



Città di Livorno

PERCORSI
d'AMBIENTE



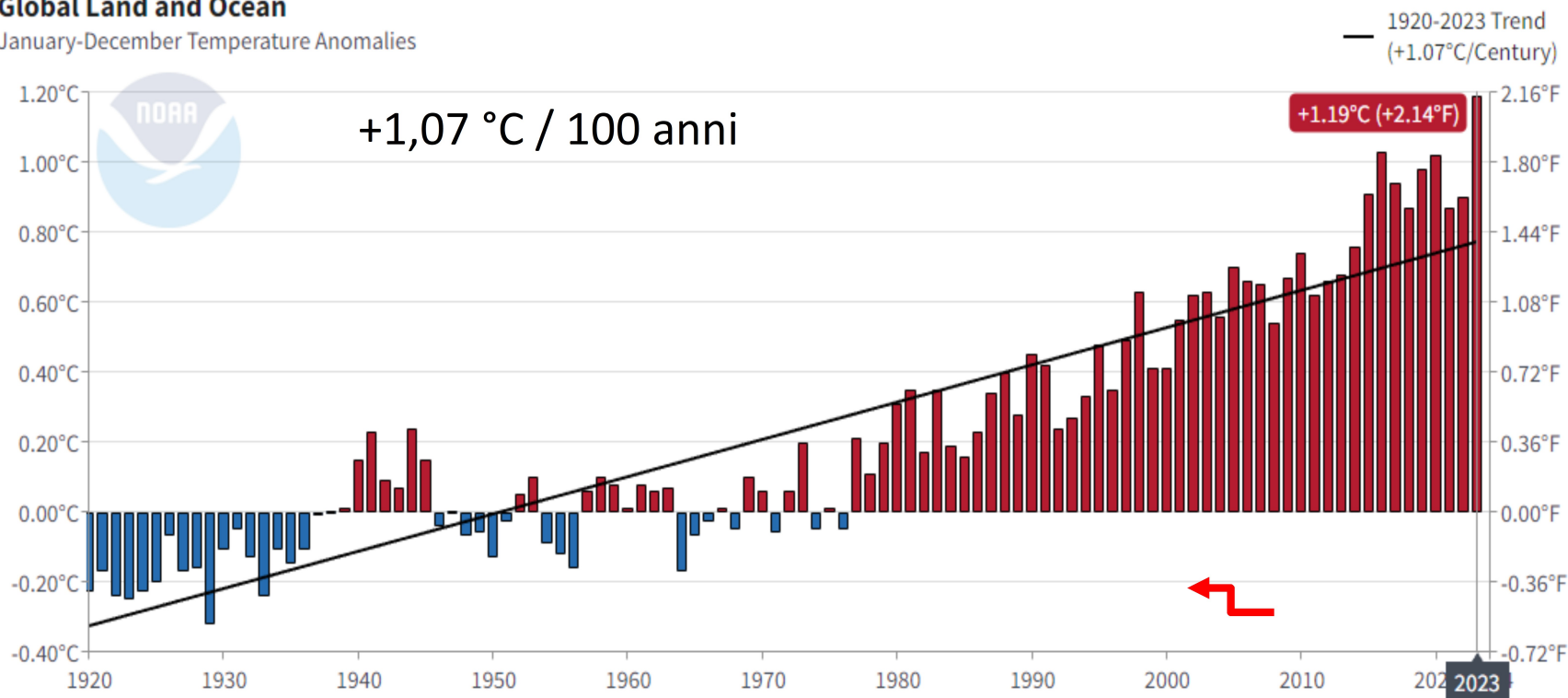
“LA TRANSIZIONE ECOLOGICA ED I CAMBIAMENTI CLIMATICI

L'emergenza climatica in Toscana e Livorno

TEMPERATURE MONDIALI 1920-2023

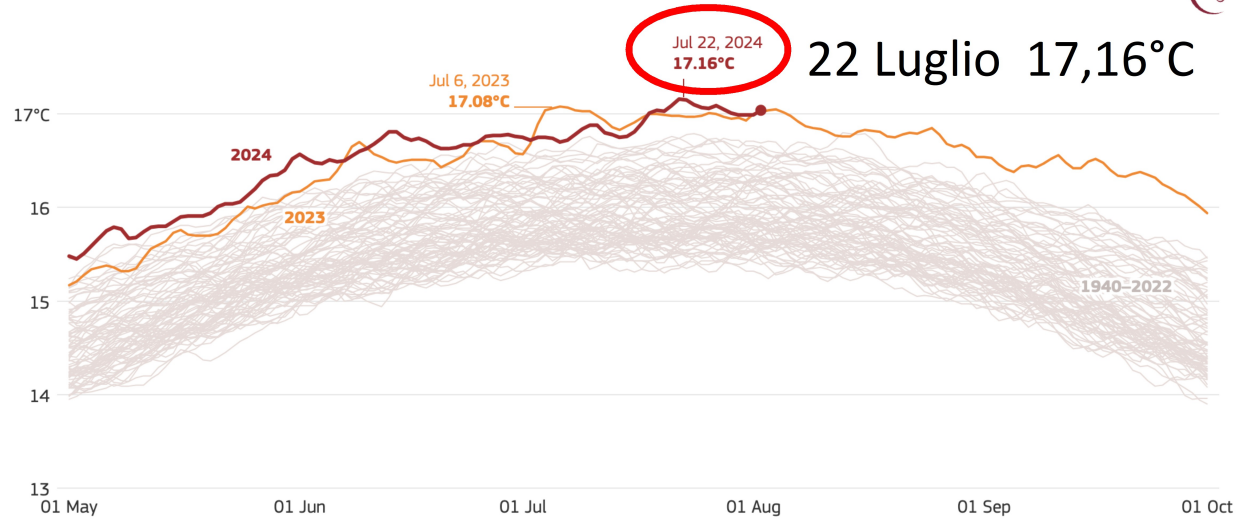
Global Land and Ocean

January-December Temperature Anomalies



Gli ultimi 9 anni sono stati i più caldi
2023 c'è un cambio?
2024 da gennaio ad agosto +1,26°C

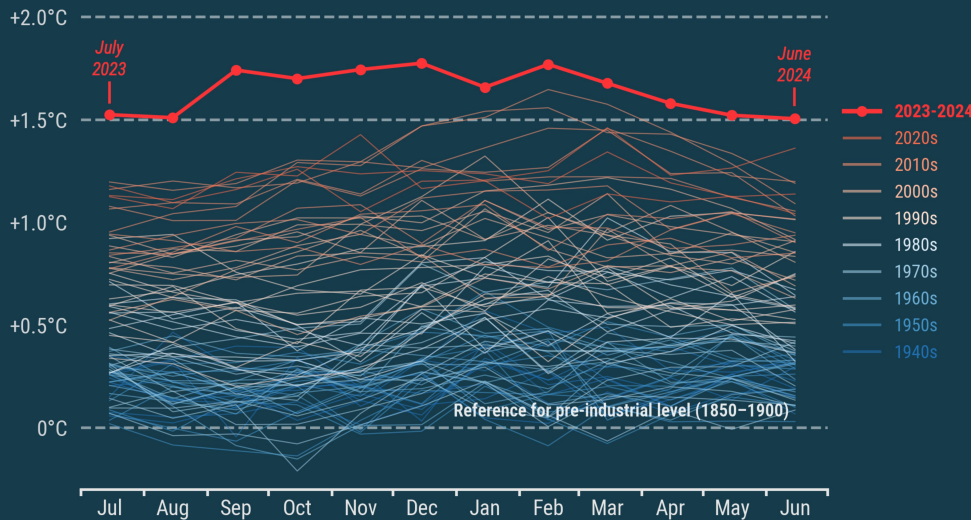
Daily global surface air temperature



Data source: ERA5 • Credit: C3S/ECMWF

Monthly global surface temperature increase above pre-industrial

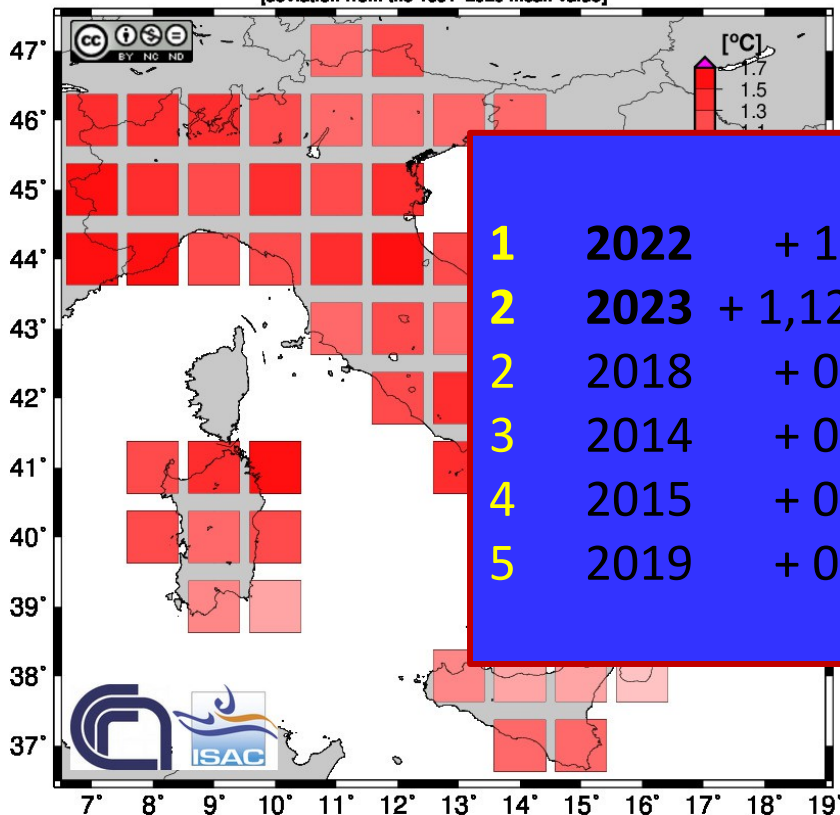
Data: ERA5 1940-2024 • Reference period: 1850-1900 • Credit: C3S/ECMWF



Luglio + 1,48°
 Agosto + 1,51°
 Settembre + 1,54°

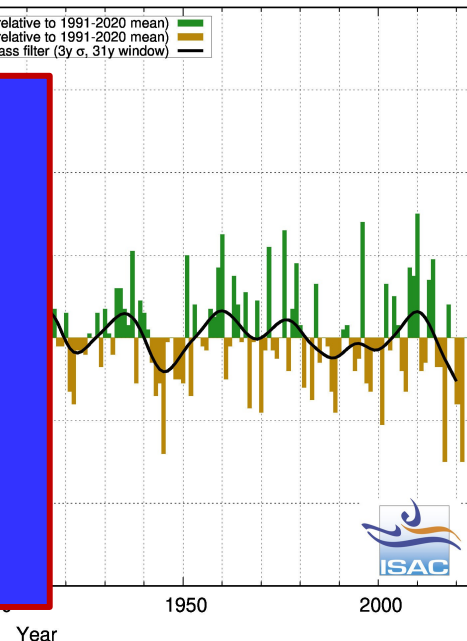
ITALIA 2023

[deviation from the 1991-2020 mean value]



