

DAILY PRECIPITATION RECORDS OVER MAINLAND SPAIN AND THE BALEARIC ISLANDS



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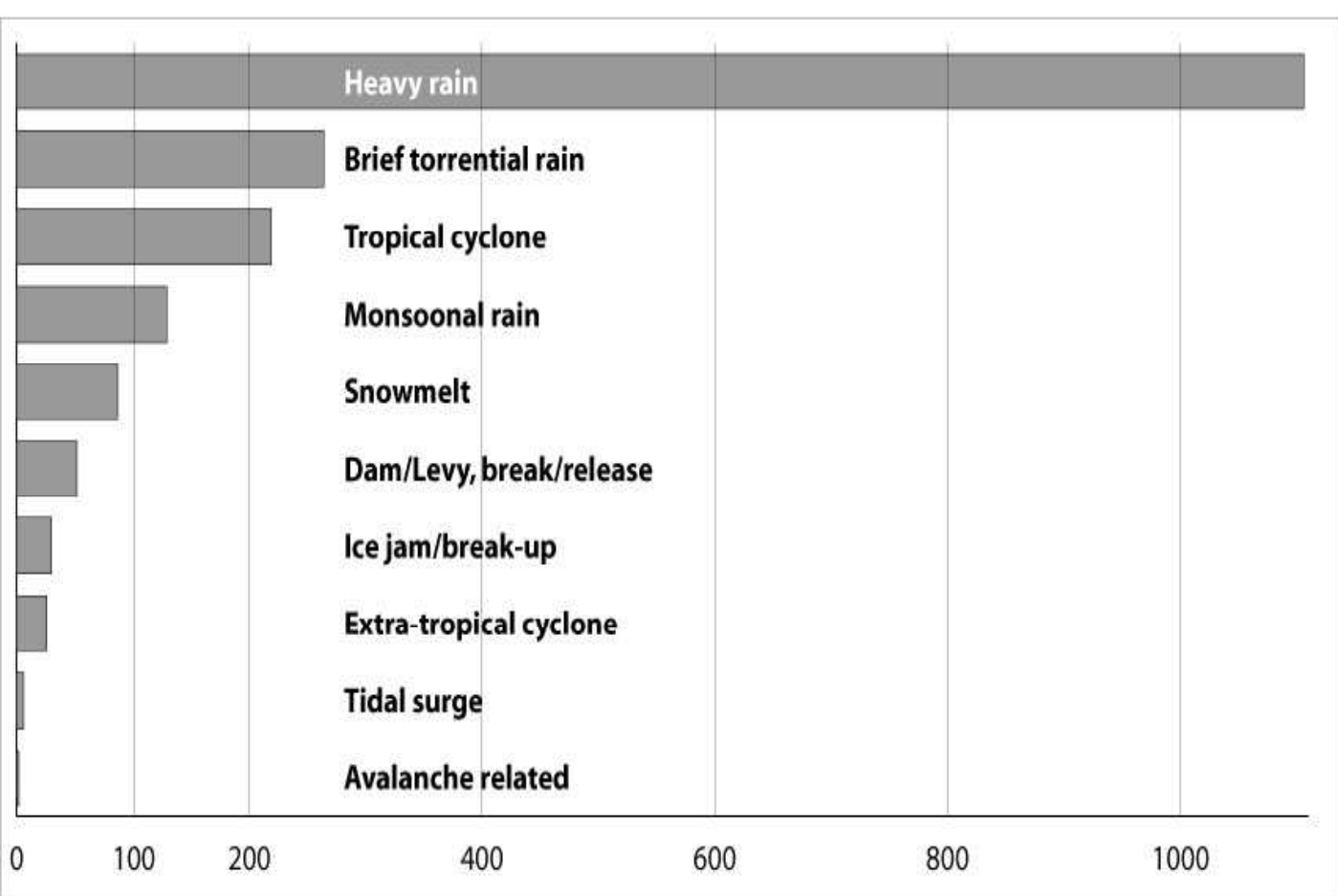
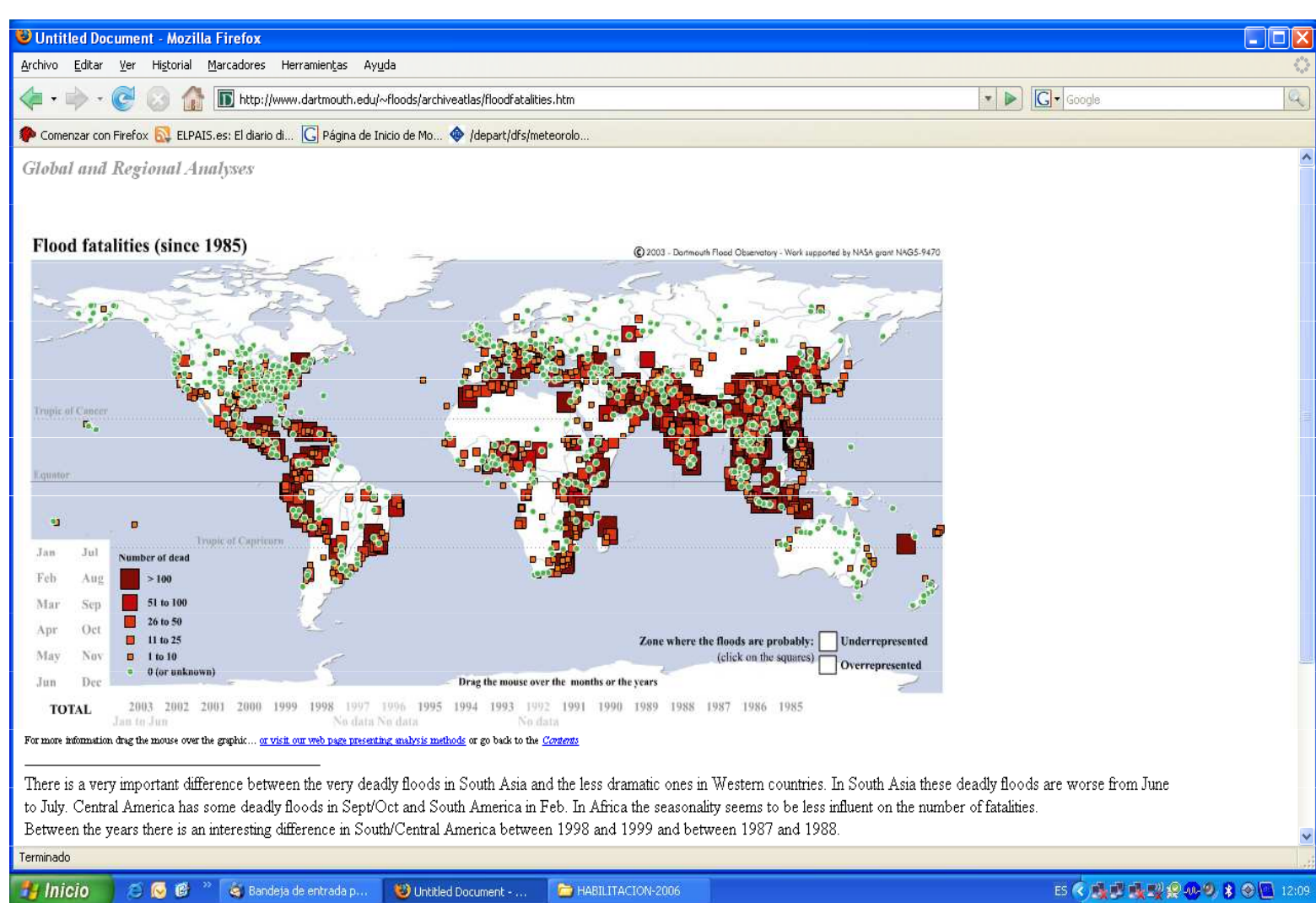
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INTRODUCTION

