

TRENDS OF “FLASH HEAT” EVENTS IN THE IBERIAN PENINSULA DURING THE PERIOD 1900 - 2010

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Outline

1. What is a flash heat? Motivation for studying flash heats.
2. Methodology
3. Results
4. Conclusions

1. What is a flash heat?

HEAT WAVE:

i) WMO

a phenomenon in which the daily maximum temperature of more than five consecutive days exceeds the average maximum temperature by 5°C with respect to the period 1961-1990.

ii) AMS

a period of abnormally and uncomfortably hot and usually humid weather, which should last at least one day, but conventionally it lasts from several days to several weeks.

HEAT BURST:

AMS

a rare atmospheric event characterized by gusty winds and a rapid increase in temperature and decrease in humidity, a an scale of few minutes that affect a local area.

(associated to downwind of thunderstorms)

	Temporal scale	Spatial scale	Driving mechanism
Heat wave	From 2 consecutive days to several weeks	Meso α (200 – 2000 km)	General atmospheric circulation dynamics
Heat burst	Few minutes	Micro β, γ (< 2 km)	Thunderstorms, local Foehn effect
????? FLASH HEAT	1-24 hours	Meso β, γ (20-200 km)	Regional Foehn effect, regional circulation

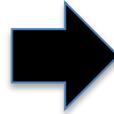
Glossary AMS (2014): Discrete period of abnormal warming, nominally lasting more than an hour but less than a day (...).

The term was first defined by studying two such events in the Mediterranean basin via simulations with a mesoscale numerical weather prediction model. Flash heat events last longer than heat bursts but are too short to be considered heat waves and are associated with some atypical physical mechanism (...).

Mazon *et al.*, 2014: Rapid and sudden advection of warm and dry air in the Mediterranean Basin. *Nat. Hazards Earth Syst. Sci.*, 14, 235–246, doi:10.5194/nhess-14-235-2014.

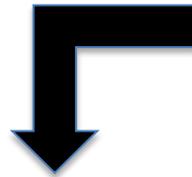
2. Methodology

Daily maximum and minimum temperatures (1900-2000) recorded at 22 cities in the Iberian Peninsula (Brunet et *al.*, 2006, 2008)



From max/min daily temperature series, a FH has been considered when:

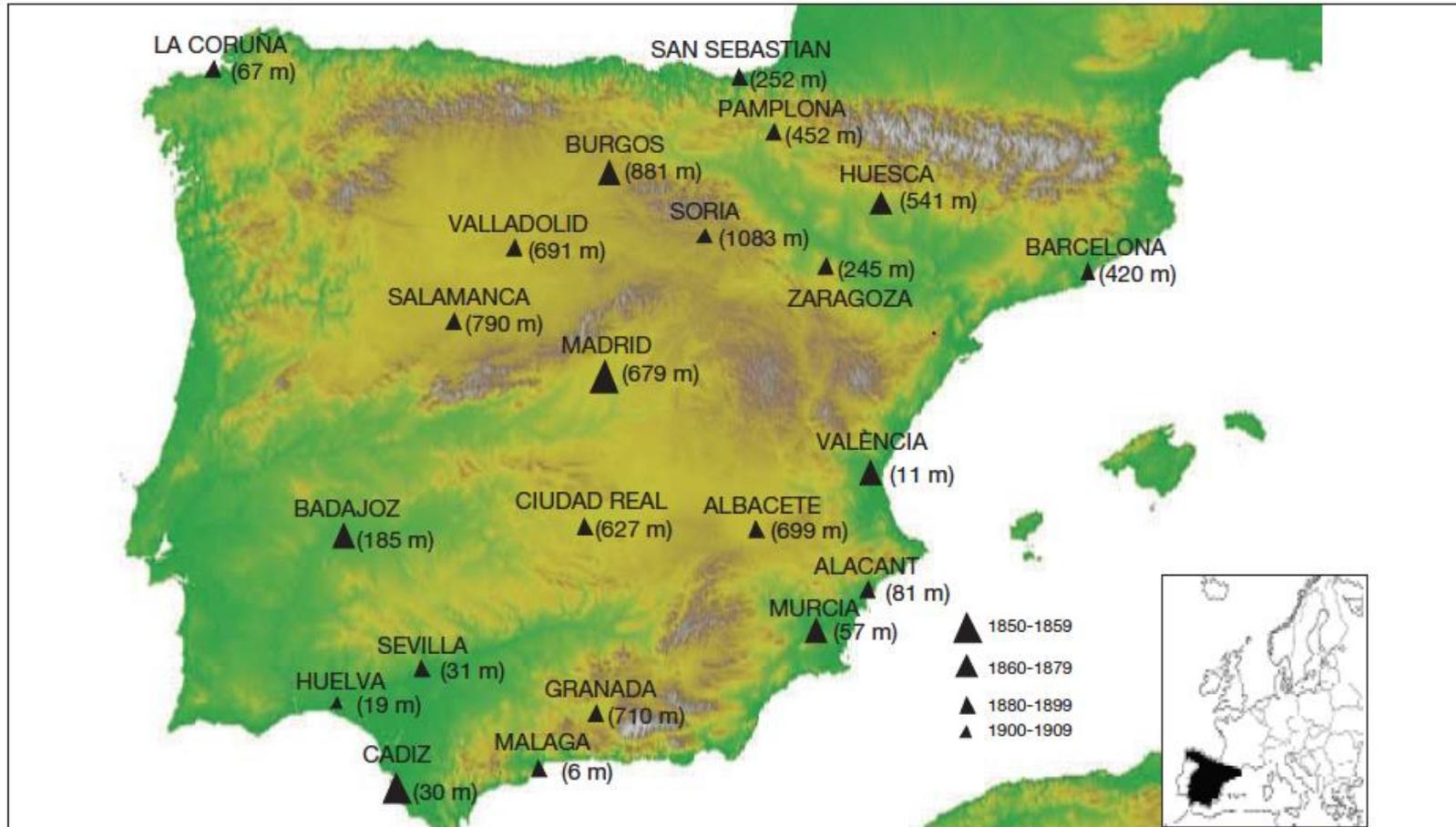
$$T(\text{Day}-1) < T(\text{Day } D) + N > T(\text{Day}+1)$$



N = 5°C FH1
N = 7°C FH2
N = 9°C FH3

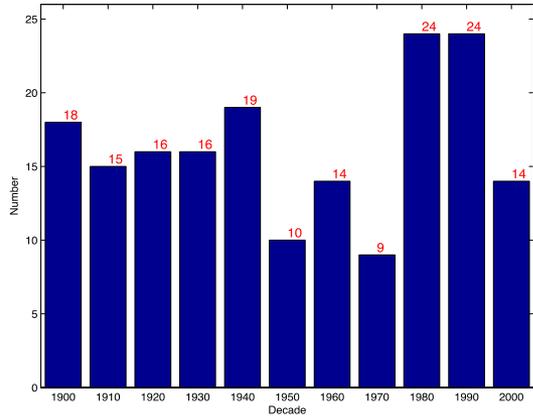
FH analysis

LOCATION OF WEATHER STATIONS TEMPERATURE SERIES (1900-2000)