ANNUAL PRECIPITATION

positive anomalies (relative to 1991-2020 mean)
negative anomalies (relative to 1991-2020 mean)
gaussian low-pass filter (3y σ , 31y window)



Classifica		
1	2022	+ 1,15°C
2	2023	+ 1,12°C
2	2018	+ 0,75°
3	2014	+ 0,6°
4	2015	+ 0,59°
5	2019	+ 0,55°

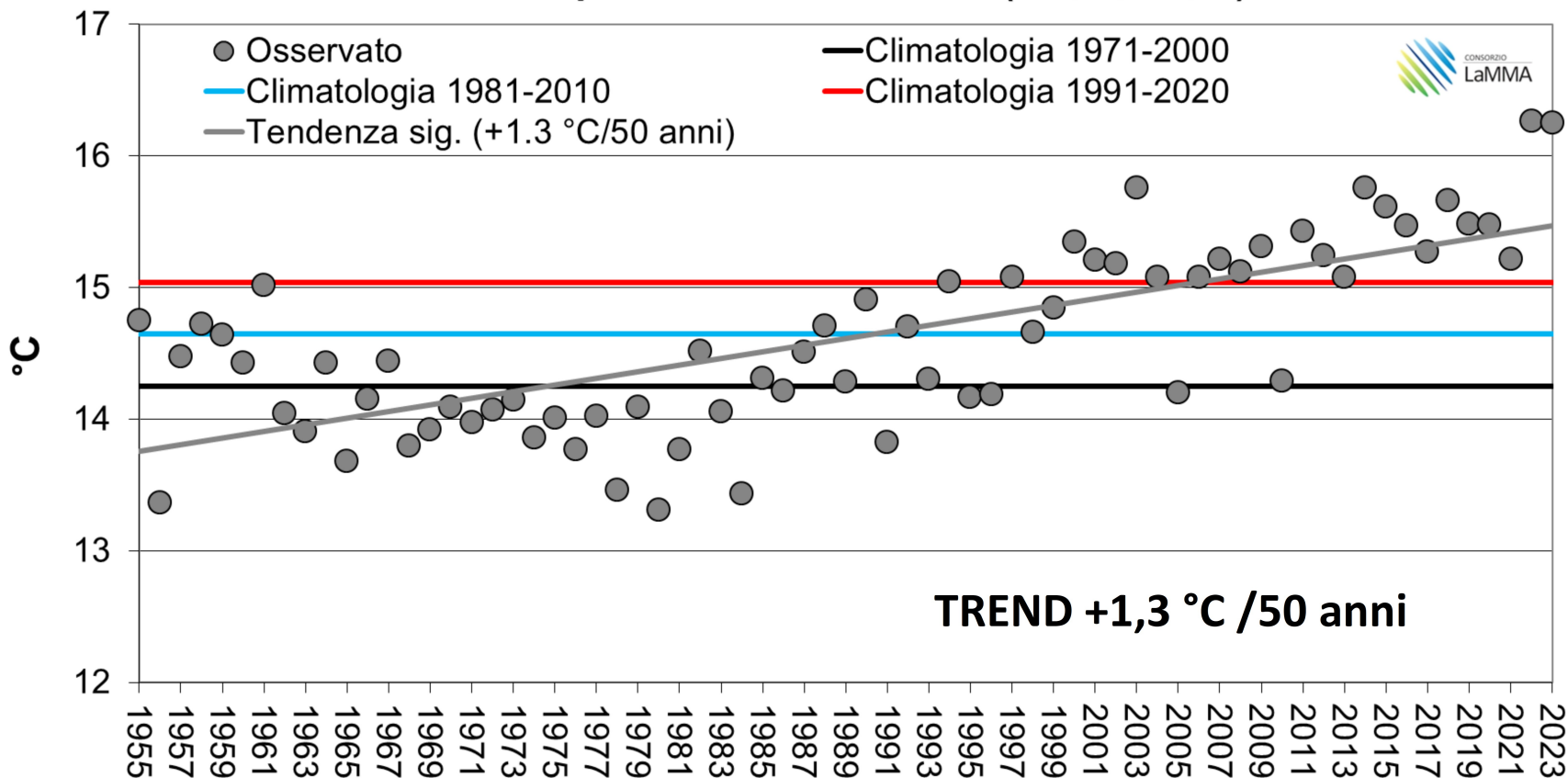
2023:	secondo + 1,12°	2022 + 1,15
MAX:	secondo + 1,15°	2022 + 1,40°
MIN:	il più caldo + 1,07°	

Clima calcolato sul periodo 1991-2020

Temperature medie annue 1955-2023

Toscana (AR, FI, GR, PI)

Temperatura media annua (AR,FI,GR,PI)

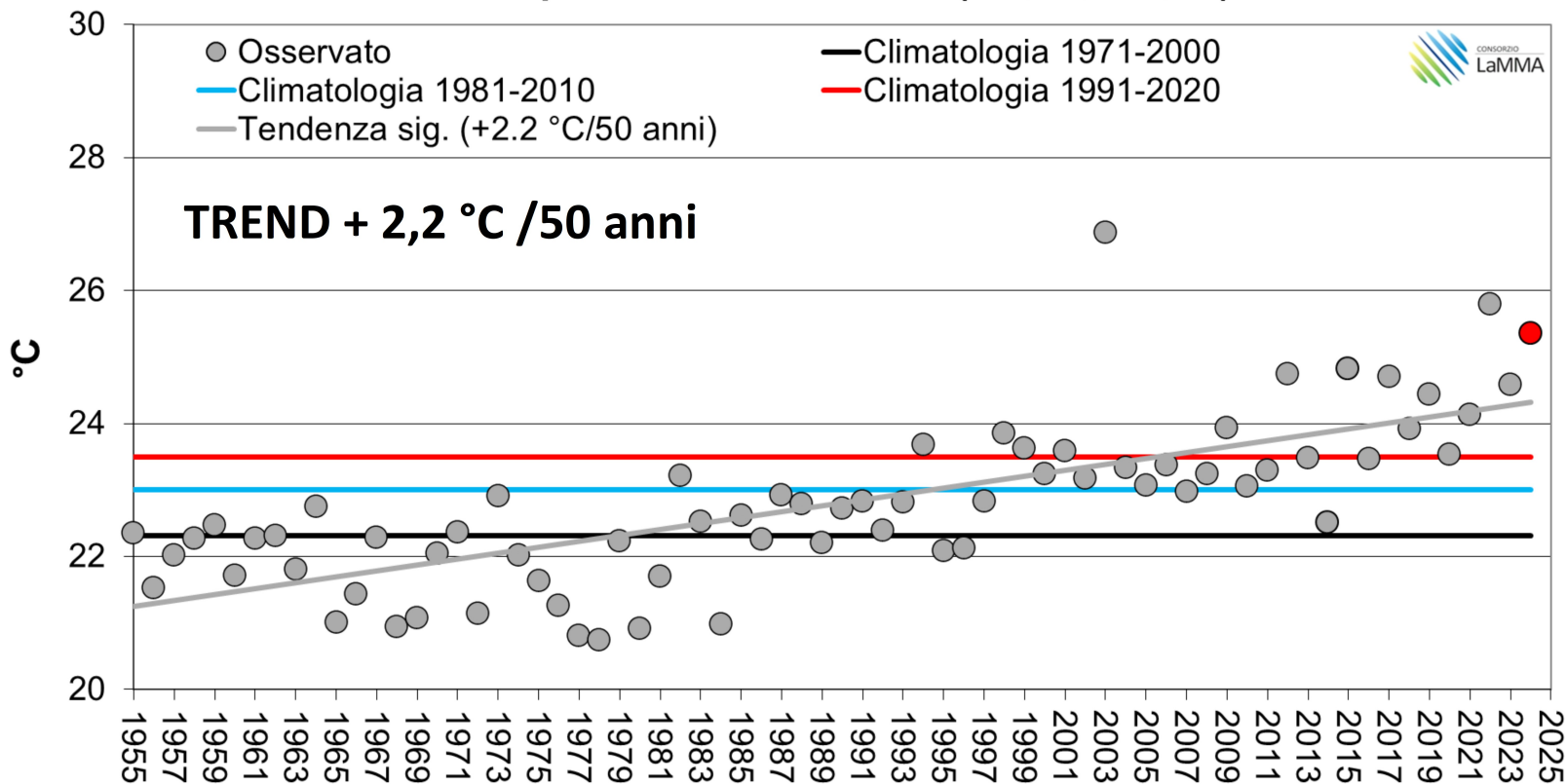


Trend (50 anni): Medie +1,3°, Massime +1,5°, Minime +1,0° (rec 2023)

ESTATE: Temp. medie 1955-2024

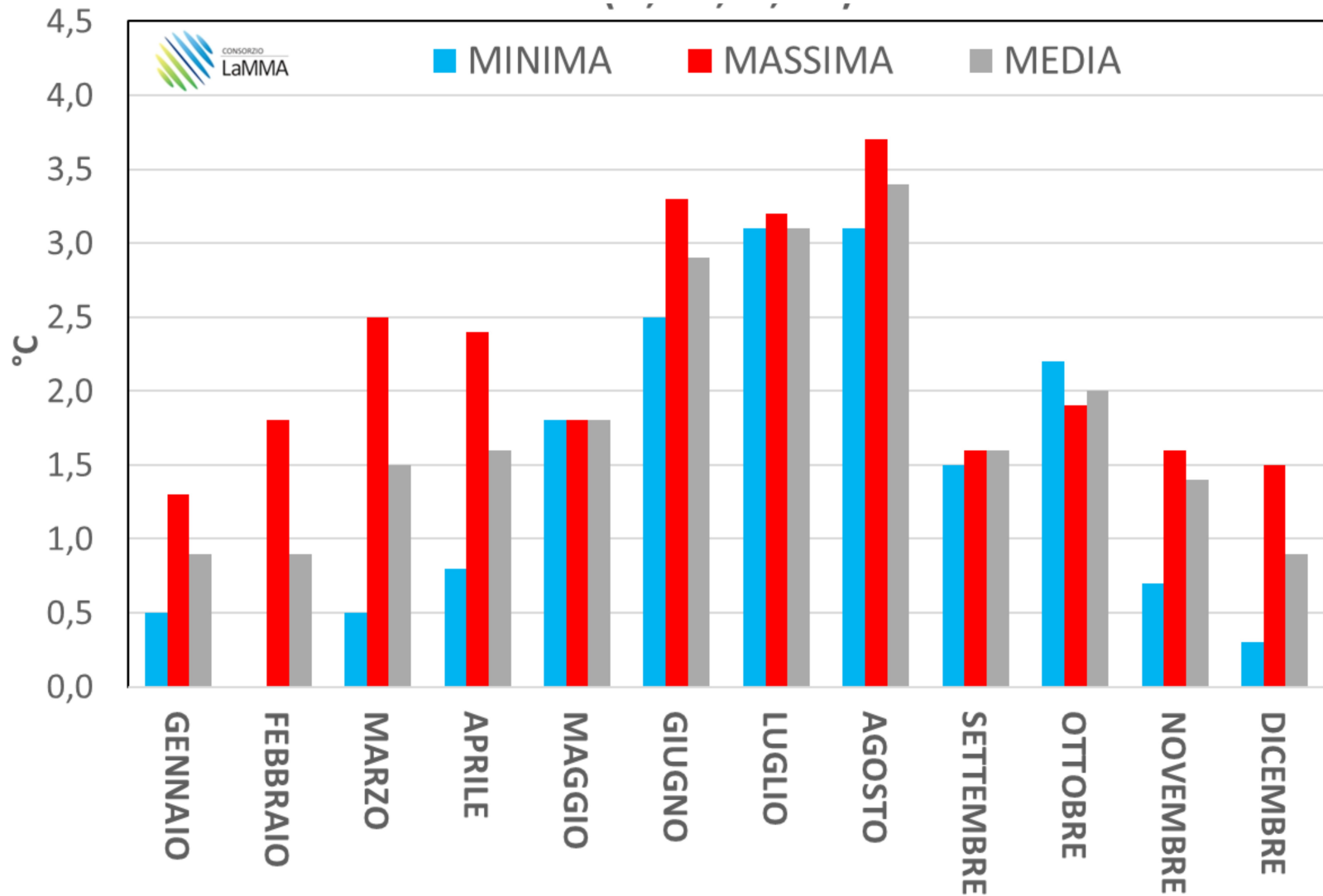
Toscana (AR, FI, GR, PI)

