



**UNIMORE**

UNIVERSITÀ DEGLI STUDI DI  
MODENA E REGGIO EMILIA

**Climate  
Change & Public  
Health**



# Climate change: evidence from the centenary series of the Geophysical Observatory of Modena

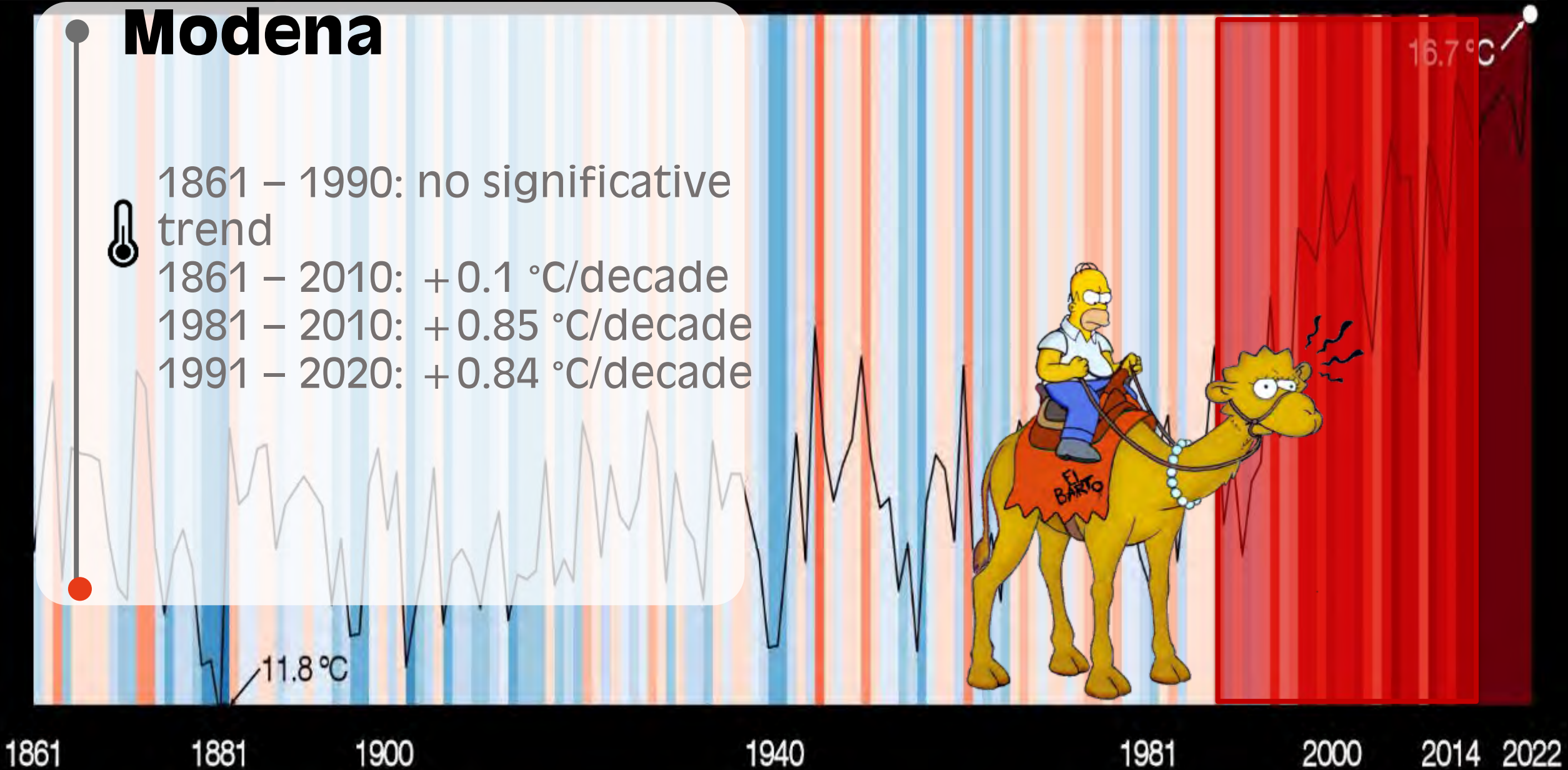
Sergio Teggi, Luca Lombroso - Osservatorio Geofisico di Modena