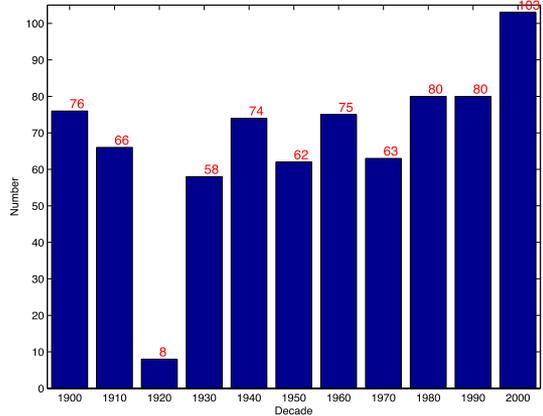


(Brunet et al., 2006, 2008)

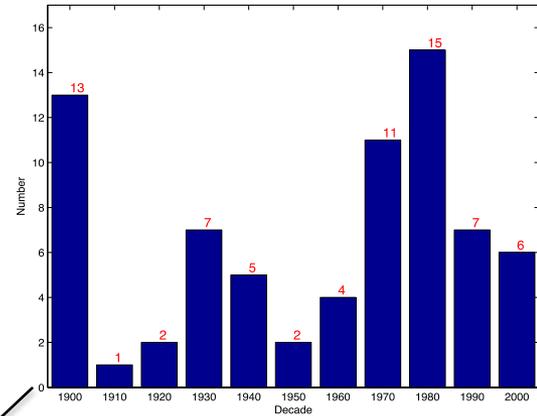
FLASH HEATS



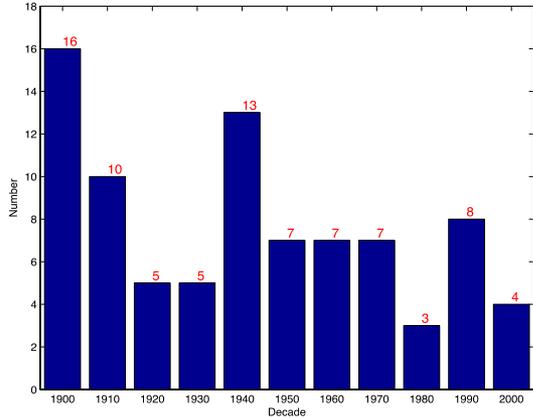
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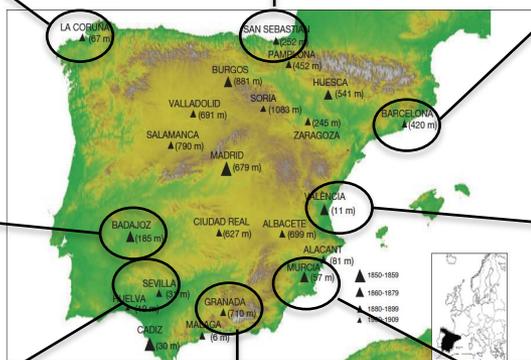
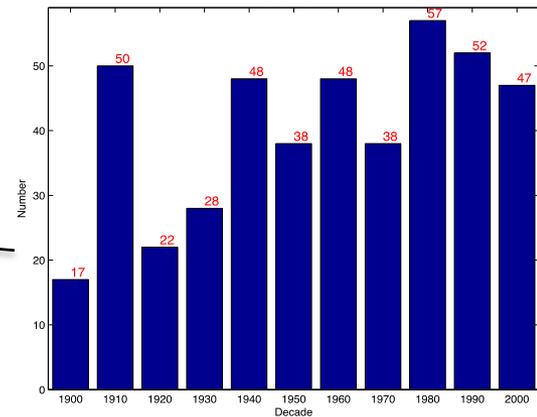
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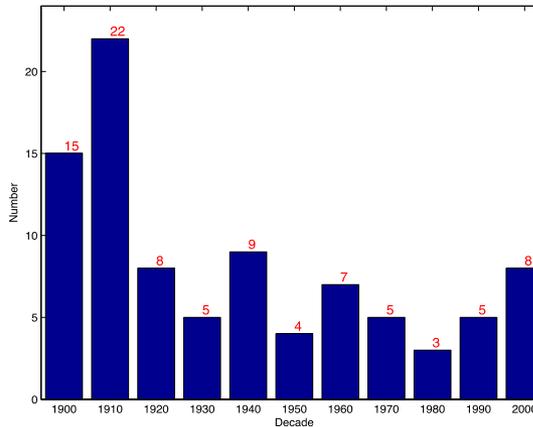
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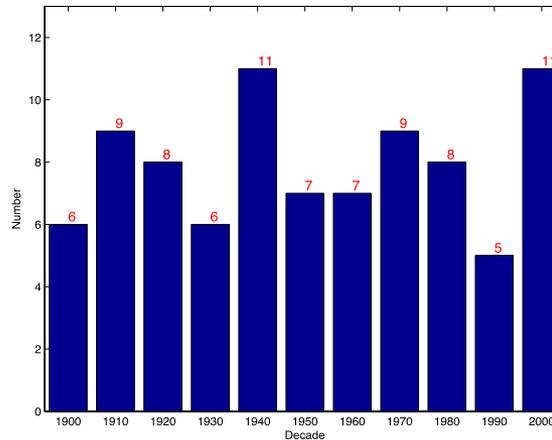