Heavy rainfall is the most important cause of flooding, far beyond tropical cyclones, monsoonal rain or tidal surges all together (Adhikari et al. 2010). Being one of the most hazardous and damaging natural phenomena worldwide, heavy rains cause tremendous losses in terms of human live and property. The social impact from heavy rain -and associated floods- is regularly suffered across Europe, but Mediterranean countries, and primarily those in the Western Mediterranean, have to cope with particularly devastating episodes. Spain, with its singular geographic and topographic features (Figure 1), is not an exception. From 1953 to 2011, 26 exceptional floods have been registered in Spain, with an estimated damage of 8100 million inflation-adjusted USD, 1287 people killed and about 750.000 people affected

Aims

Disasters information



Source: "EM-DAT: The OFDA/CRED International Disaster Database, www.em-dat.net - Université catholique de Louvain - brussels - Belgium"

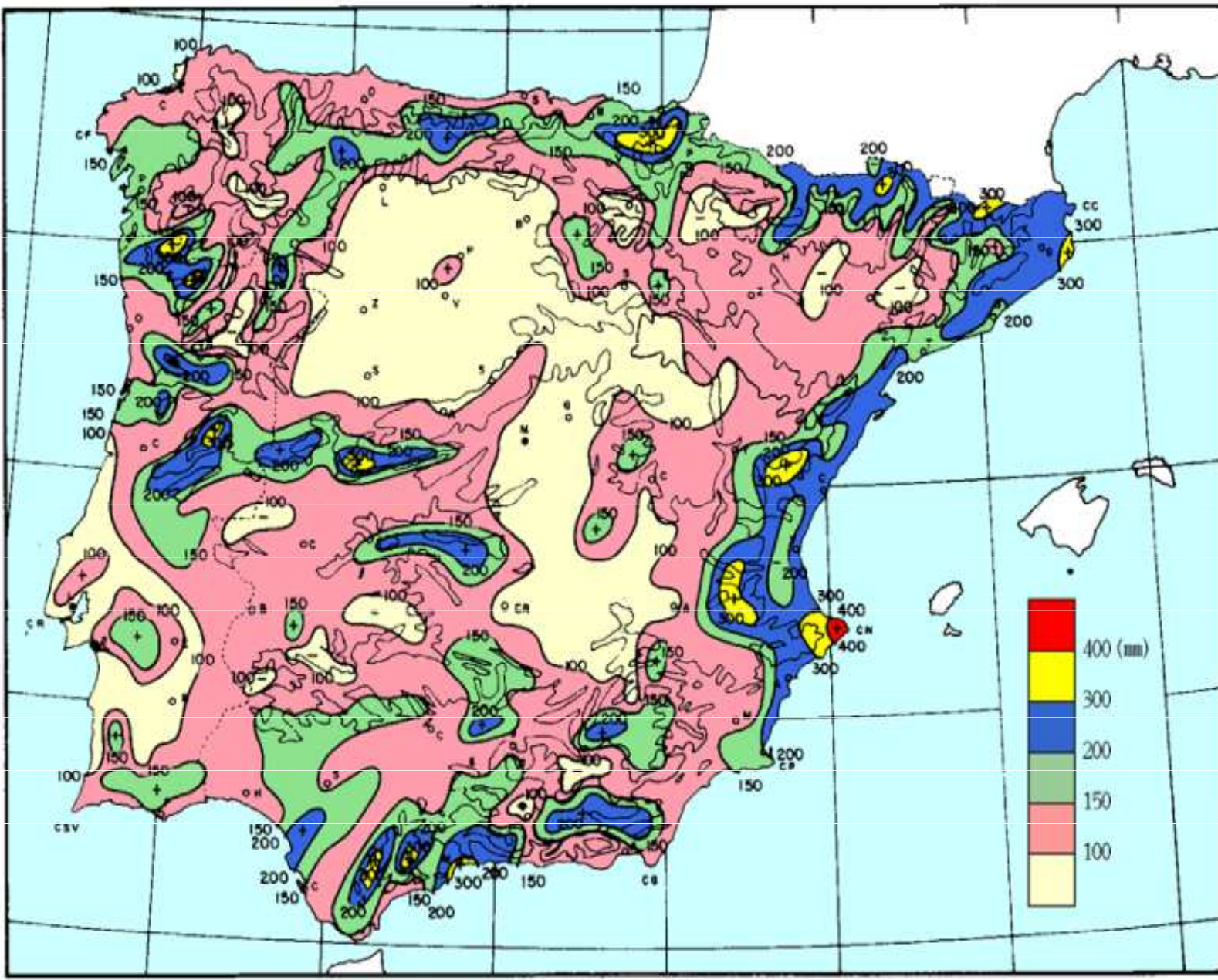
For some natural disasters (particularly floods and droughts) there is no exact day or month for the event, and for other disasters (particularly pre-1974) the available record of the disaster does not provide an exact day or month.

