA LA	X	X	2	12	14
MUAN 219N 850W	2	X	X	X	2	PORT ARTHUR TX	X	X	X	9	9
JACKSONVILLE FL	X	X	X	2	2	GALVESTON TX	X	X	X	7	7
VENICE FL	1	1	X	1	3	FREERPORT TX	X	X	X	5	5
TAMPA FL	X	1	1	1	3	PORT O CONNOR TX	X	X	X	3	3
CEDAR KEY FL	X	1	1	3	5	GULF 29N 85W	1	9	3	2	15
ST MARKS FL	X	1	4	4	9	GULF 29N 87W	1	13	5	2	21
APALACHICOLA FL	X	5	5	3	13	GULF 28N 89W	X	11	9	2	22
PANAMA CITY FL	X	5	6	4	15	GULF 28N 91W	X	1	11	5	17
PENSACOLA FL	X	2	9	6	17	GULF 28N 93W	X	X	2	9	11
MOBILE AL	X	1	8	8	17	GULF 28N 95W	X	X	X	6	6
GULFPORT MS	X	1	8	9	18	GULF 27N 96W	X	X	X	3	3

COLUMN DEFINITION PROBABILITIES IN PERCENT

A IS PROBABILITY FROM NOW TO 8PM SAT

FOLLOWING ARE ADDITIONAL PROBABILITIES

B FROM 8PM SAT TO 8AM SUN

C FROM 8AM SUN TO 8PM SUN

D FROM 8PM SUN TO 8PM MON

E IS TOTAL PROBABILITY FROM NOW TO 8PM MON

MEANS LESS THAN ONE PERCENT