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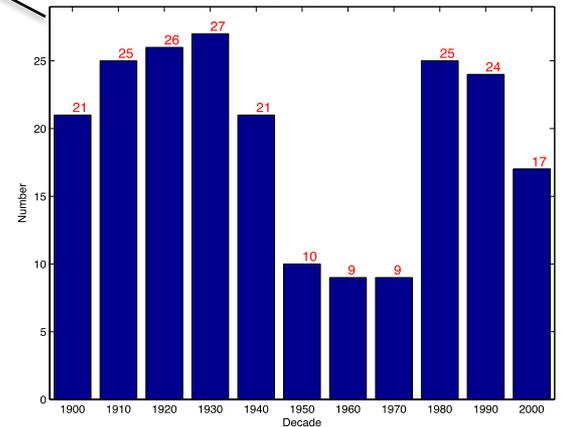
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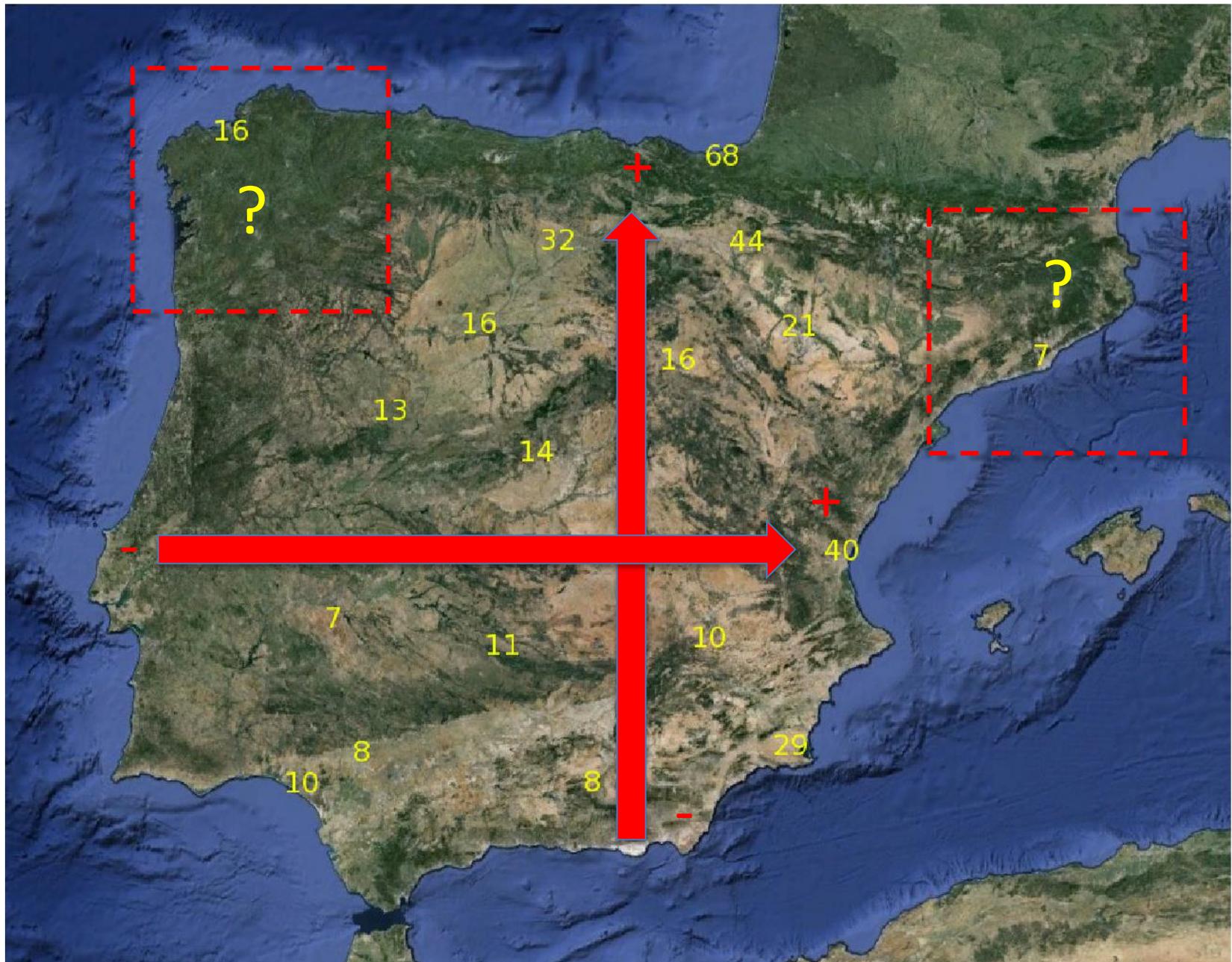
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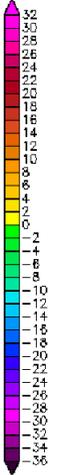
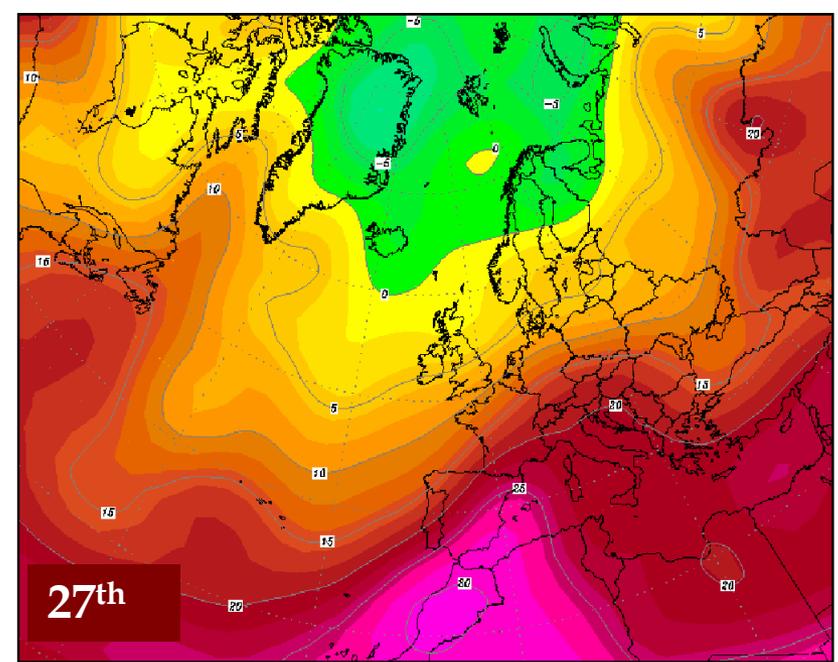
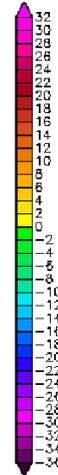
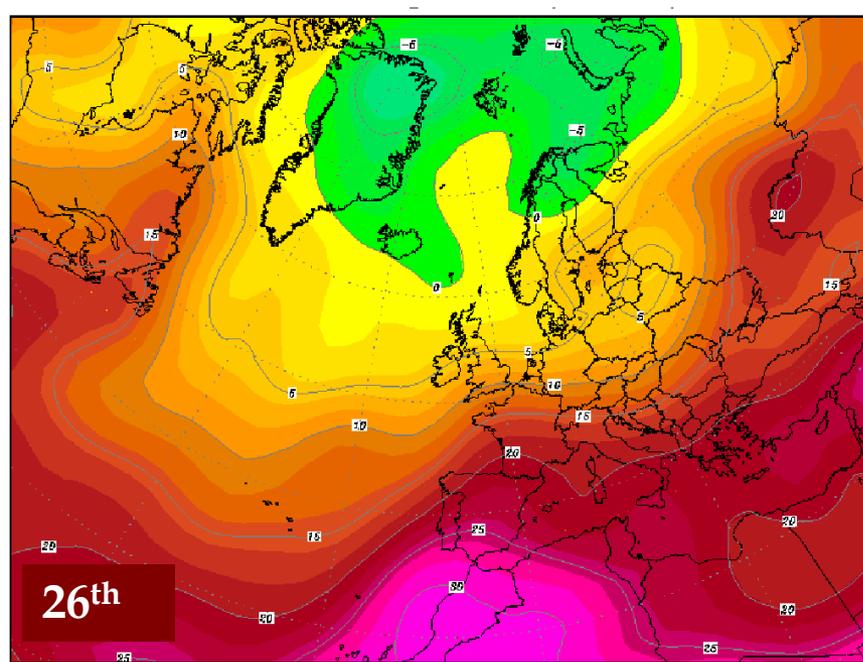