Summarized Table of Natural Disasters in Spain from 1953 to 2007							
	# of Events	Killed	Injured	Homeless	Affected	Total Affected	Damage USD (000's)
Drought	4	0	0	0	6,000,000	6,000,000	10,660,000
Earthquake	1	0	0	0	1,500,000	1,500,000	2,465,000
Epidemic	2	2	0	0	752	752	0
Extreme Temperature	8	15,216	78	0	376	376	2,304,300
Flood	22	1,280	1,700	6,000	734,880	742,580	7,765,886
Slides	1	84	129	0	0	129	0
Wild Fires	14	60	121	0	18,600	18,721	2,754,108
Wind Storm	15	132	62	0	60,350	60,412	1,136,000

Created on Nov-23-2007. - Data version v03.07

Disaster	Date	No Killed
Extreme temperature	1-Aug-2003	15,090
Flood	19-Oct-1973	500
Flood	27-Sep-1962	445
Extreme temperature	Jan-1971	400
Mass movement wet	7-Aug-1996	84
Flood	Oct-1957	77
Flood	Oct-1953	50
Flood	25-Aug-1983	45
Flood	19-Oct-1982	43
Extreme temperature	9-Jan-1985	40

Extreme daily precipitation in Spain and Portugal from Font (1983)



Font (1983) used data from the available raingauge stations from 1931 to 1960.

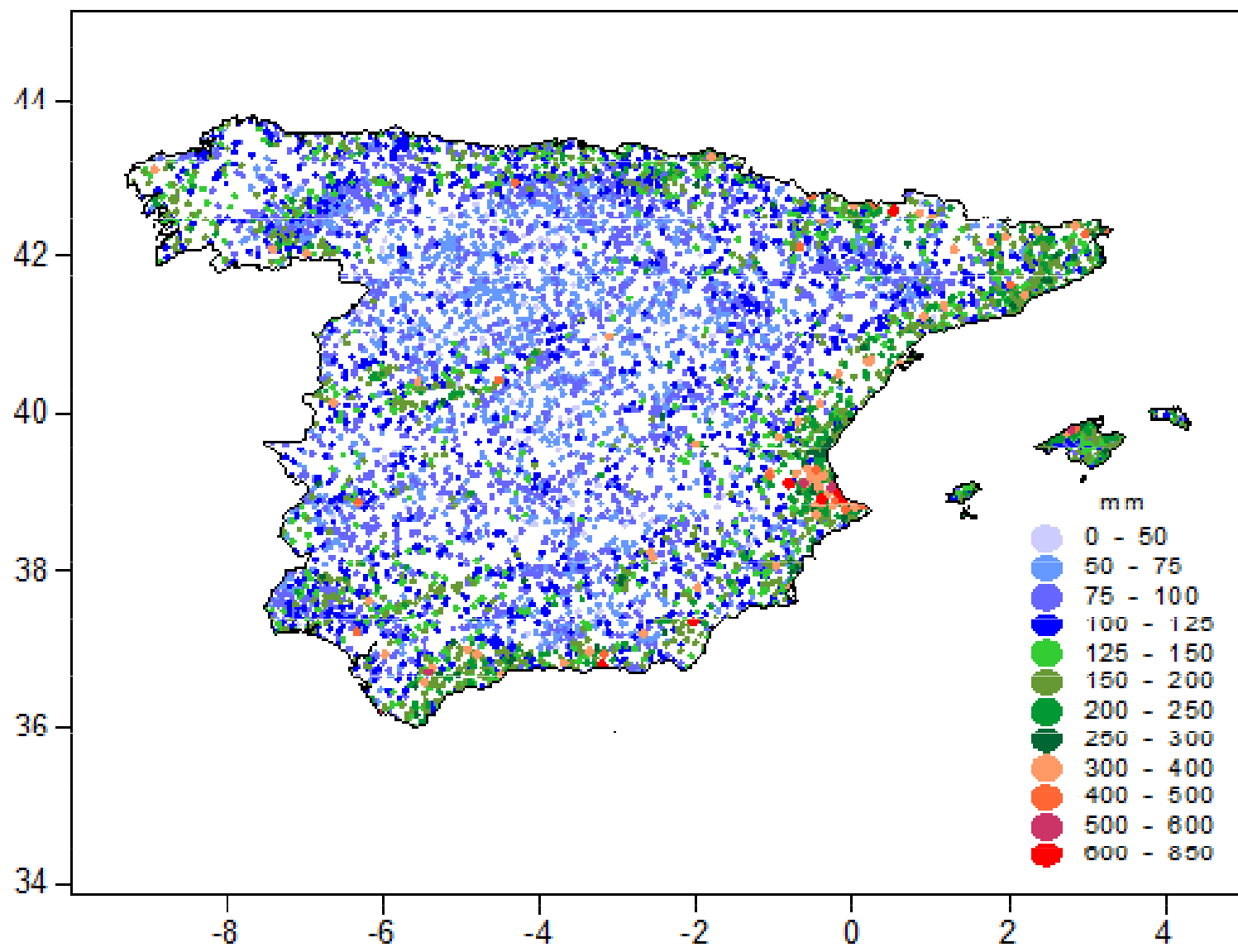
Highest values were found along the Mediterranean coastal area. Highlights the region of Valencia where there were observations of more than 400 mm.