Temperatura media estate (AR, FI, GR, PI)



Trend (50 anni): Primavera +1,2°, Autunno +1,2°, Inverno +0,8°

AUMENTO TEMPERATURA IN TOSCANA DAL 1955 (FI, PI, GR, AR)

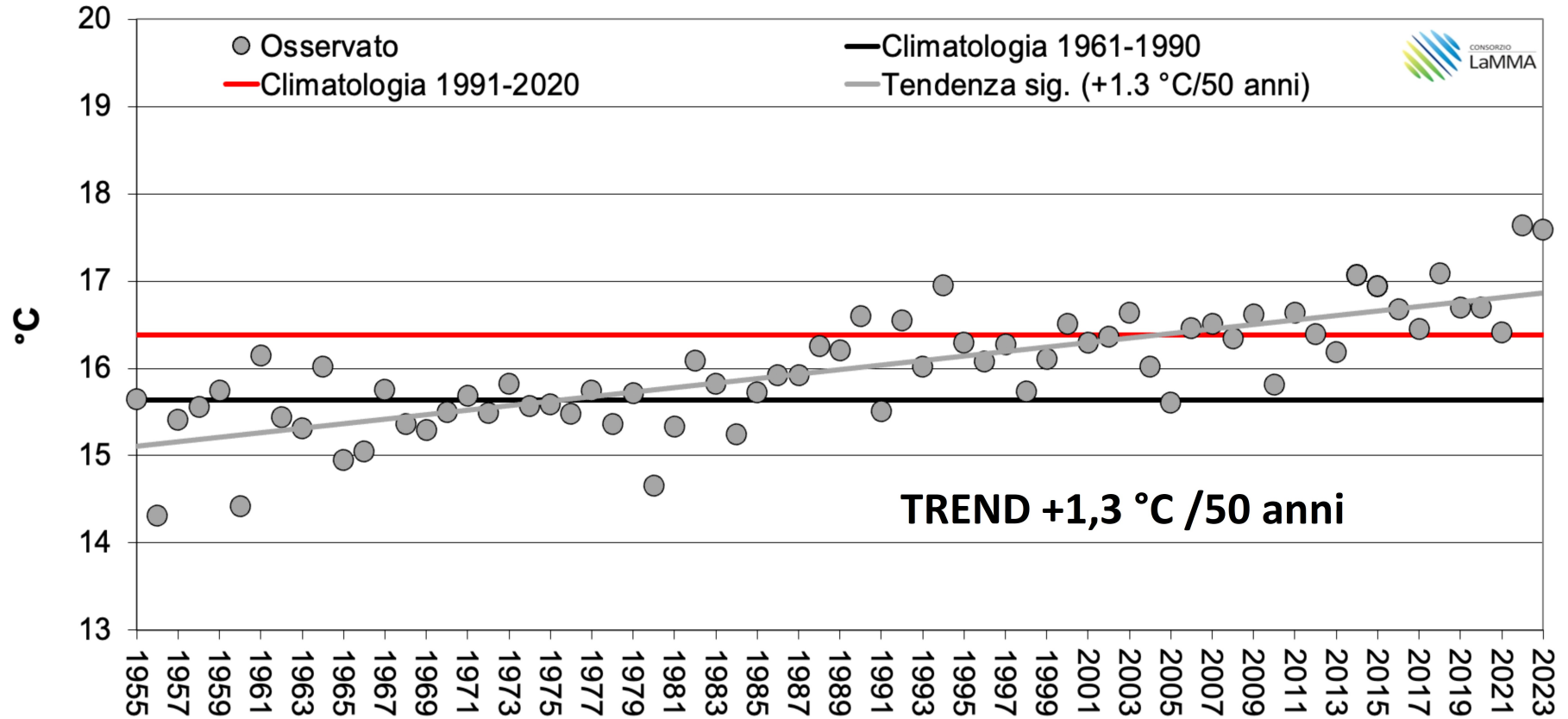


Aumenta evapotraspirazione

Temperature medie annue 1955-2023

LIVORNO

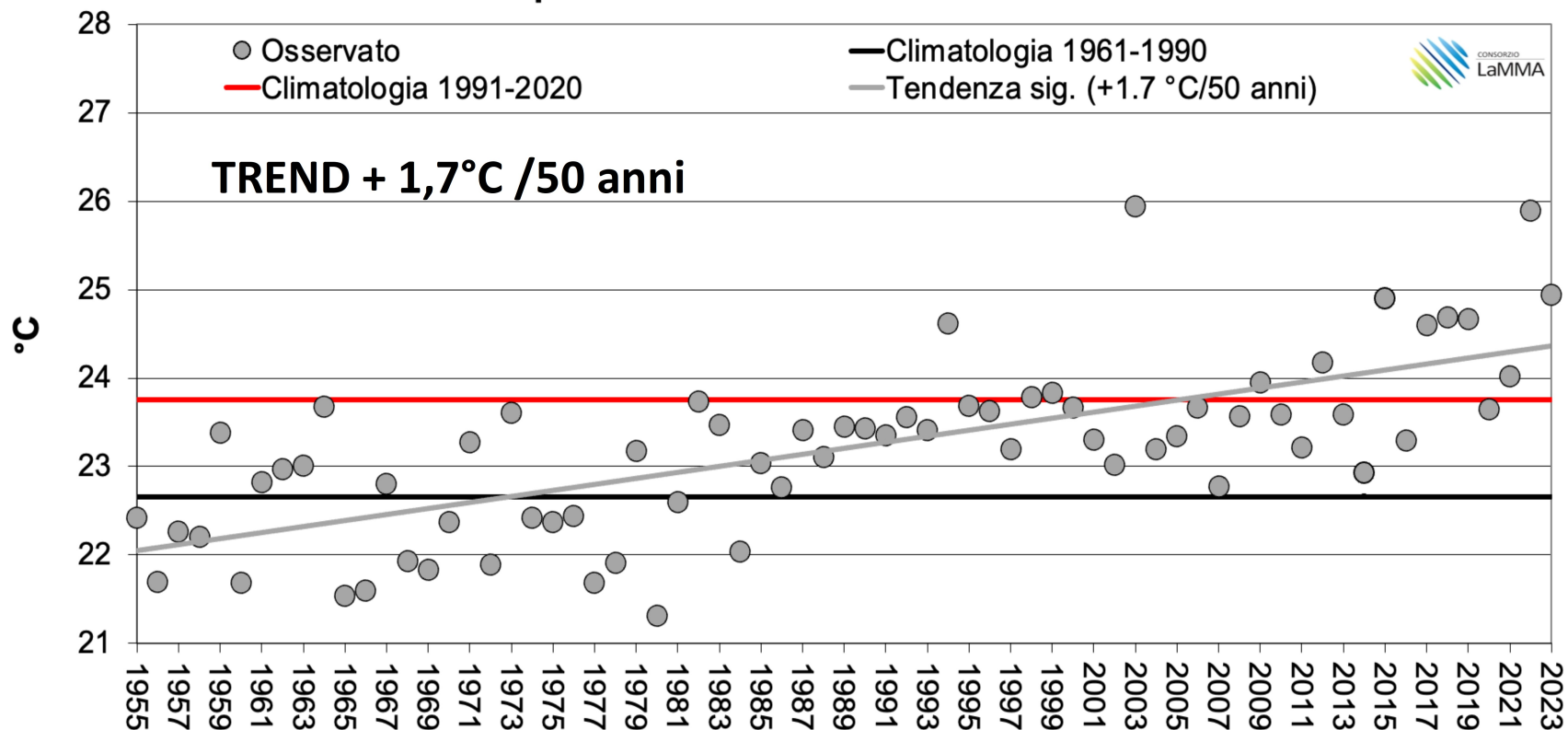
Temperatura media annua Livorno



ESTATE: Temp. medie 1955-2024

LIVORNO

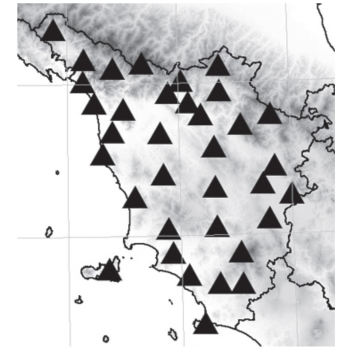
Temperatura media estate Livorno



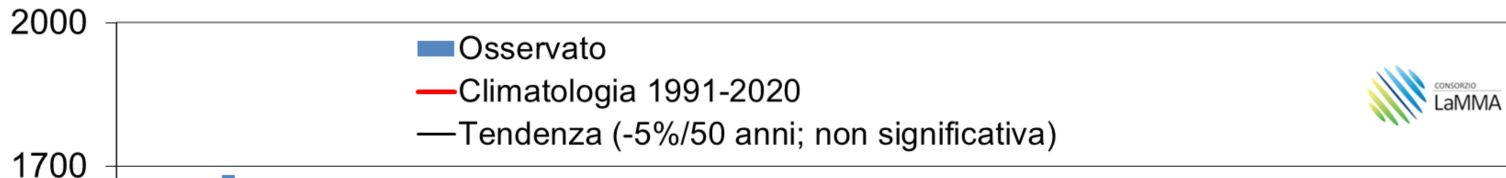
Trend (50 anni): Primavera +1,1°, Autunno +1,3°, Inverno +1,1°