FLASH HEATS

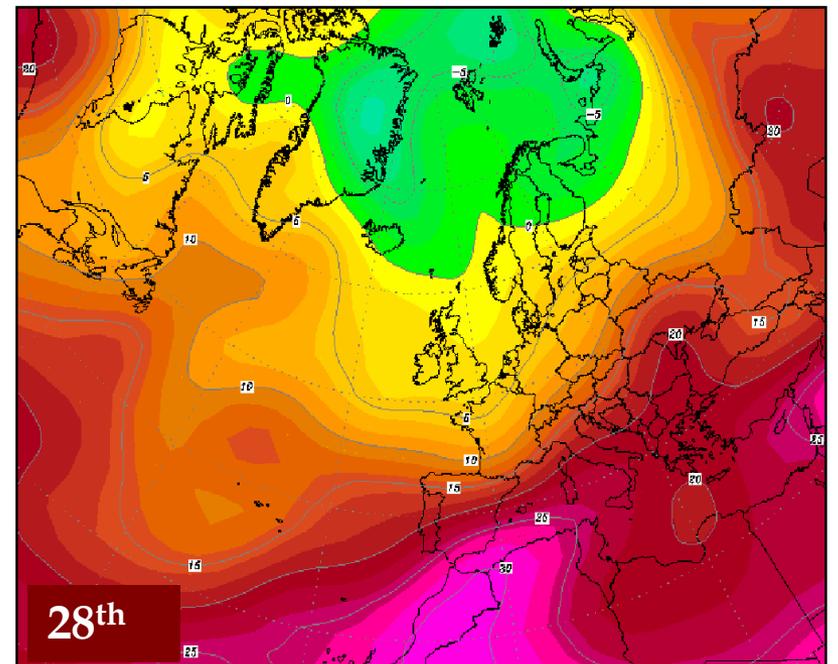


Absolute average number of FH in the period 1900-2000



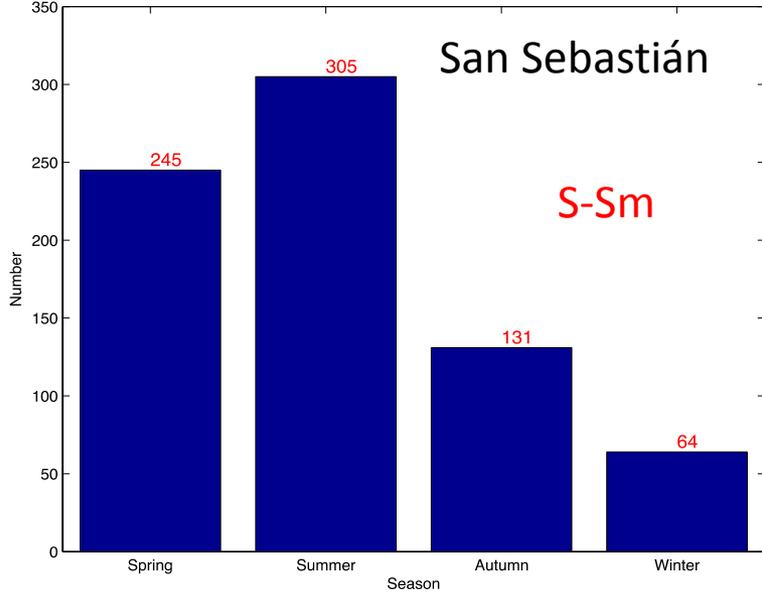


NCEP Reanalysis of
temperature at 850 hPa (color
contour) at 00 UTC on August
2010