In the coastal area of Catalonia and the south of the Pyrenees, daily values greater than 200 mm were also found.

Main aim: update the map of Font (1983), after 30 years of its publication, with all the available data of raingauge in Spain (except Canary Islands)

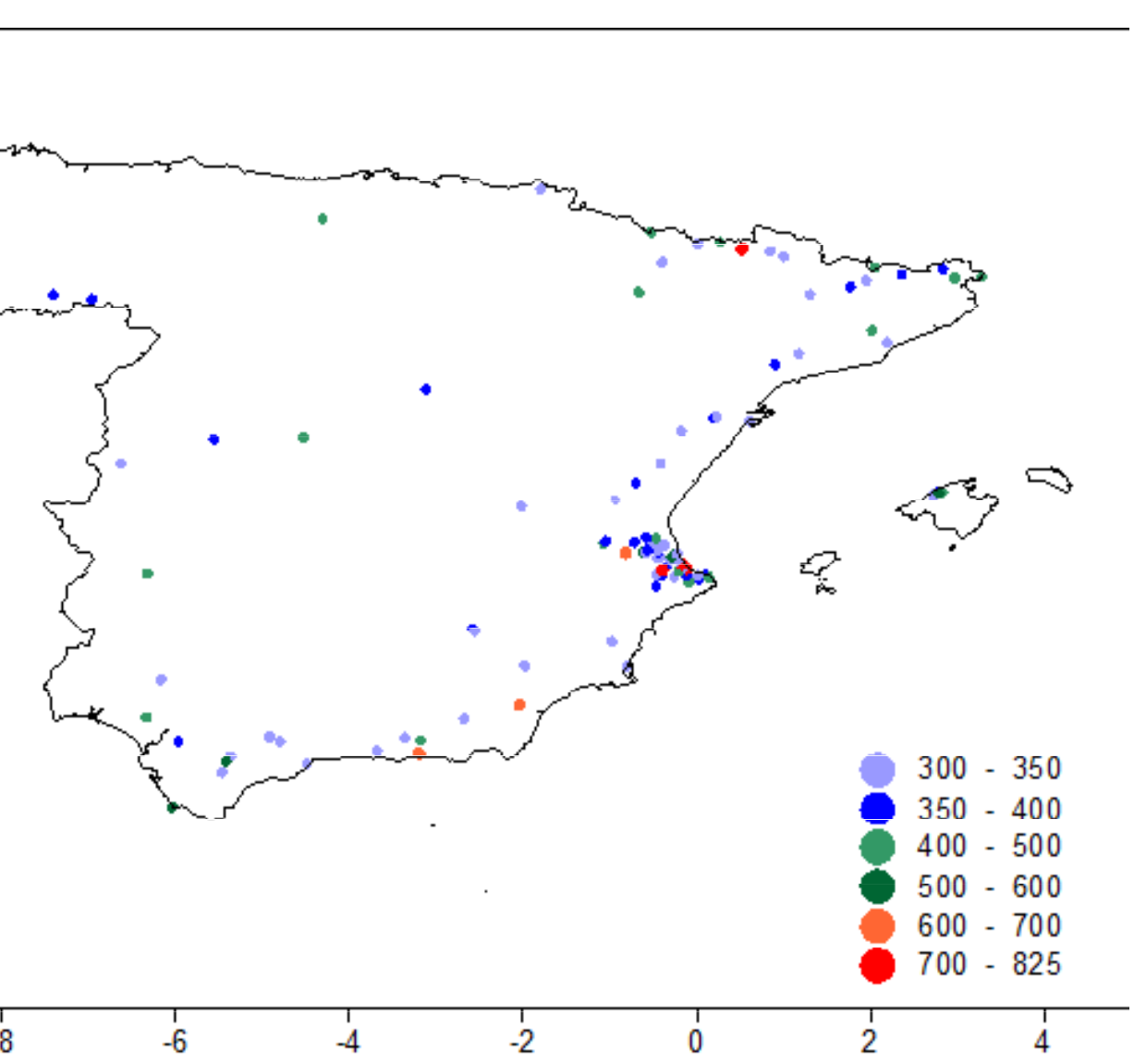
RESULTS

New map of extreme daily precipitation in Spain



Daily (07 day D to 07 UTC day D+1) precipitation amounts from 8184 rain gauge stations starting from the date each one started operations until 31 December 2008