CAMBIAMENTI CLIMATICI

PIOGGIA CUMULATA ANNUALE

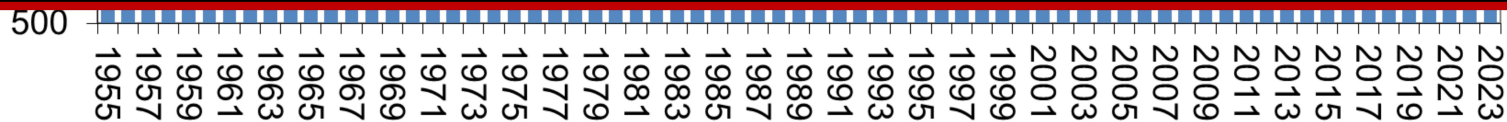


Pioggia annuale



VARIAZIONE % OGNI 50 ANNI DAL 1955 AL 2023

PERIODO	PIOGGIA	GIORNI DI PIOGGIA
ANNO	-5	-8
PRIMAVERA	-14	-20
ESTATE	-16	-23
AUTUNNO	3	3
INVERNO	-3	-8

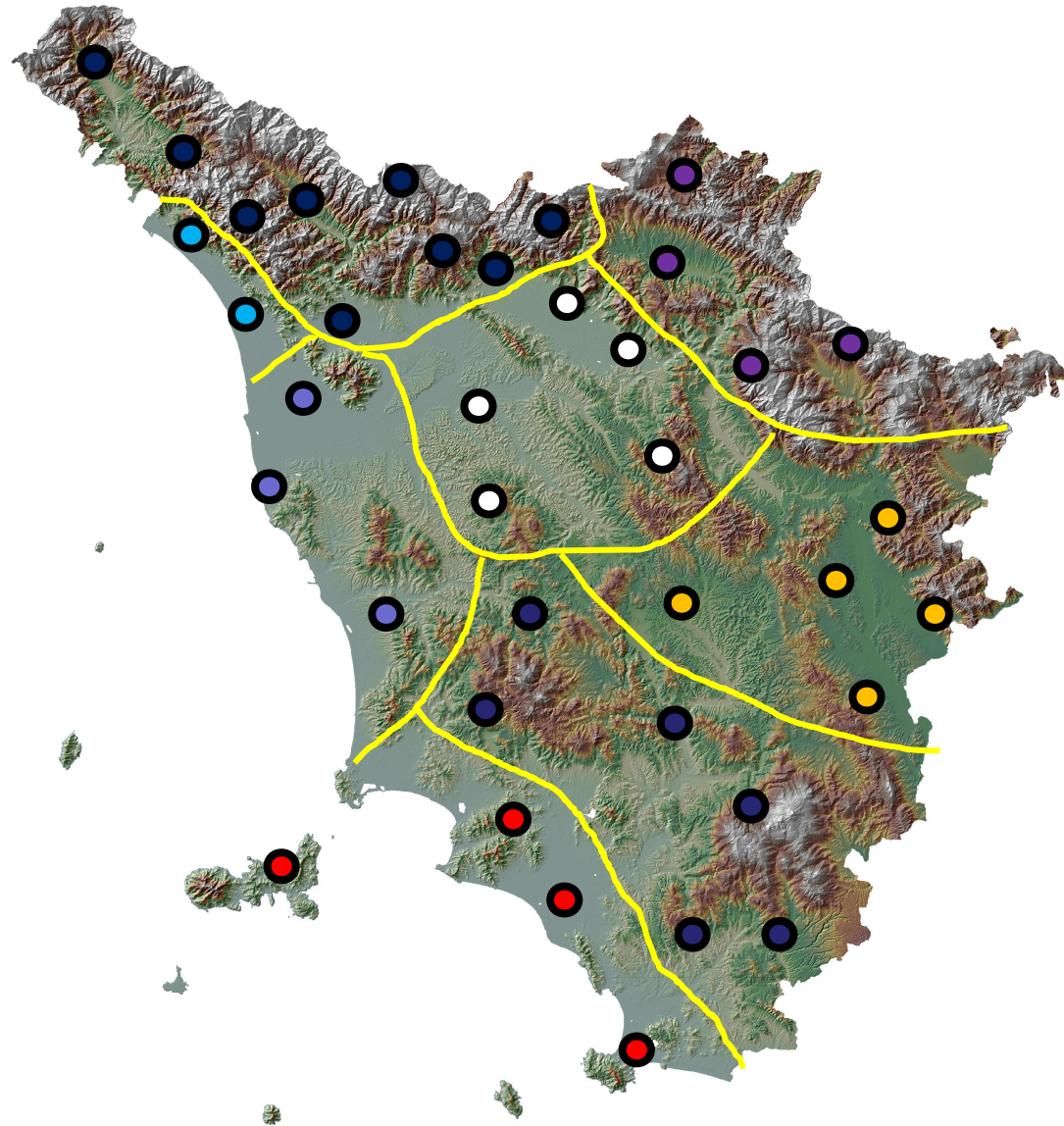




Pioggia: Suddivisione Toscana in 8 aree

AREE:

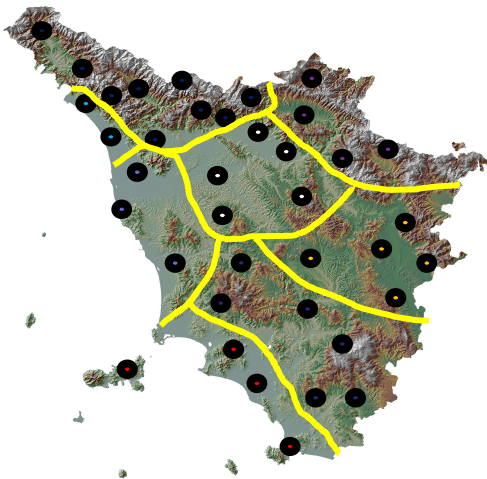
1. NO Nord Ovest
2. App Orient
3. Costa Nord
4. Costa Centro
5. Fi-Chianti
6. Amiata-Coll.Met.
7. Chiana-Coll.Siena
8. Costa Sud



Pioggia

Trend annuali e stagionali sulle 8 aree 1955-2023

AREE	ANNUALE	PRIMAVERA	ESTATE	AUTUNNO	INVERNO
NORD OVEST	-6	-18	-21	2	2
APPEN. ORIEN.	-1	-7	-17	7	7
COSTA NORD	-2	-13	-20	10	10
COSTA CENTRO	-3	-18	-22	4	4
FI-CHIANTI	-8	-15	-25	4	4
AMIATA-COLL. MET.	-9	-18	-2	-3	-3
CHIANA-COLL. SIENA	2	-6	4	5	5
COSTA SUD	-4	-16	0	10	10



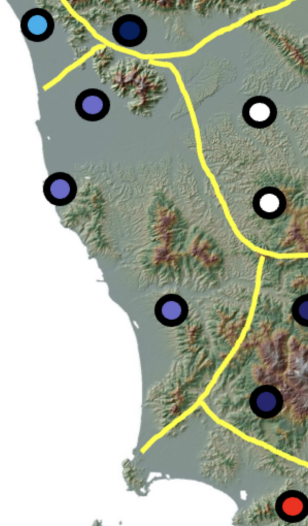
Non ci sono trend significativi se non
diminuzione in:

PRIMAVERA: Costa Centro

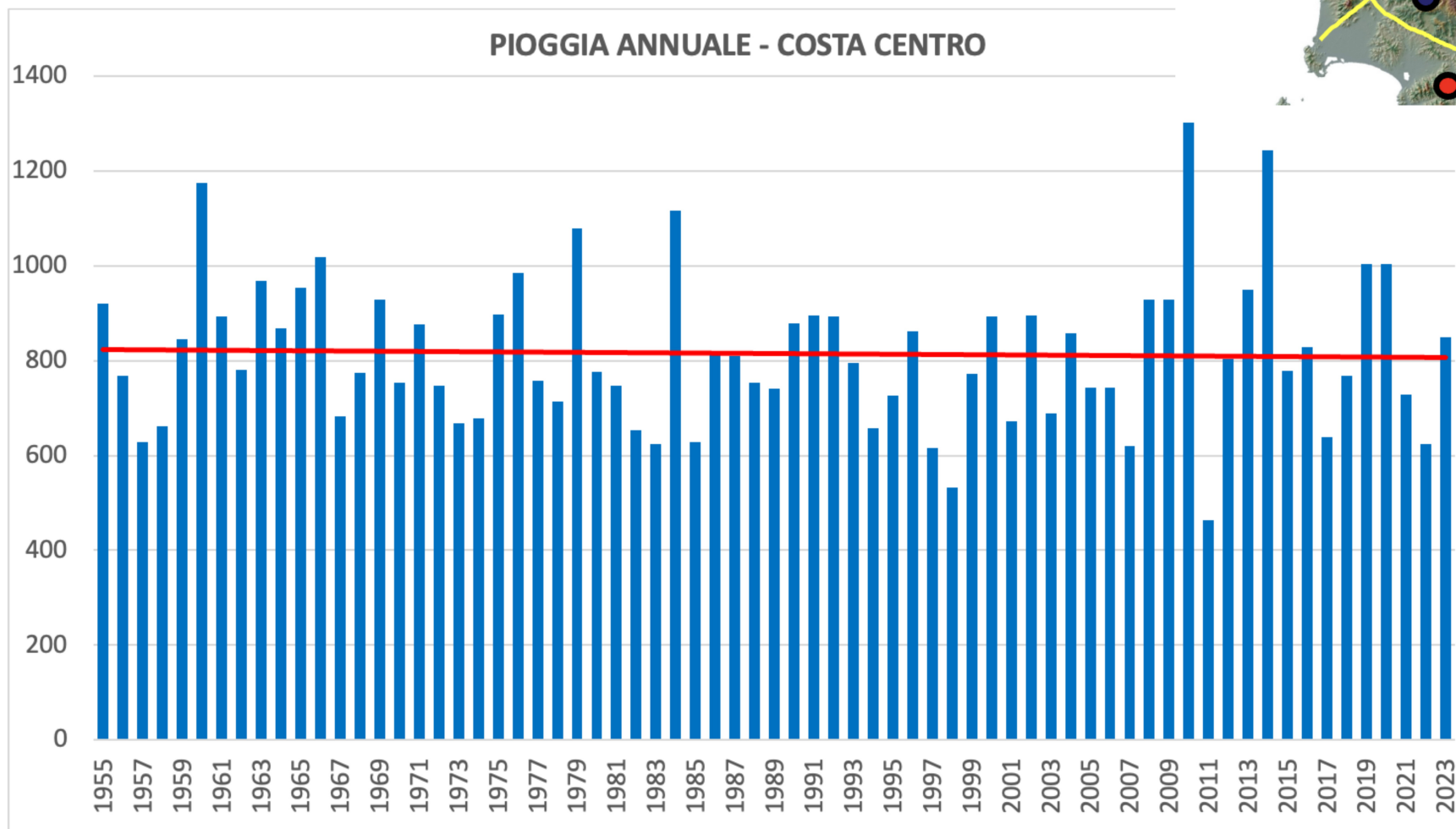
ESTATE: Nord-Ovest, Fi-Chianti

minore attività temporalesca?