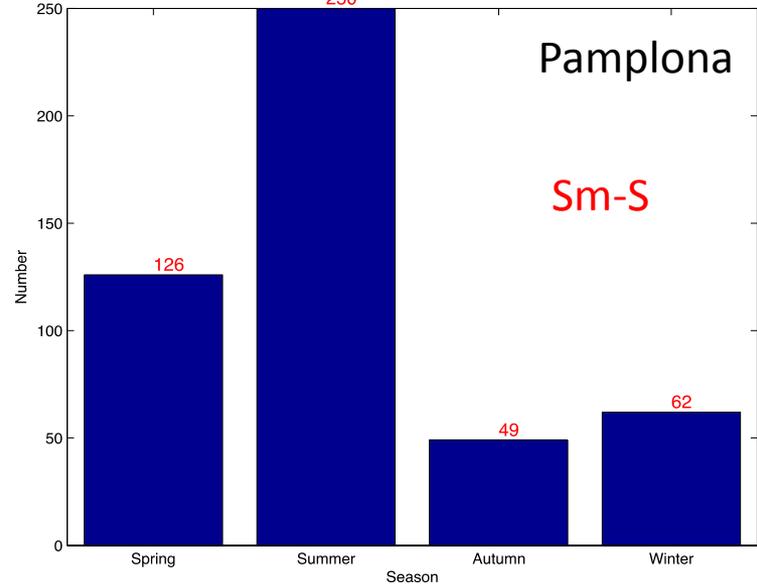


SEASONALITY ANALYSIS

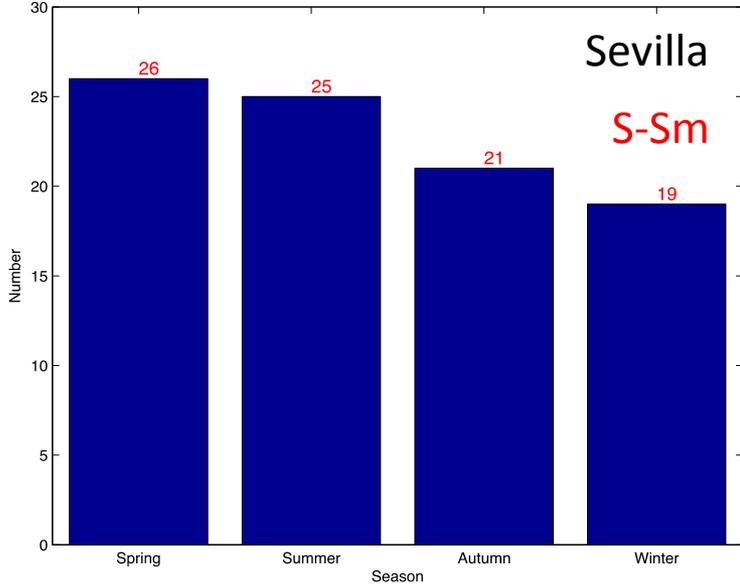
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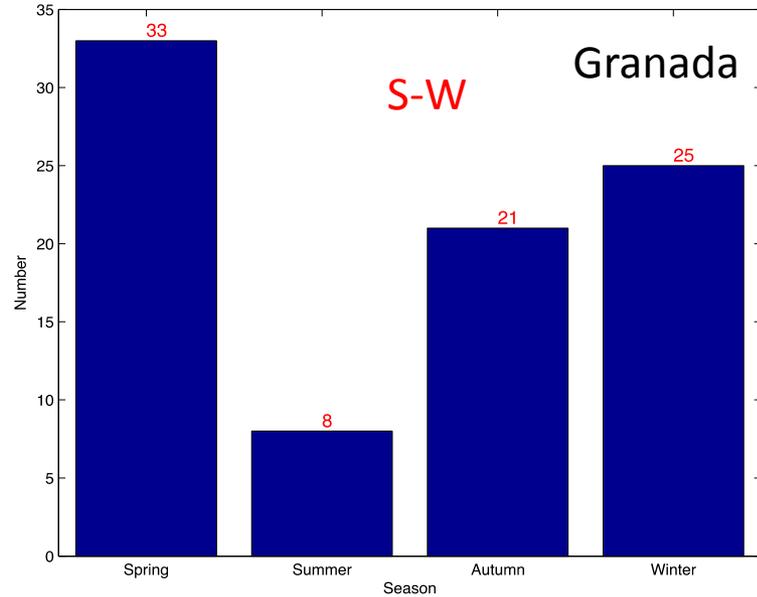
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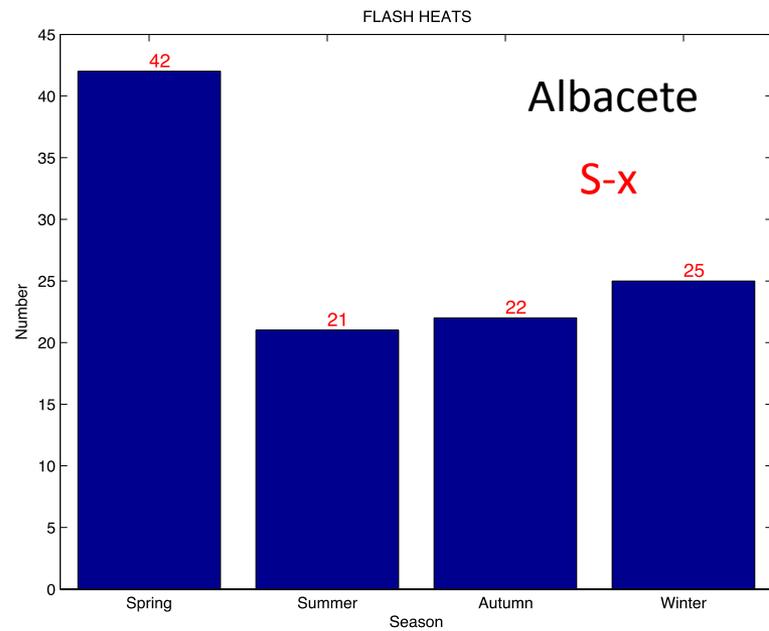
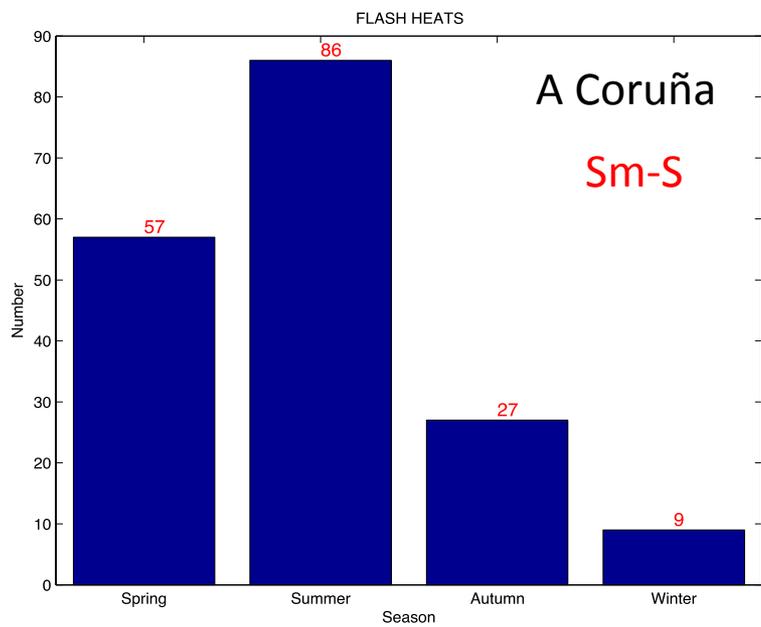
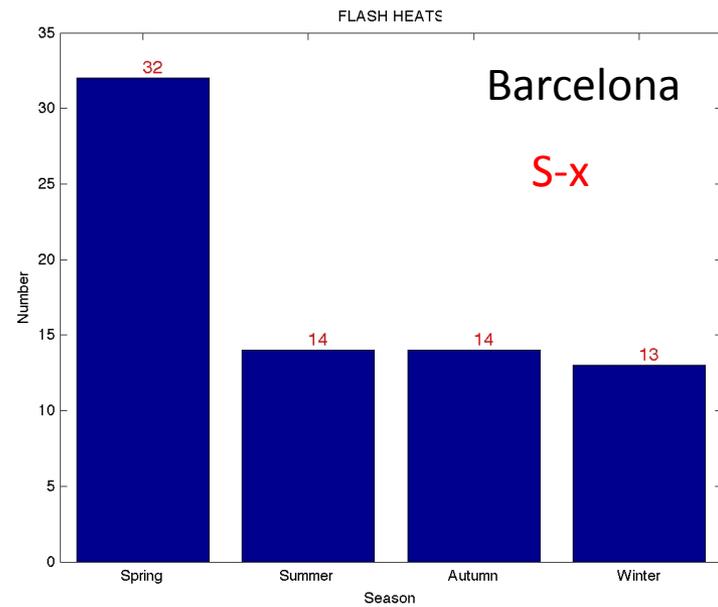
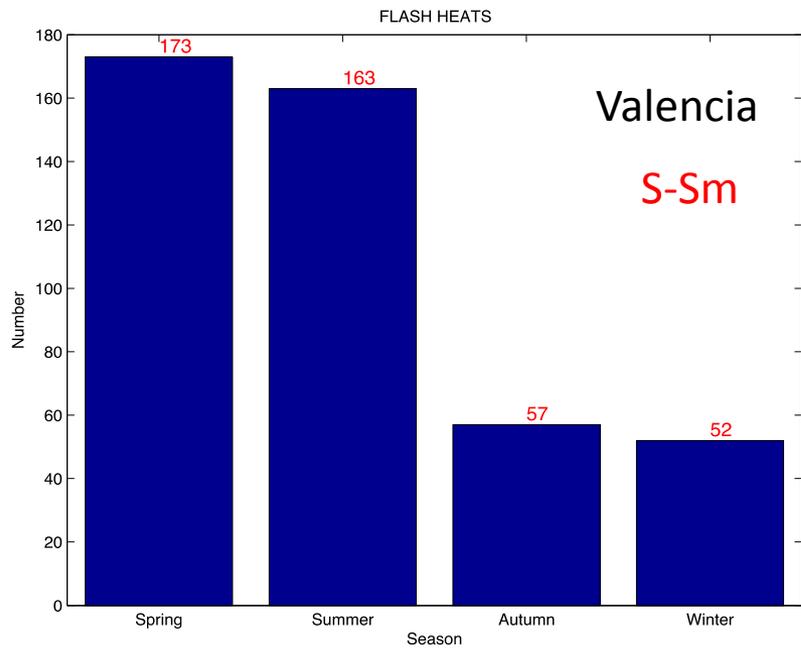