P<100	100<=P<200	200<=P<300	300<=P
4414	3175	490	105

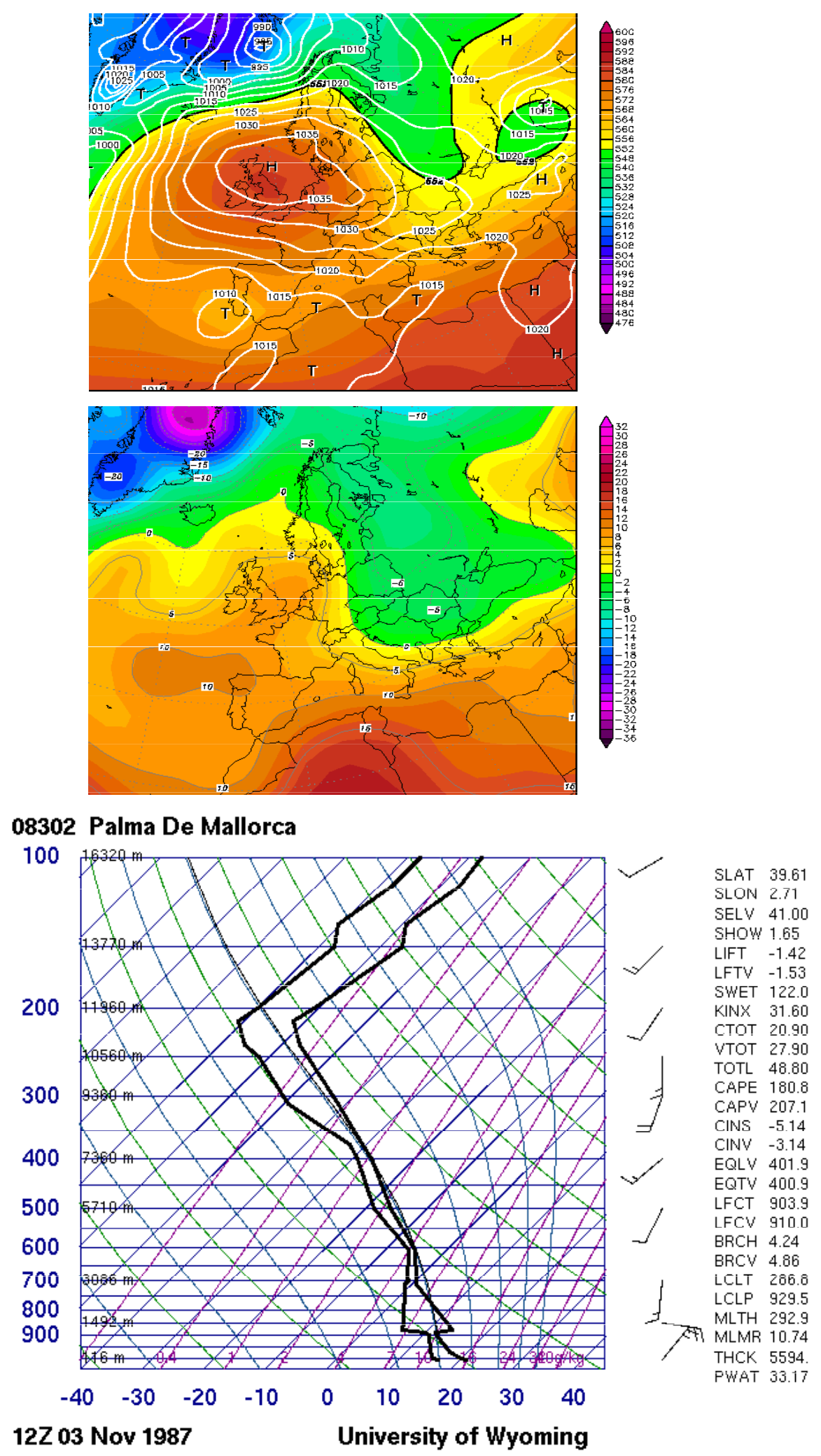


Location of the 105 raingauge station that have recorded daily precipitation Greater than 300 mm

More extreme daily precipitation

Province	Rain gauge identifier	Altitude (masl)	Precipitation (mm)	Date
Valencia	8058A	20	817.0	03-Nov-1987
Valencia	8288E	243	790.0	04-Nov-1987
Valencia	8071C	22	720.0	03-Nov-1987
Huesca	9838B	1138	700.5	22-Nov-1923
Valencia	8270O	700	632.0	20-Oct-1982
Granada	6275	240	600.0	19-Oct-1973
Almeria	6366	240	600.0	19-Oct-1973
Balearic Islands	B684	830	536.5	22-Oct-1959
Cádiz	5944	793	525.0	13-Dec-1987
Valencia	8274U	40	520.0	04-Nov-1987
Valencia	8077	17	520.0	11-Sep-1996
Cádiz	5979	22	503.0	27-Jan-1960
Valencia	8076	35	500.0	11-Sep-1996

NCEP reanalysis for 4th November 1987 at 00 UTC:
a) Surface pressure and 500 hPa isohypses
b) 850 hPa temperature
c) Sounding of Palma de Mallorca on 3th November 1987 at 12 UTC



CONCLUSIONS

- Major extreme precipitation are concentrated along the Mediterranean coast.
- Minor extreme precipitation are located over the Northern Plateau
- Important extreme precipitation are found along the eastern part of the Cabntabran coast
- Important precipitations are found over the Central Range
- Valencia region is the region most affected by heavy rain. The higher daily amount recorded in Spain is 817 mm in a town located at the Mediterranean coast in the Valencia region.
- The Balearic Islands are also affected by very important daily precipitation amounts. The highest value recorded is 536 mm in a raingauge located close the highest peak of Mallorca island.

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