Dipartimento di Ingegneria "Enzo Ferrari "

Reggio Emilia, 9th June 2023

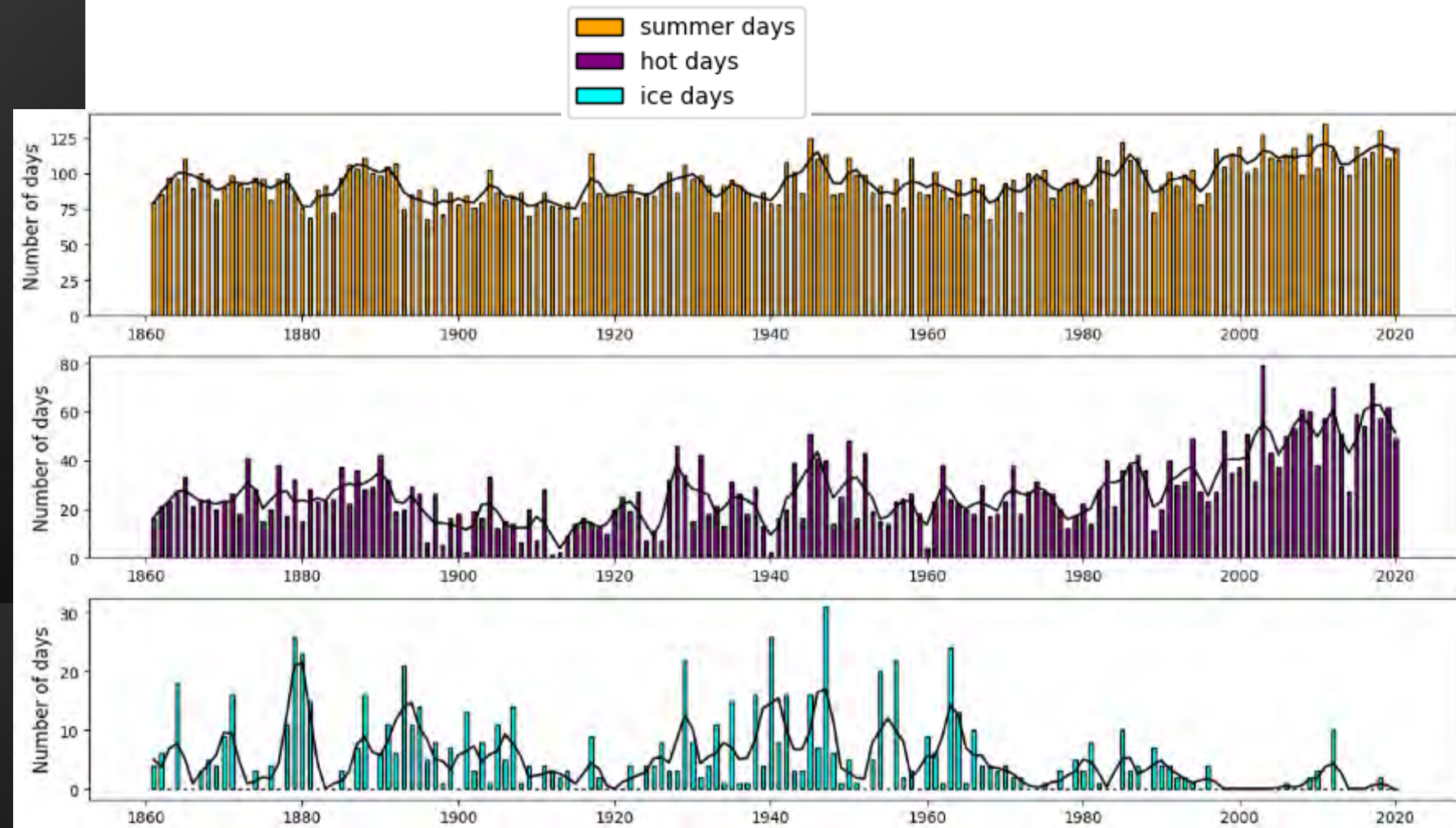
# Modena

- 1861 – 1990: no significant trend
- 1861 – 2010: + 0.1 °C/decade
- 1981 – 2010: + 0.85 °C/decade
- 1991 – 2020: + 0.84 °C/decade