FLASH HEATS



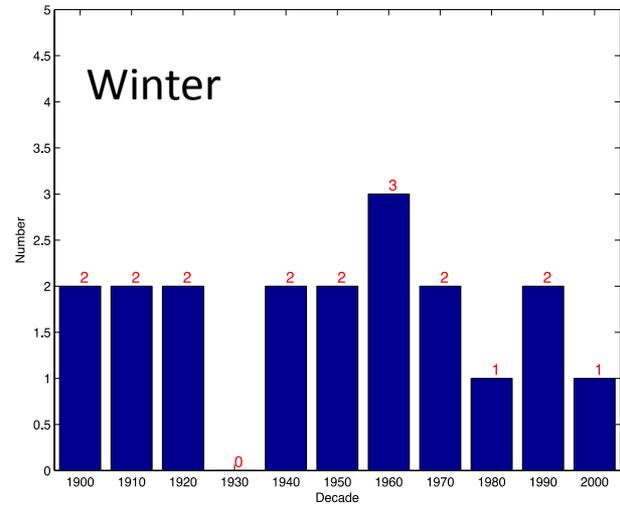
FLASH HEATS



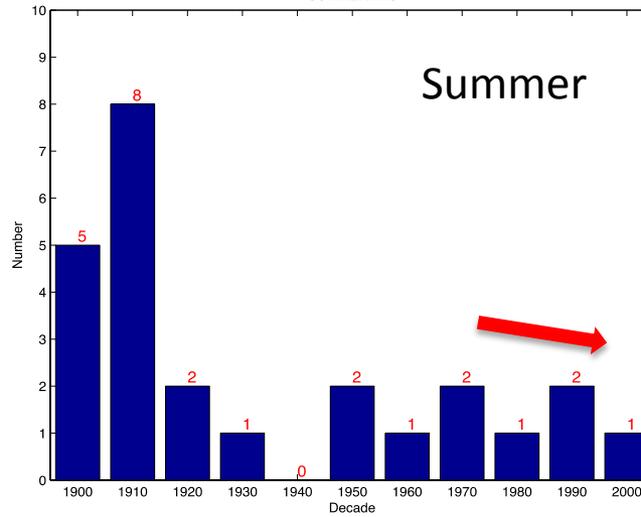


Sevilla

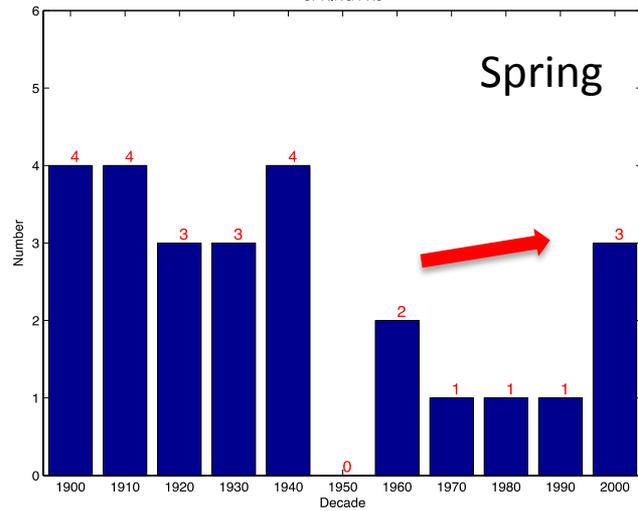
WINTER FHs



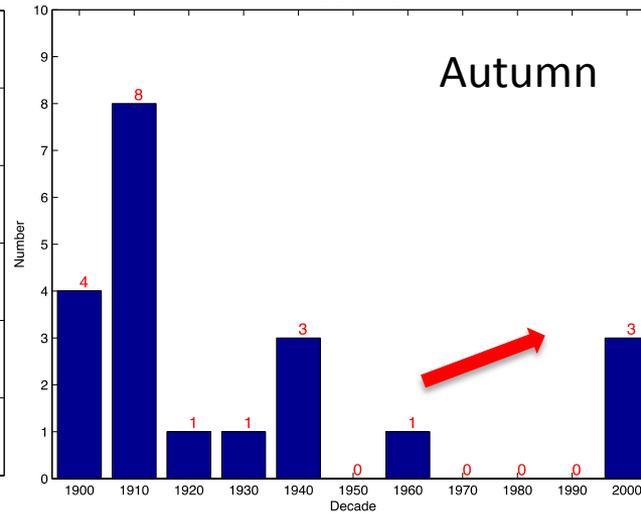
SUMMER FHs



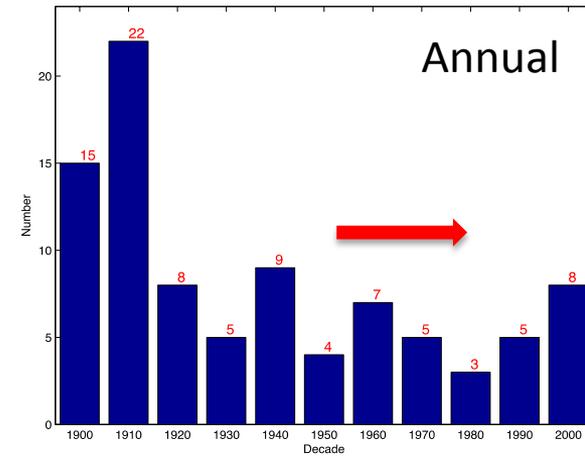
SPRING FHs



AUTUMN FHs



FLASH HEATS

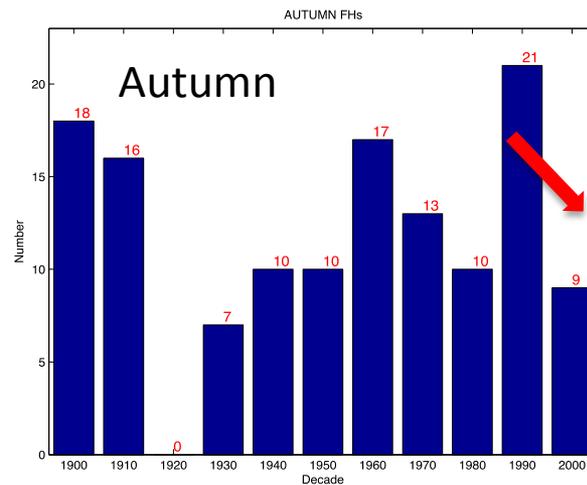
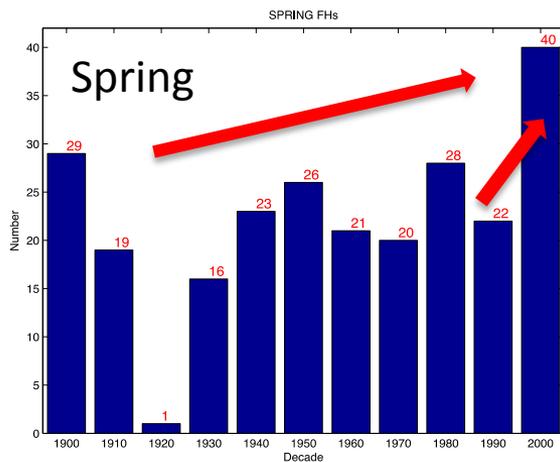
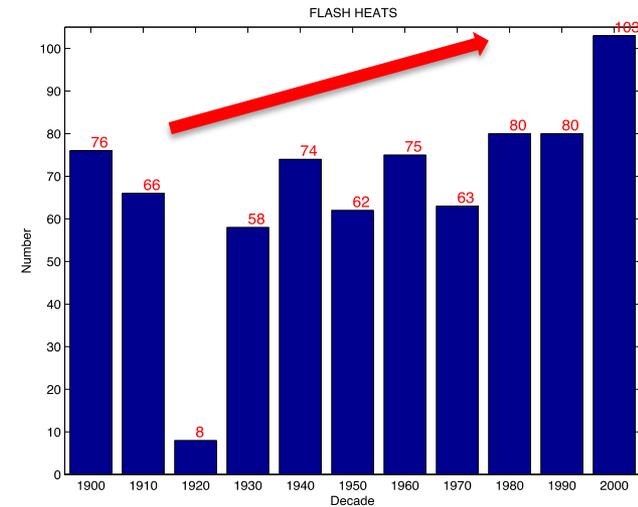
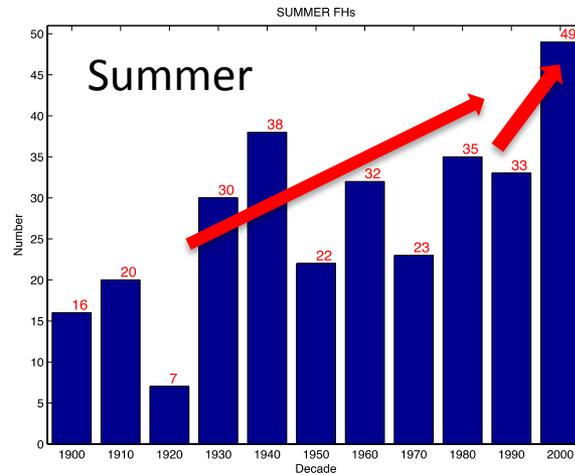
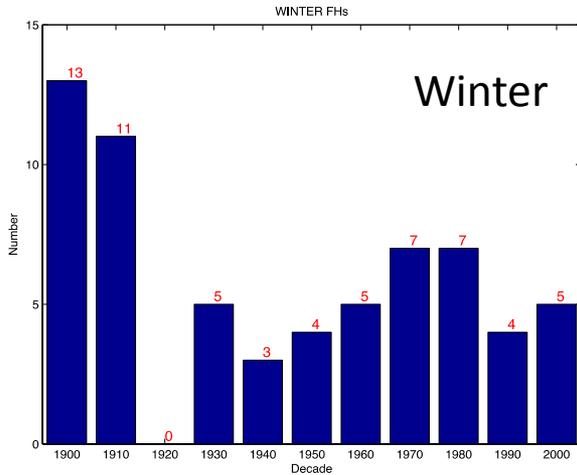