Pioggia annuale COSTA CENTRO



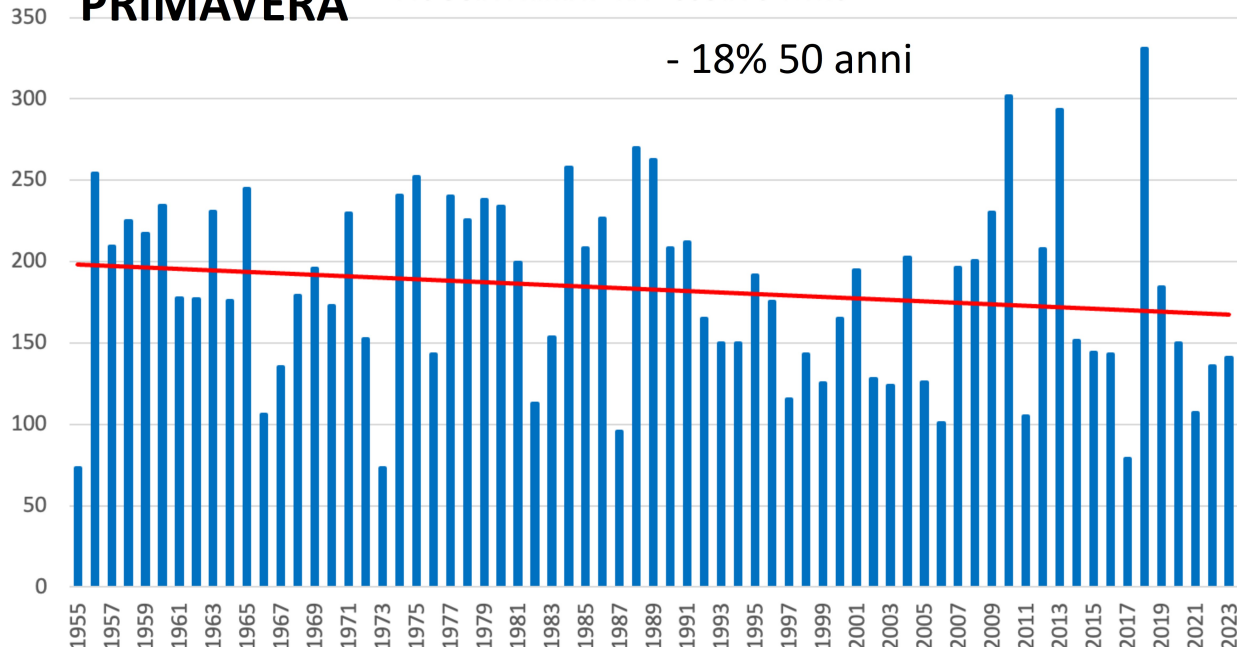
- 2,5% 50 anni



PRIMAVERA

PIOGGIA PRIMAVERA - COSTA CENTRO

- 18% 50 anni

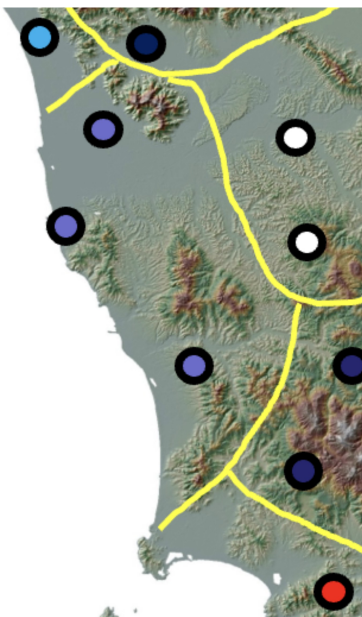


COSTA CENTRO

- Primavera calo signif.
- Inverno stabile serie completa, dagli anni 90 deciso aumento nella seconda parte (tutte le aree)
- Autunno opposto - 43%

+ 5% 50 anni

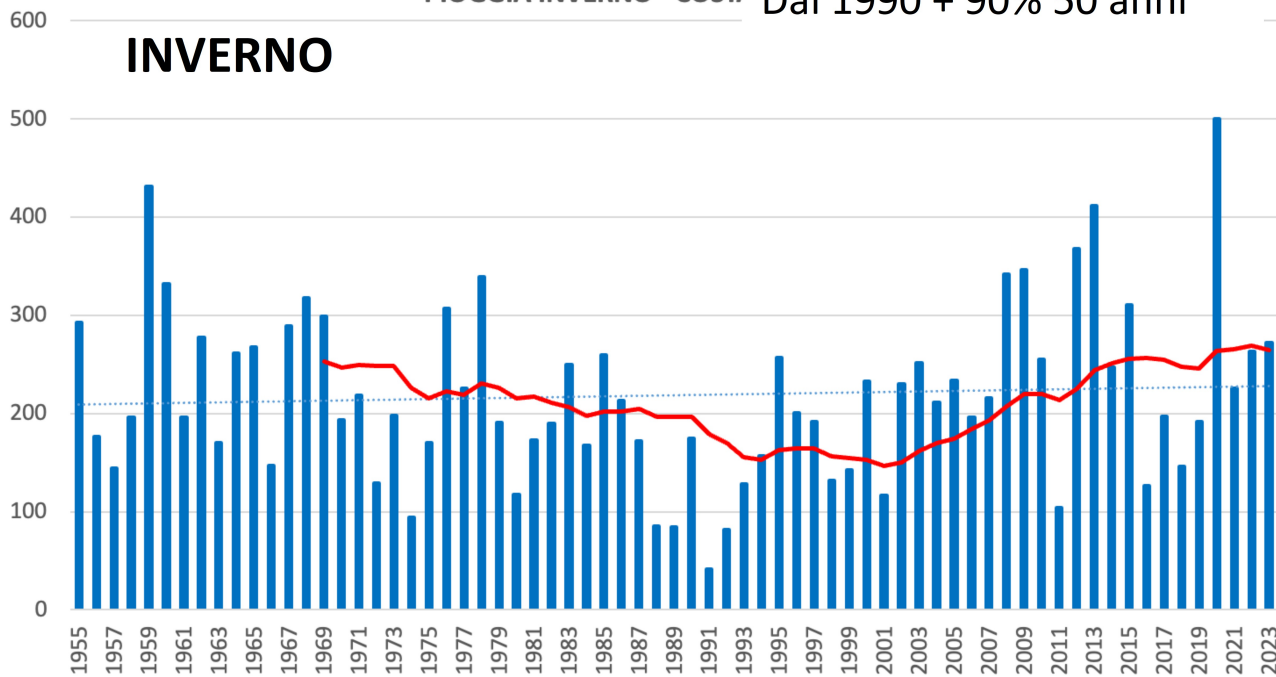
Media Mobile 15 anni



PIOGGIA INVERNO - COSTA

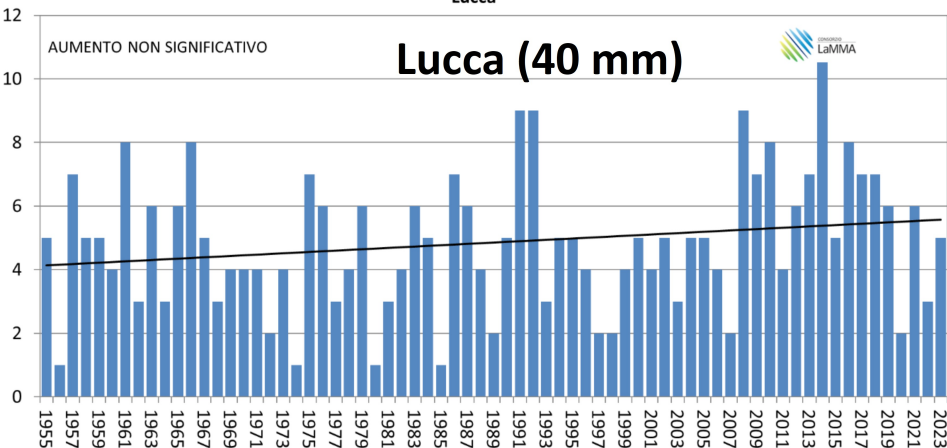
Dal 1990 + 90% 50 anni

INVERNO

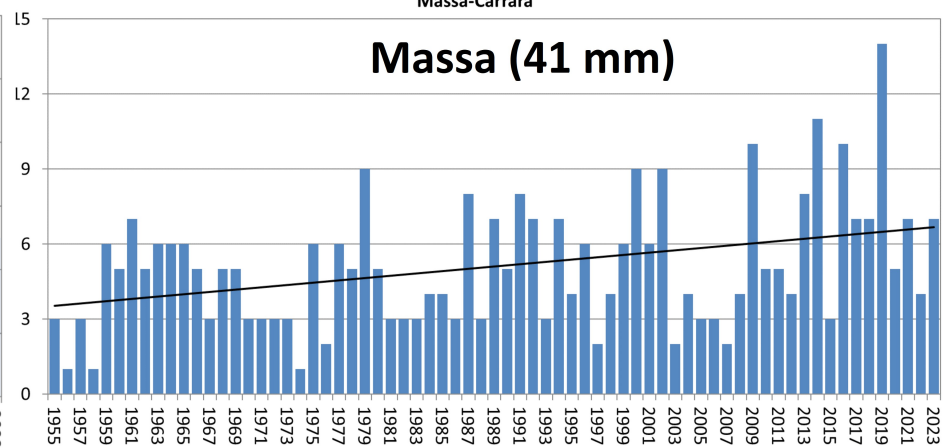


Numero di giorni con precipitazione maggiore del 95°percentile 1955-2023

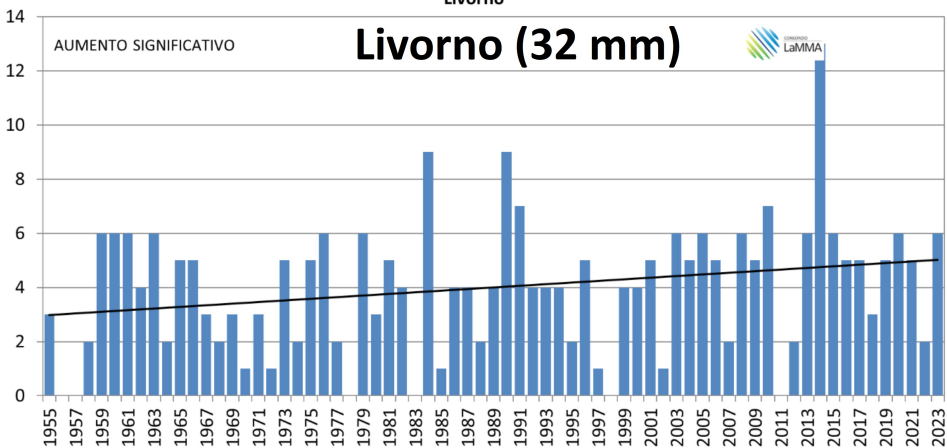
Giorni annui con pioggia giornaliera > 40 mm (95 percentile)
Lucca



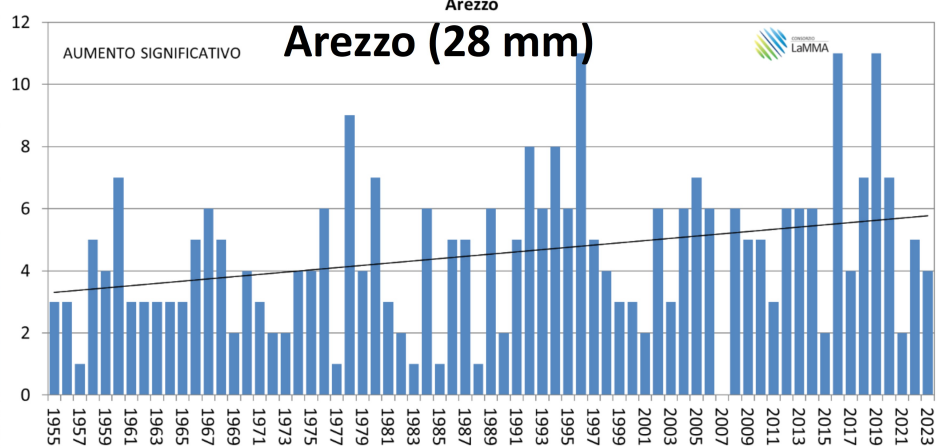
Giorni annui con pioggia giornaliera > 41 mm (95 percentile)
Massa-Carrara