# Extreme index– Tx- max daily temperature

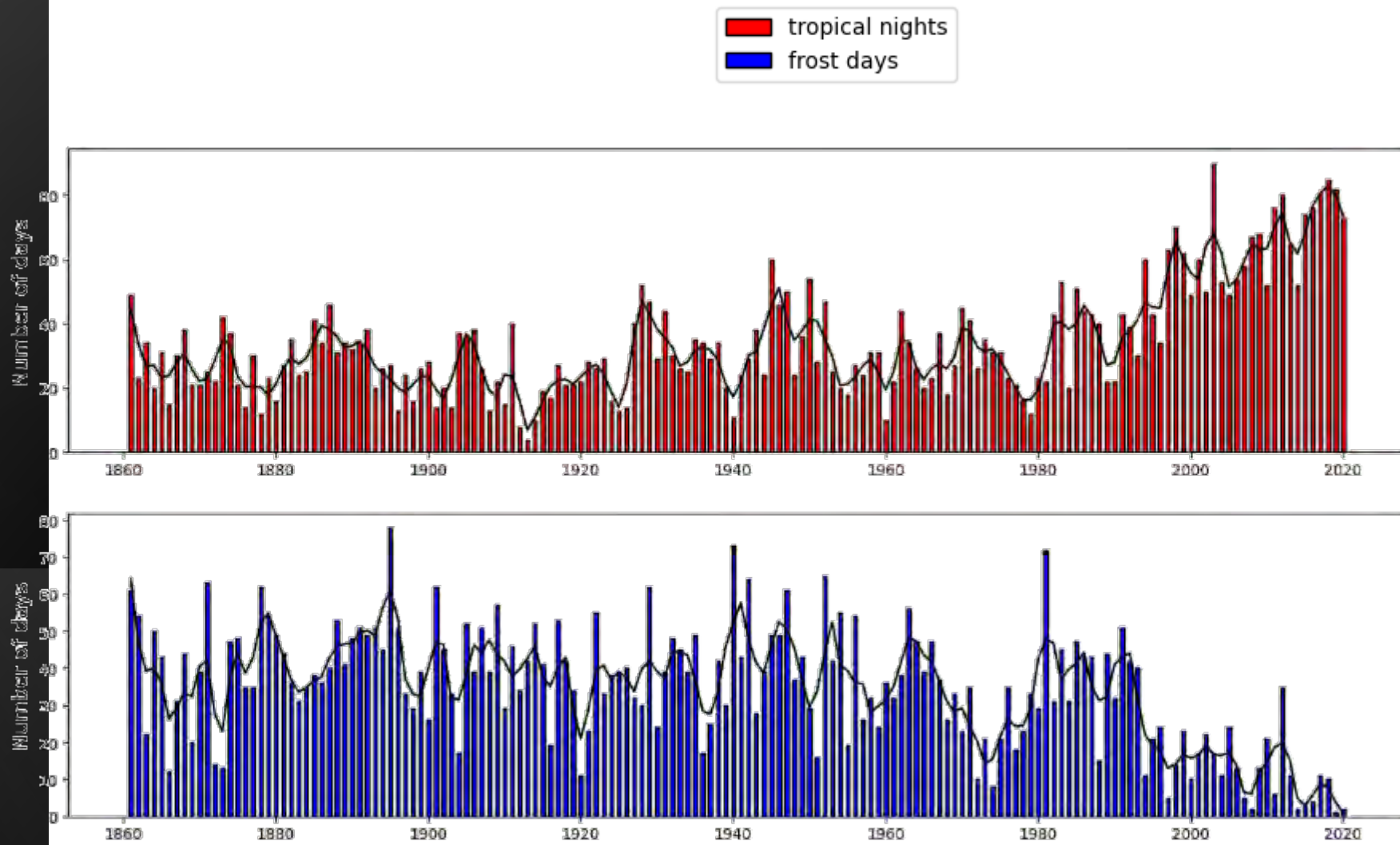
- Summer days:
  - $T_x > 25\text{ }^\circ\text{C}$
- Hot days
  - $T_x > 30\text{ }^\circ\text{C}$
- Ice days
  - $T_x < 0\text{ }^\circ\text{C}$