Weak variation of FH in all seasons



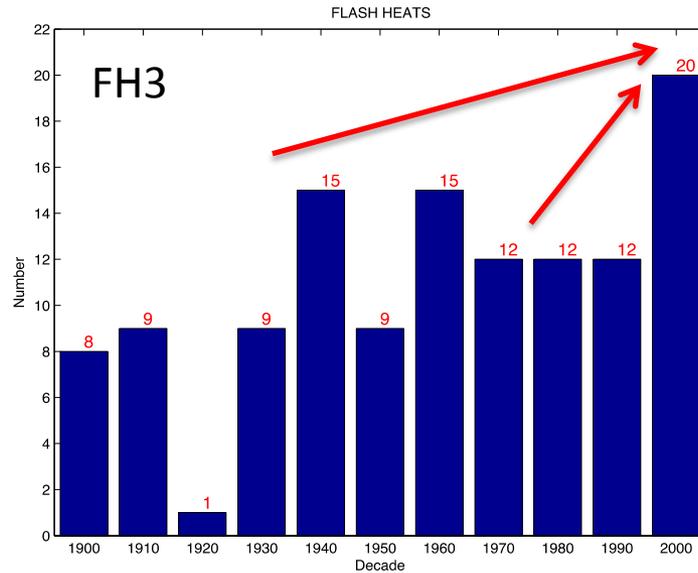
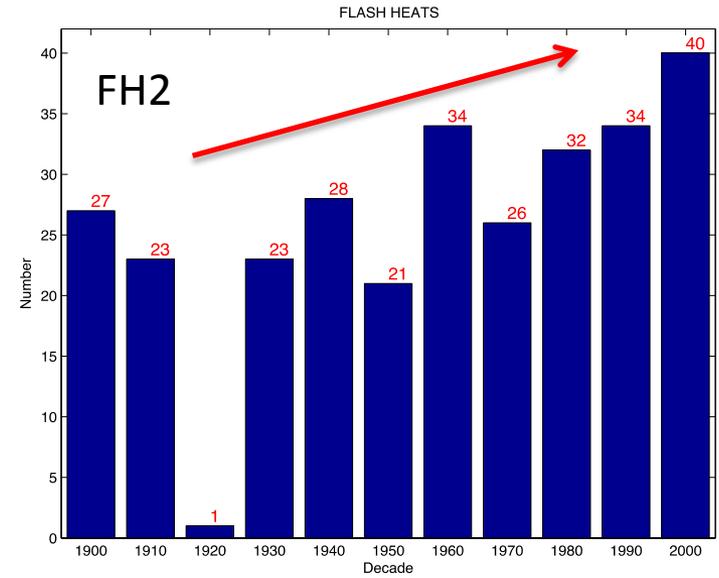
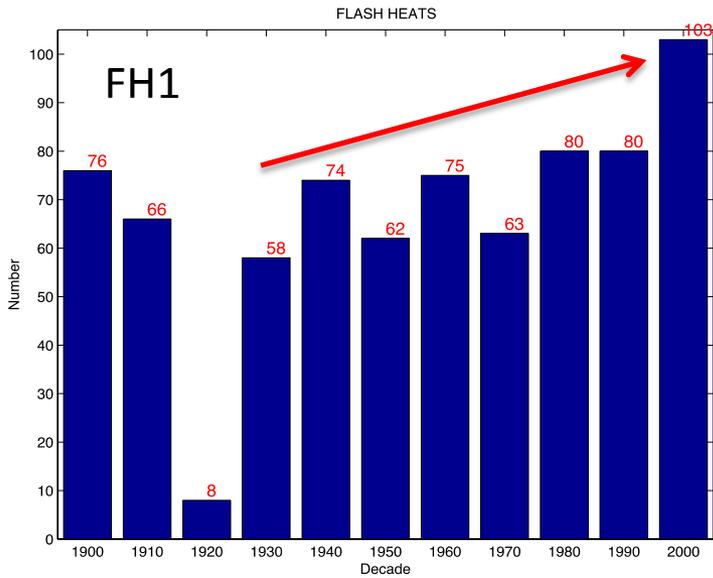
Weak variation during the year

San Sebastián



Spring and summer have largest contribution to the annual increasing of FH.
Autumn contributes decreasing the number of FH, mainly during 1990's.