Giorni annui con pioggia giornaliera > 32 mm (95 percentile)
Livorno



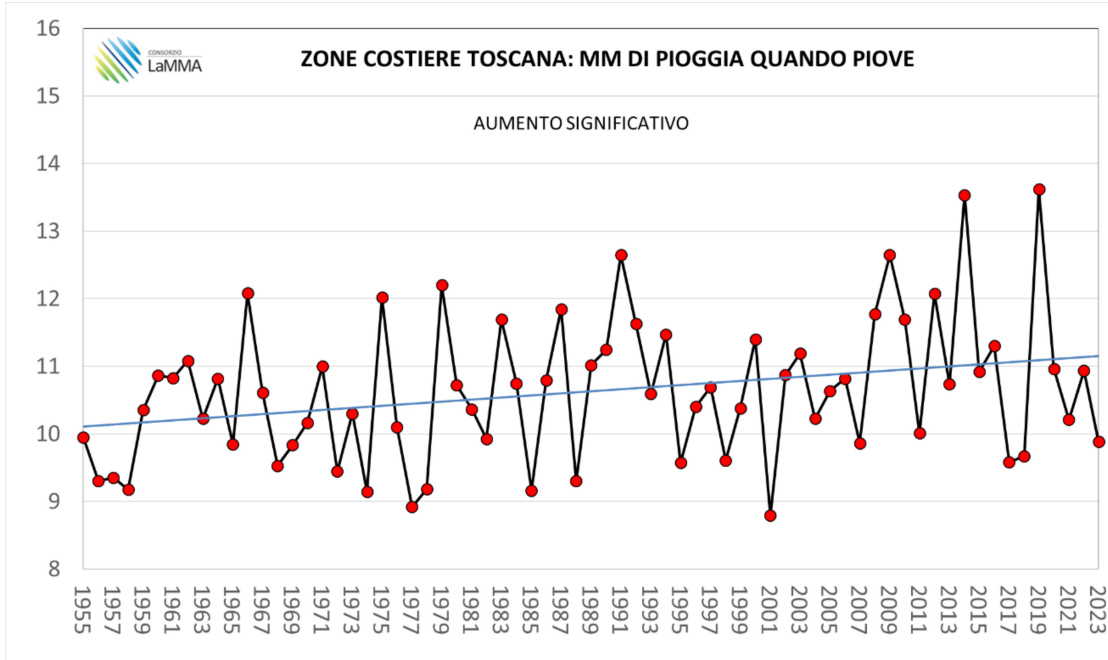
Giorni annui con pioggia giornaliera > 28 mm (95 percentile)
Arezzo



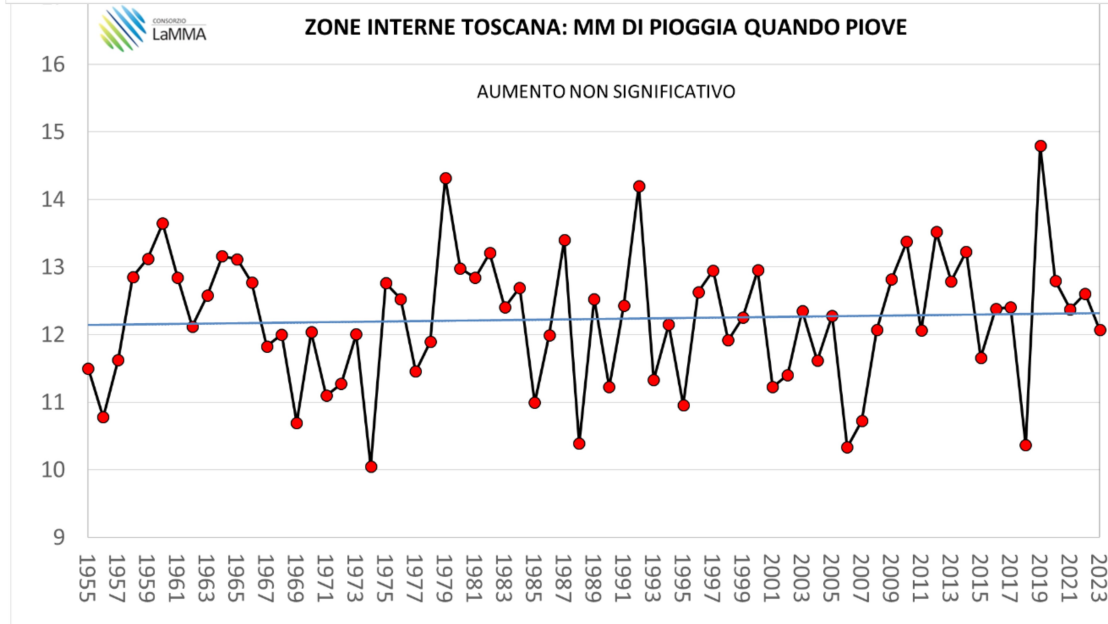
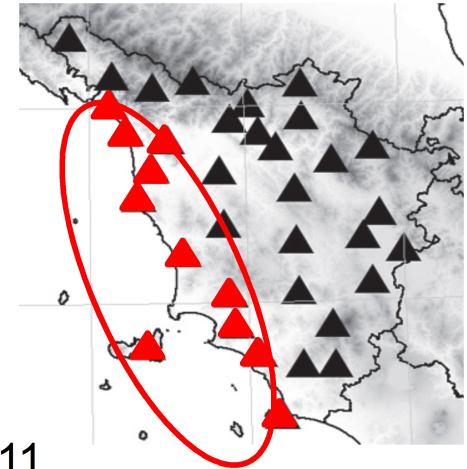
SEGNALI DI UN AUMENTO DELL'INTENSITA'



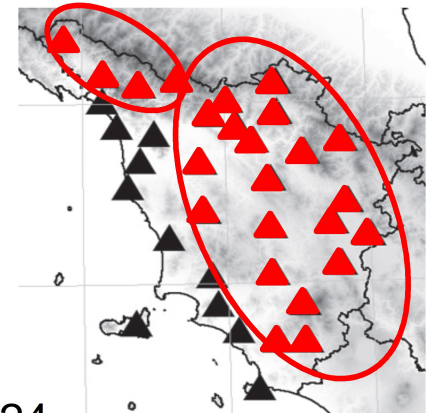
Quanto piove quando piove! (1955-2023)