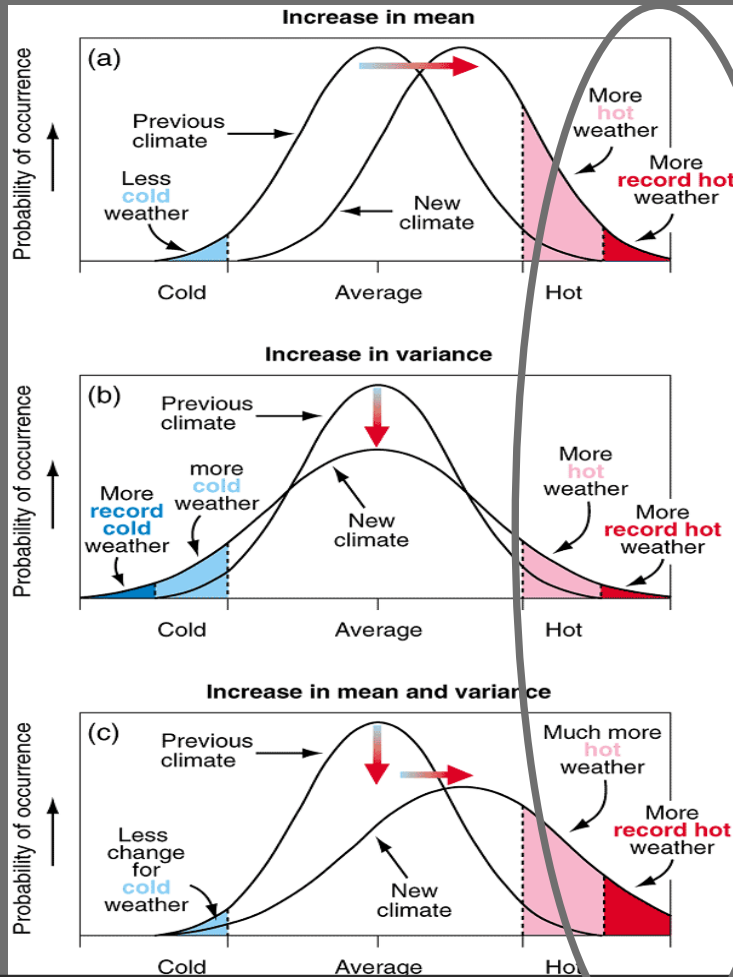


# Extreme index- Tn Min daily temperature

- Tropical nights:  
•  $T_n > 20\text{ }^\circ\text{C}$
- Frost days:  
•  $T_n < 0\text{ }^\circ\text{C}$