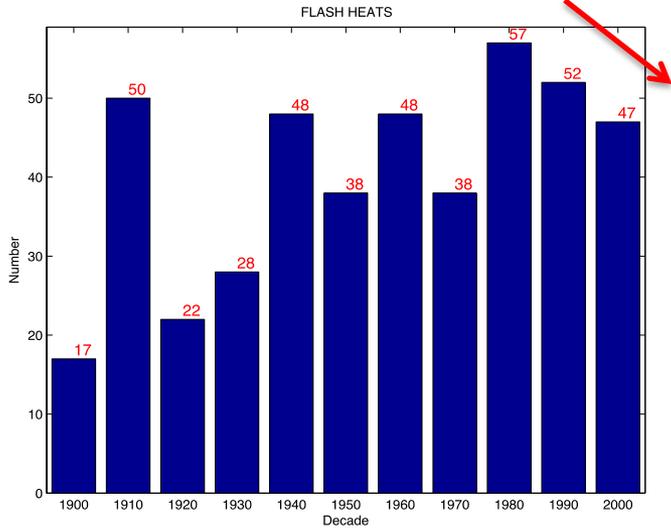
Intensity of FH – San Sebastián



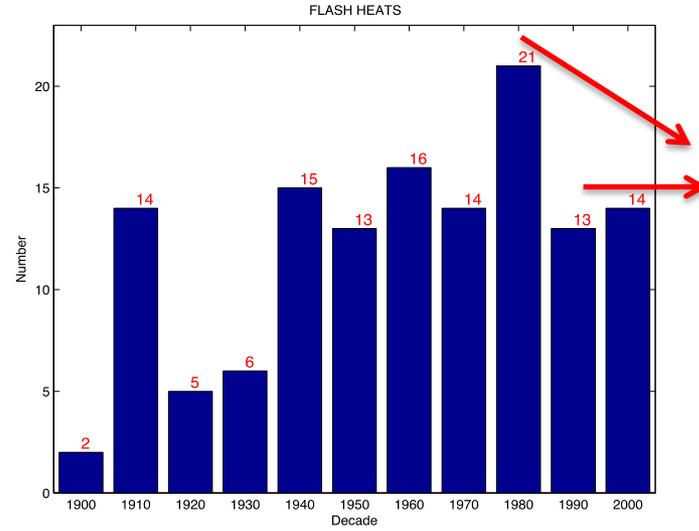
Positive trend in all type of FH

Valencia

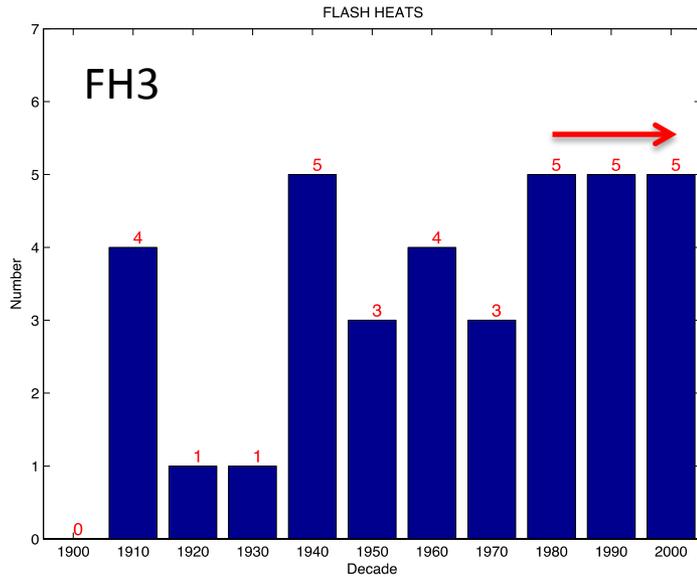
FH1



FH2



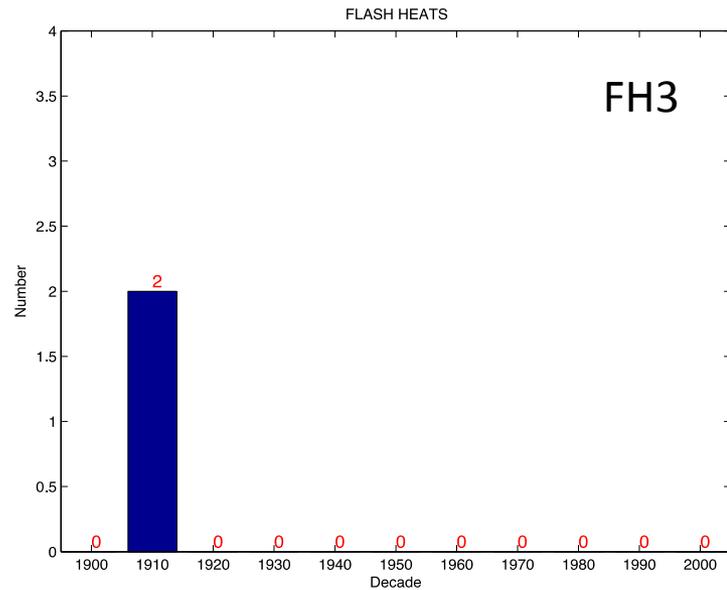
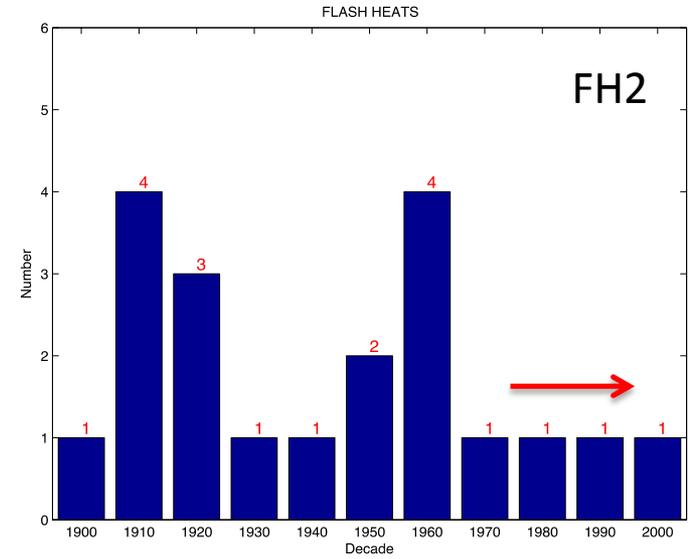
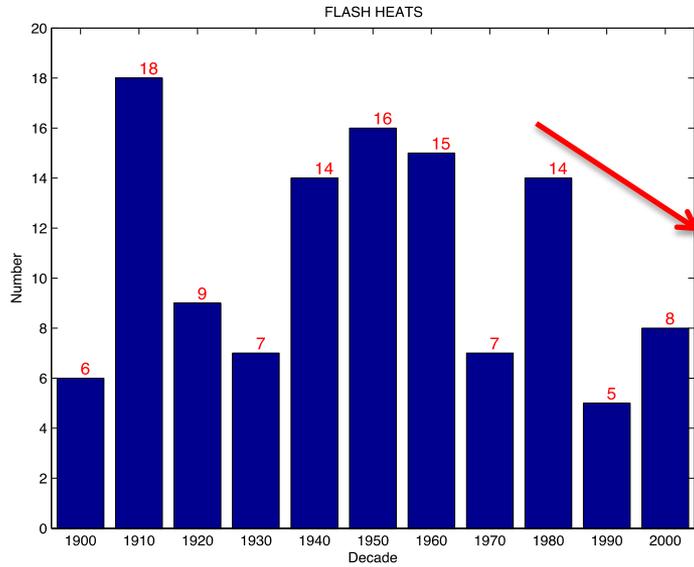
FH3



Negative trend in FH1.
No trend in FH3

Huelva

FH1



Negative trend in FH1
No trend in FH2
No FH3

Conclusions

1. The average number of FH per decade shows a spatial distribution along the IP:

- i) Increasing from S-N
- ii) Increasing from W-E
(except for NE and NW extremes of IP shows)

2. The average number of FH per decade shows a temporal distribution along the IP:

- i) FH appears mainly during Spring and Summer.

3. The trend of FH per decade shows:

- i) Positive trend in the northern areas (San Sebastian, Pamplona, Zaragoza, Burgos)
- ii) Positive trend in the east (Valencia)
- iii) Negative trend in the NE (Barcelona)
- iv) No trend in the southern areas (Huelva, Sevilla, Badajoz, Granada) as well as in some central areas (Madrid)

This analysis could be in agreement with

- a) The trend to remain in a more north latitude, mainly during the spring and summer. Consequently, rapid and sudden movement to the north of this ridge affect the northern latitudes for a short time in the IP, while in the south the warm air associated with the ridge remains for longer time.
- b) South and southwesterly prevails -> Regional Foehn effect increases in some areas in the east and north.

4. Concerning with the intensity of FH:

- FH2 and FH3 have been detected along the XX century in the IP
- FH3:
 - Increases in the north (San Sebastián)
 - No trend in the east (Valencia)
 - Decreases in the South (Sevilla)

Thank you for your attention!