Costa 11

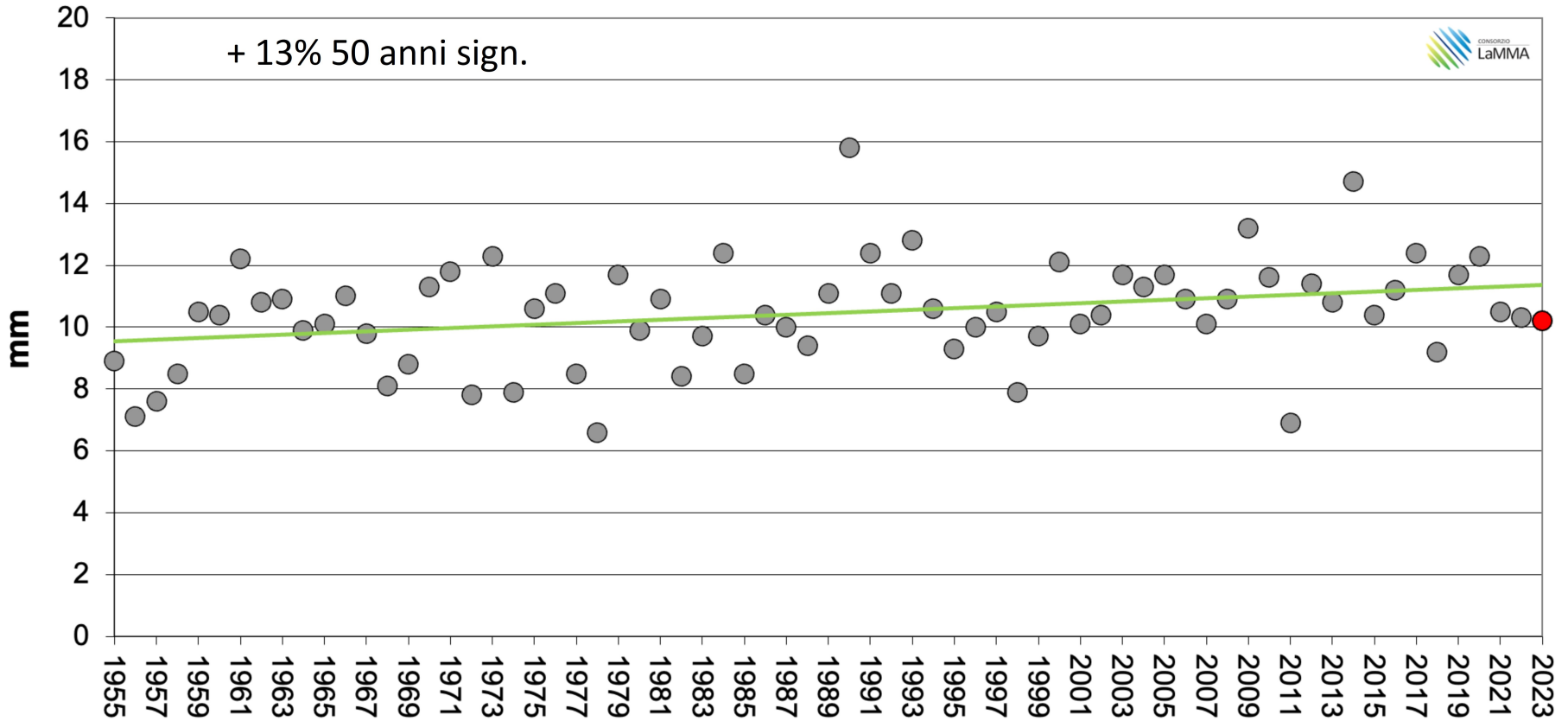


Interno 24



Quanto piove quando piove! (1955-2023) LIVORNO

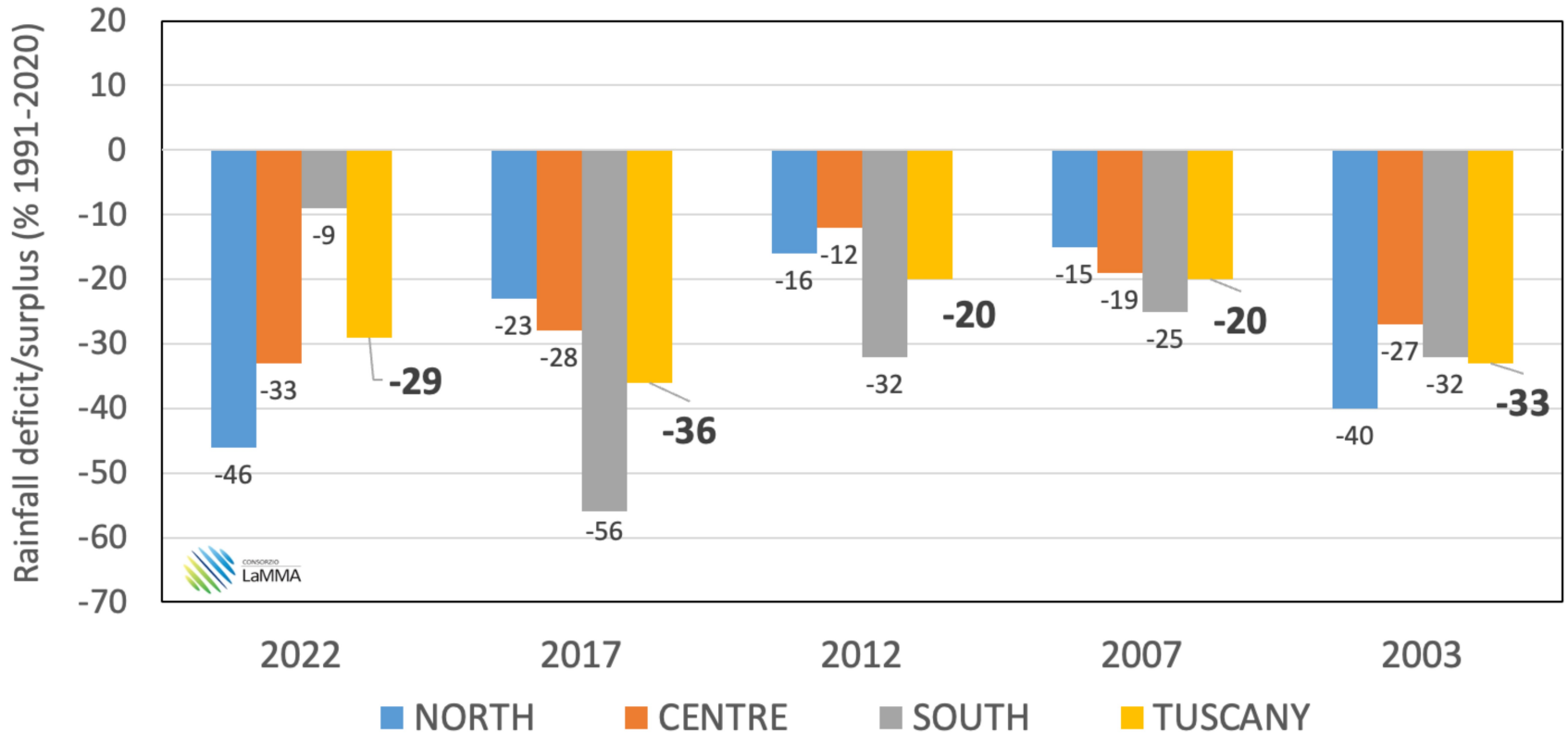
Quanto piove quando piove a LIVORNO (anno)





Forti siccita' in Toscana Gennaio-Ottobre (2000-2022)

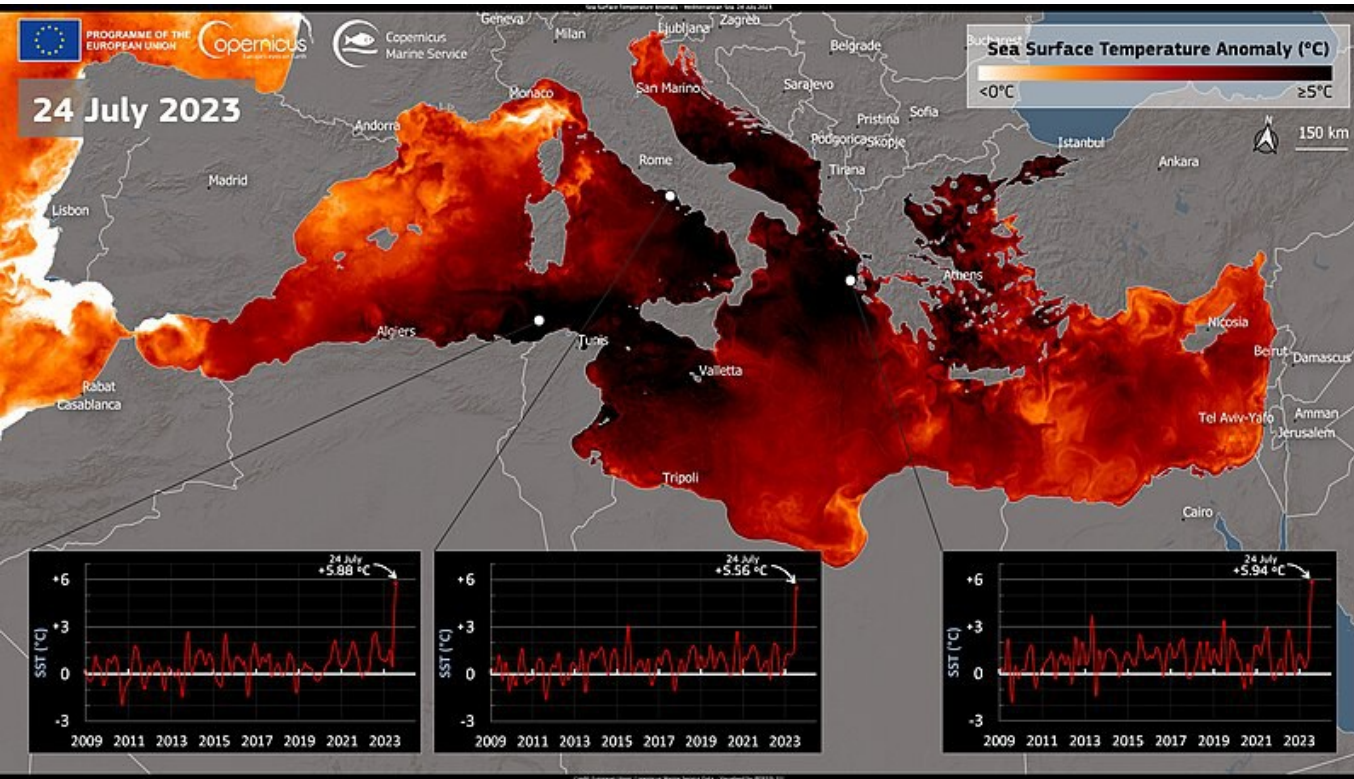
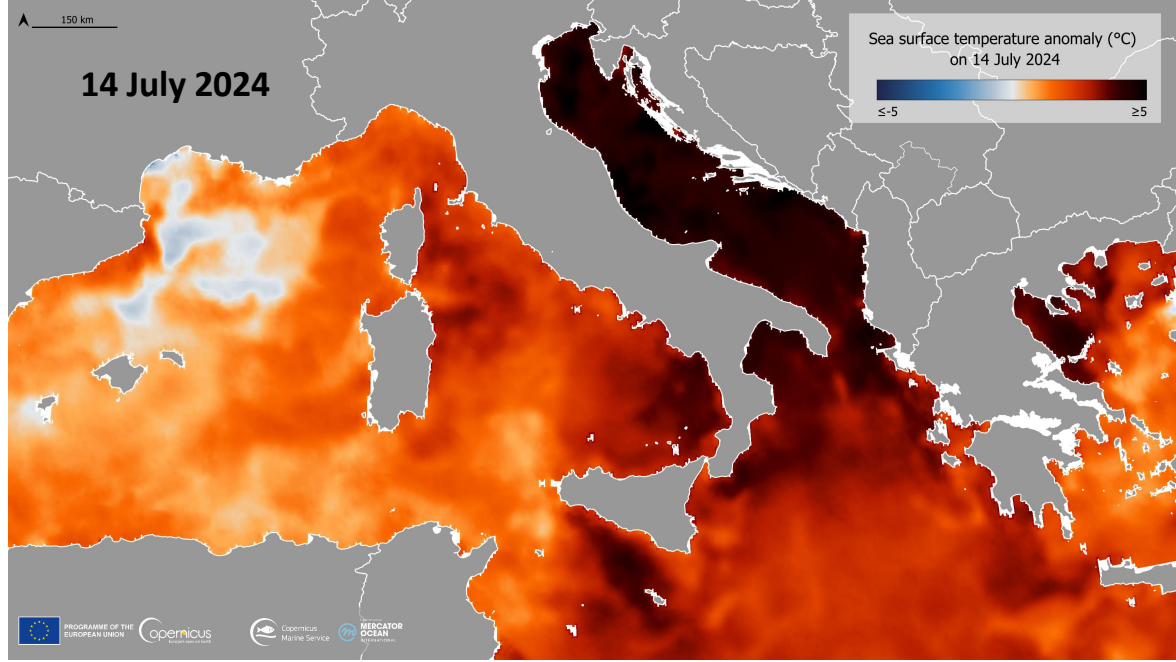
THE WORST DROUGHTS OF RECENT YEARS IN TUSCANY
(JANUARY 1- OCTOBER 31 period)



Temperatura superficiale del mare

24 luglio 2023

14 luglio 2024

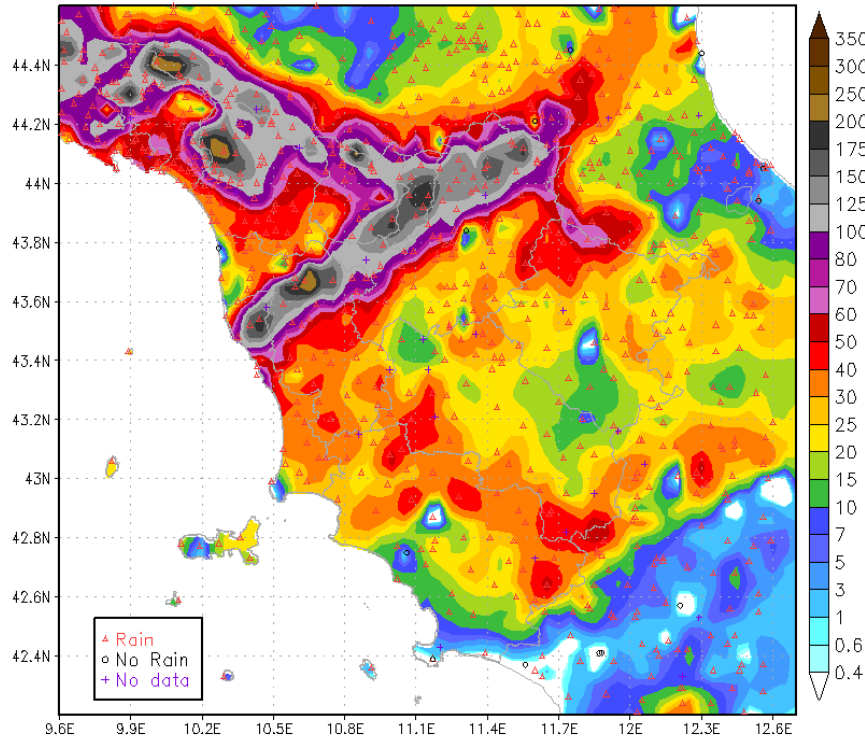


+ evaporazione,
+ energia,
+ umidità



2 NOVEMBRE 2023

Total Precipitation [mm] cumulated on
Thu, 02/11/2023



Cumulati

157,4 mm media su Bisenzio
all'idrometro Vaiano Gamberame (140,7
in 12 ore)