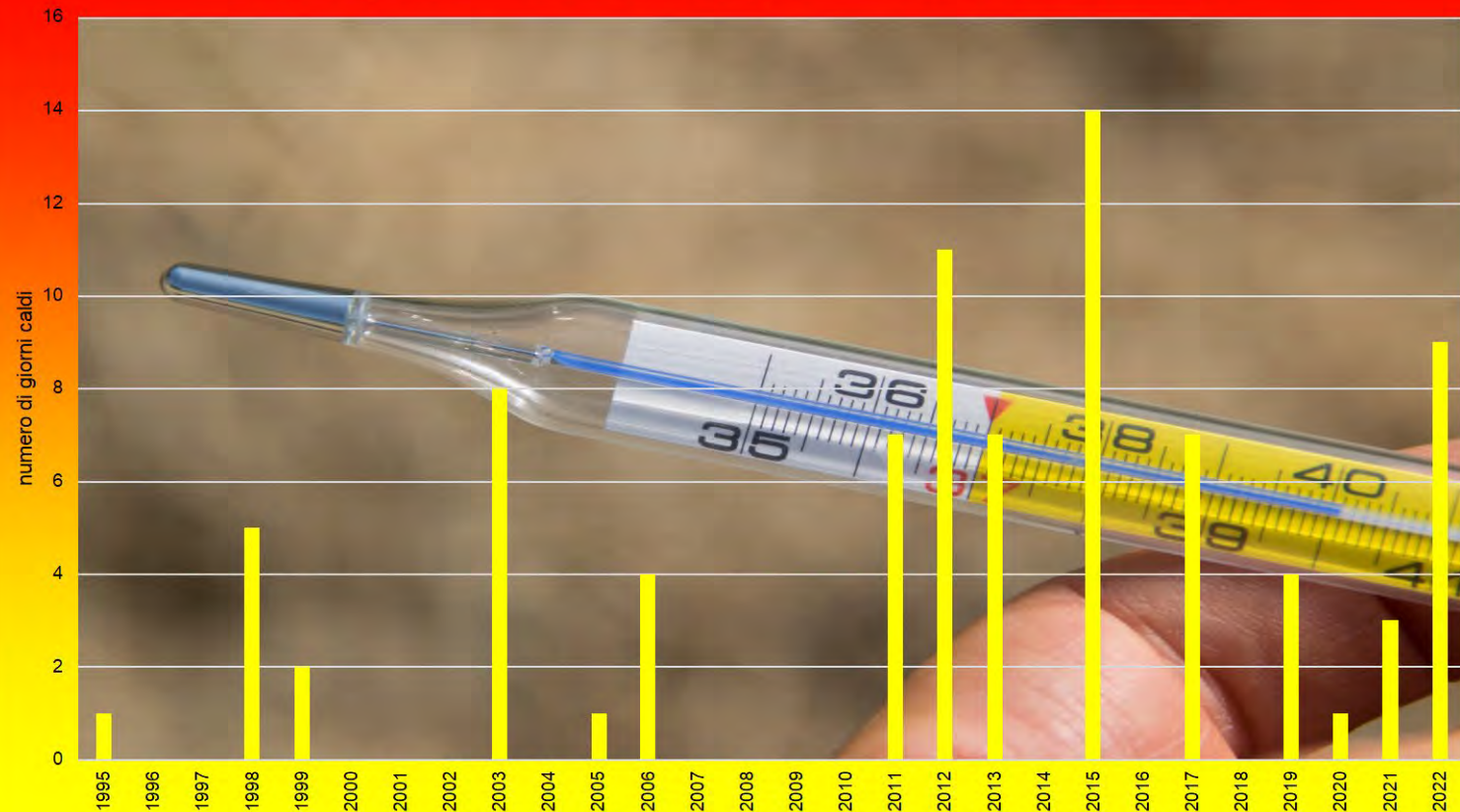


# Extreme index- «fever» temperature



Schematic showing the effect on extreme temperatures when (a) the mean temperature increases, (b) the variance increases, and (c) when both the mean and variance increase for a normal distribution of temperature. (IPCC, 2001)

Geophysical Observatory of Modena - DIEF  
Campus: "fever" days -  $T_{max} \geq 37^\circ\text{C}$ .