200 mm Appennino, Apuane e
Garfagnana, 250 Vagli di sotto (181 in 12
ore)

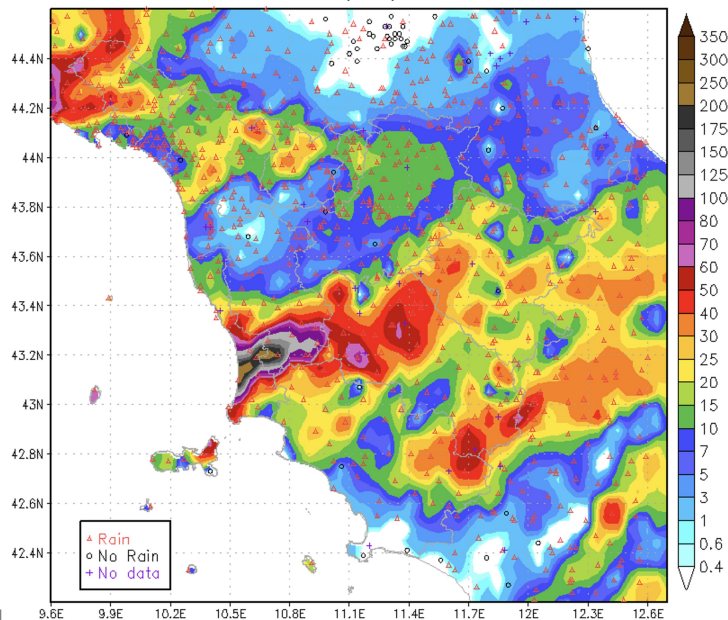
Intensità

1h: 113,8 mm Pontedera, 104,2 Gello.

3h: 191,8 Pontedera, 115,8 Vaiano, 112,4
La Ferruccia, 101,2 Gamberame.

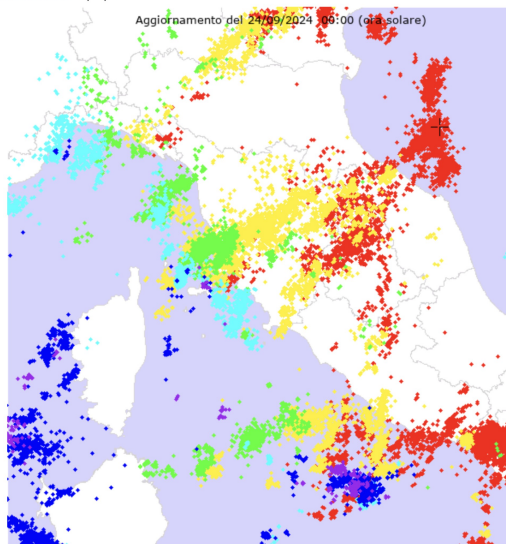
25 pluviometri hanno registrato cumulate sulle 6 ore con periodo
di ritorno > 200 anni

Pioggia 23 settembre



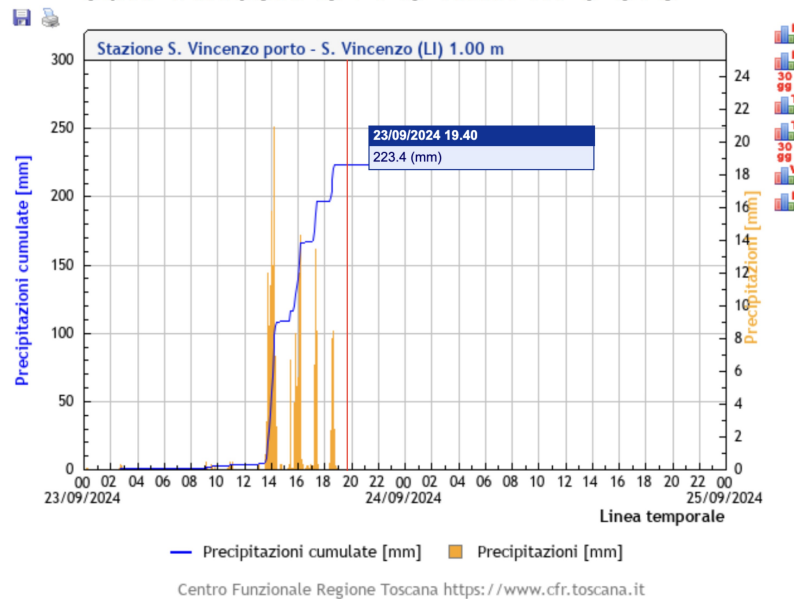
ultimo evento 23/09/2024 23:49:53 ora solare

Aggiornamento del 24/09/2024 09:00 (ora solare)

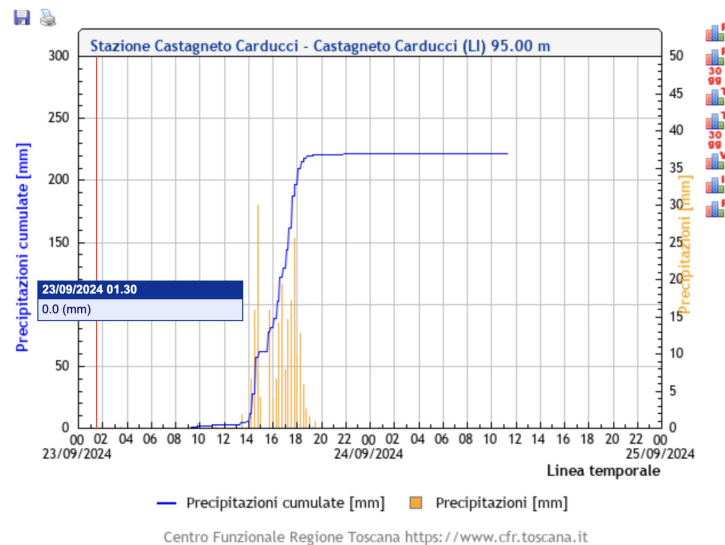


Fulmini 23 settembre

San Vincenzo 223 mm in 6 ore

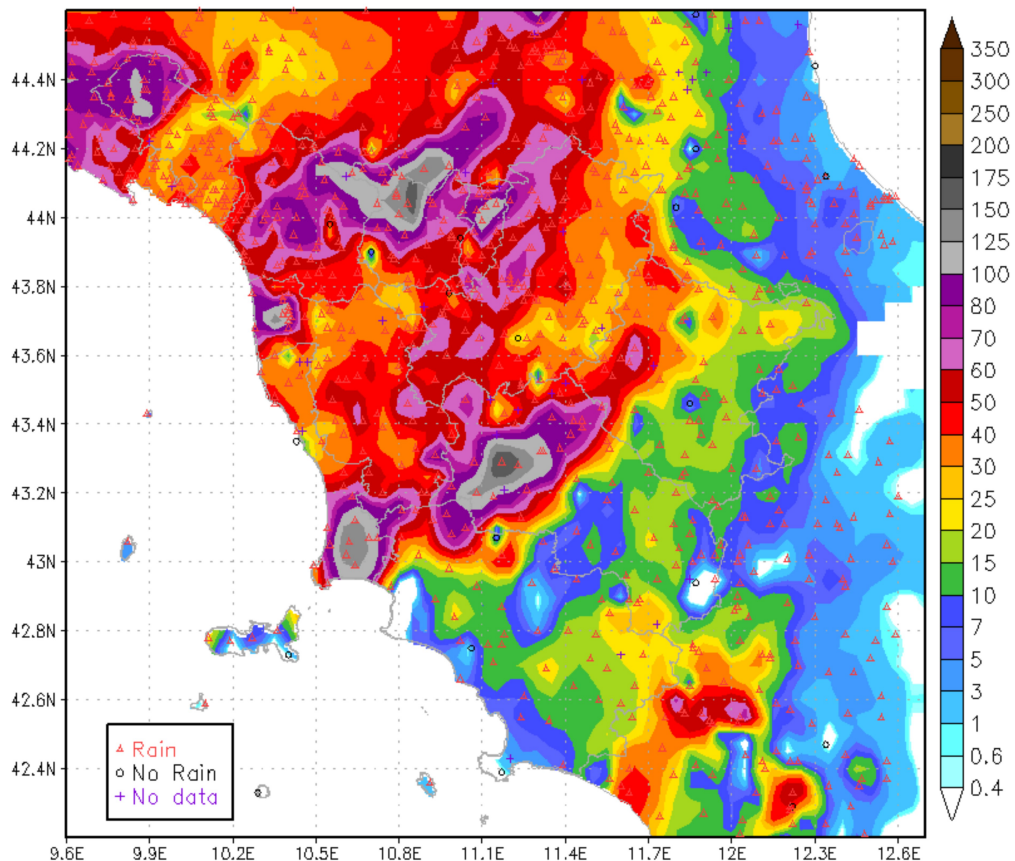


Castagneto Carducci 220 mm in 6 ore



17-18 OTTOBRE 2024

precipitazioni registrate sulla Toscana nella giornata
del 17 ottobre



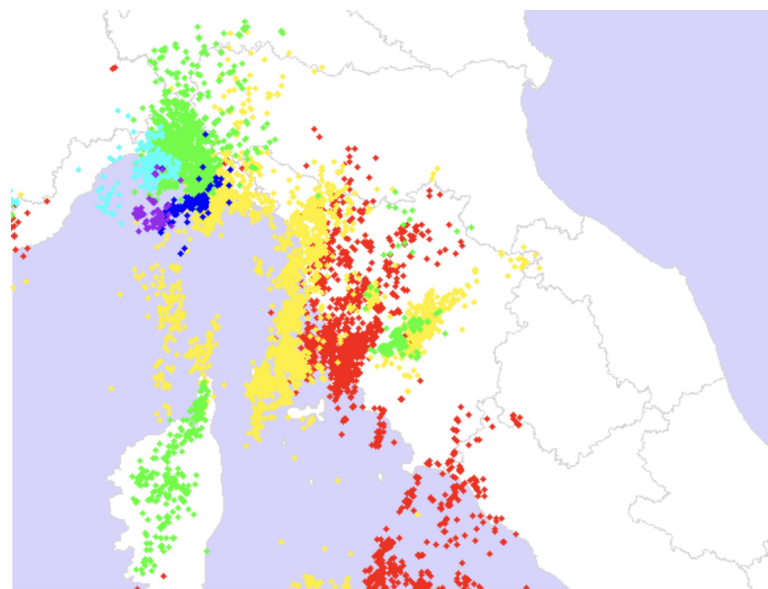
Campiglia Marittima

Tot. 163 mm, dalle 20:15 alle
22:15 131,4 mm

Venturina

Tot 145,8 mm dalle 20:15 alle
22:30 113,6 mm

Diverse stazioni con più di 100
mm in poche ore



GRAZIE PER L'ATTENZIONE