August 30, 2022: 105 km/h



June 22, 2019: 111 km/h



June 4, 2023: 80 km/h



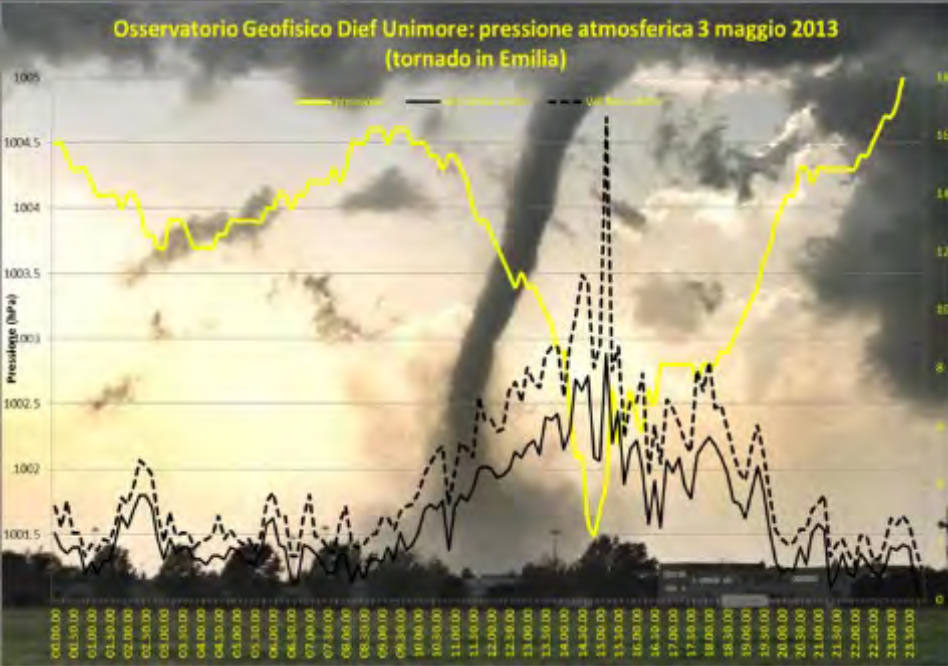
August 3, 22, 2019: 125 km/h





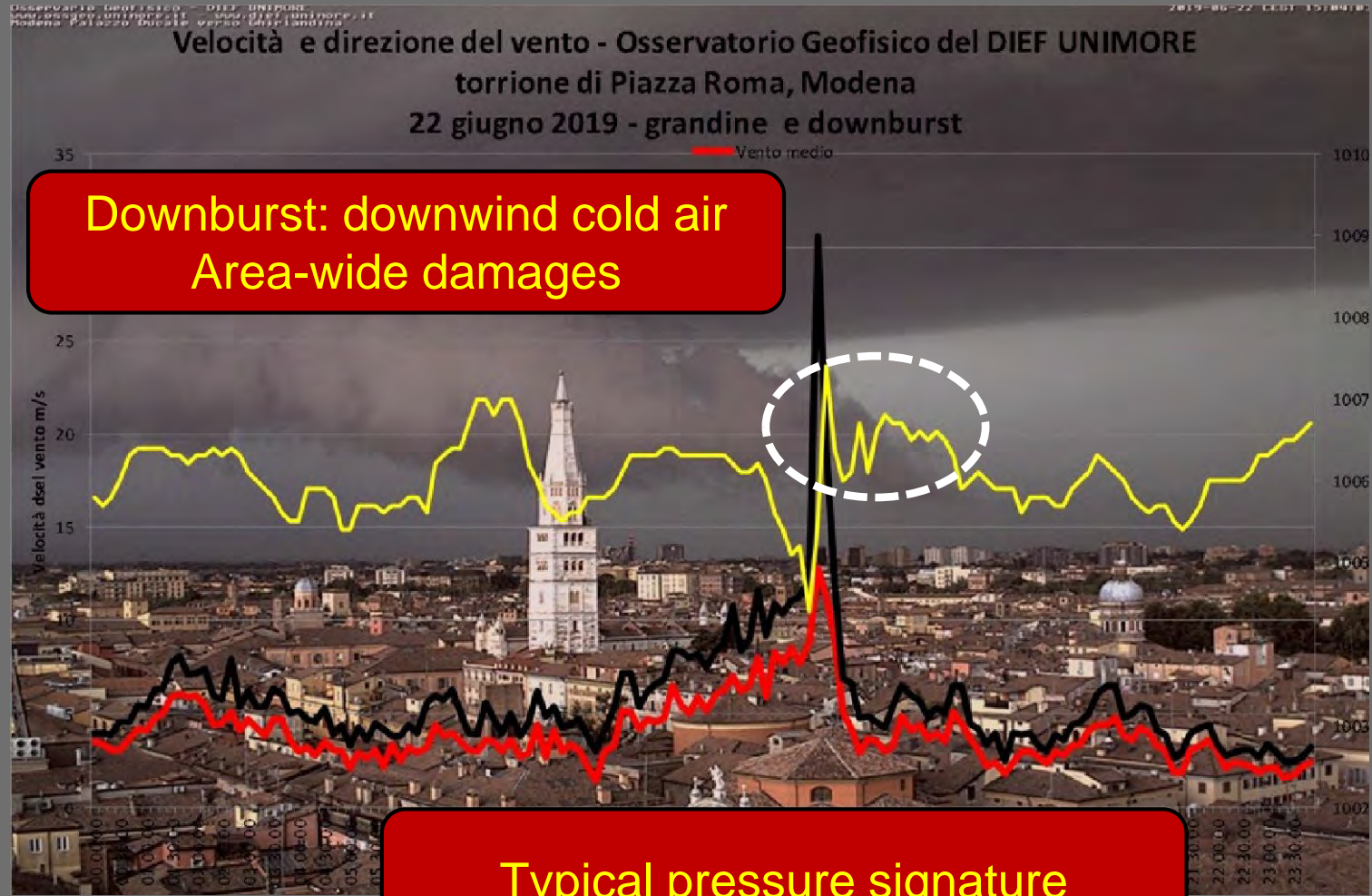
# Storm wind: the "pressure signature" allows to identify the type of phenomenon

**Tornado: upwind hot air  
Striped damages**



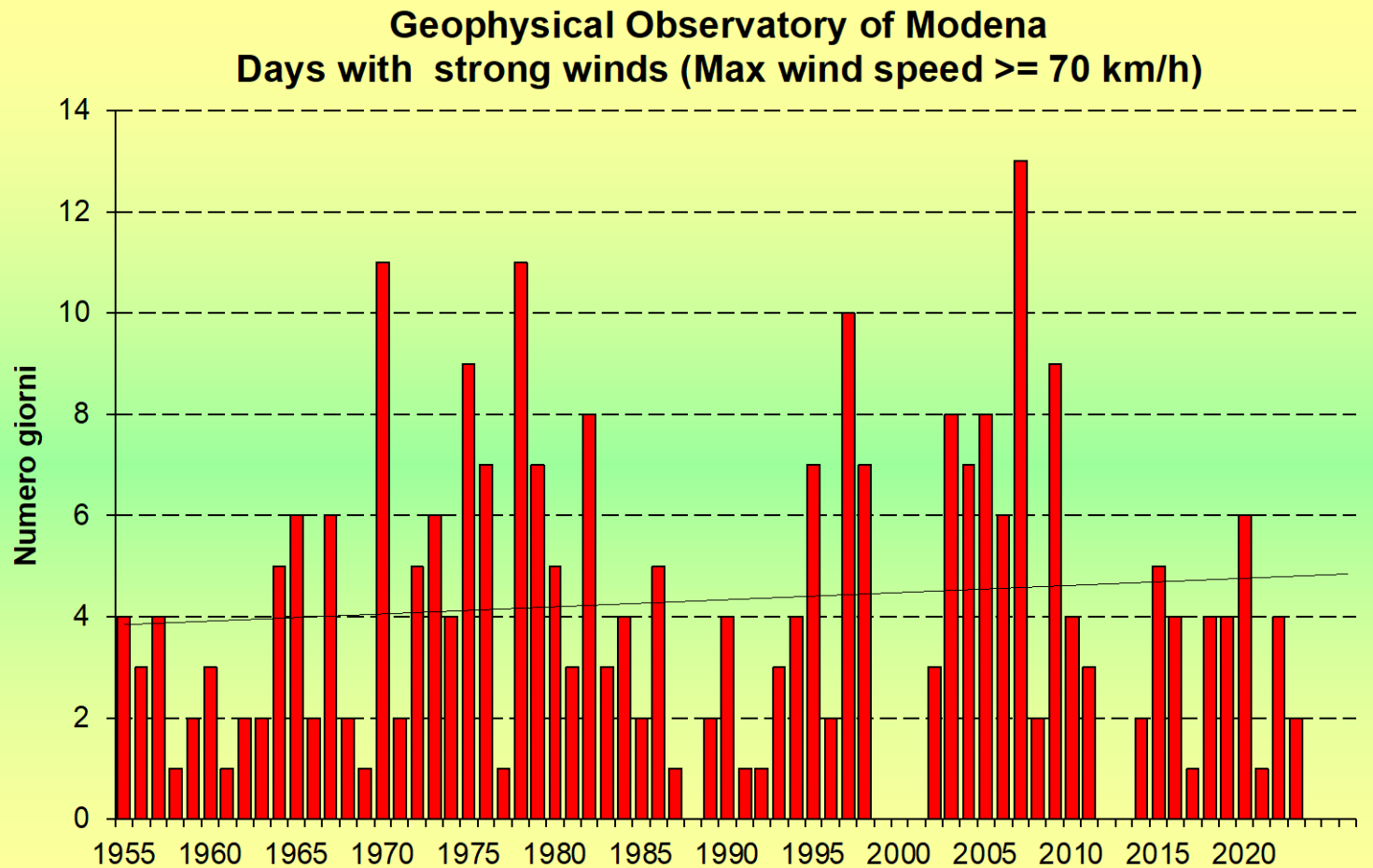
**Rapid pressure drop followed by  
an increase**

**Downburst: downwind cold air  
Area-wide damages**



**Typical pressure signature**

- Limited statistical evidence on severe thunderstorms.
- The trend in the number of days with strong winds does not appear to show significant changes.
- However, thunderstorms are highly localized and scattered phenomena.

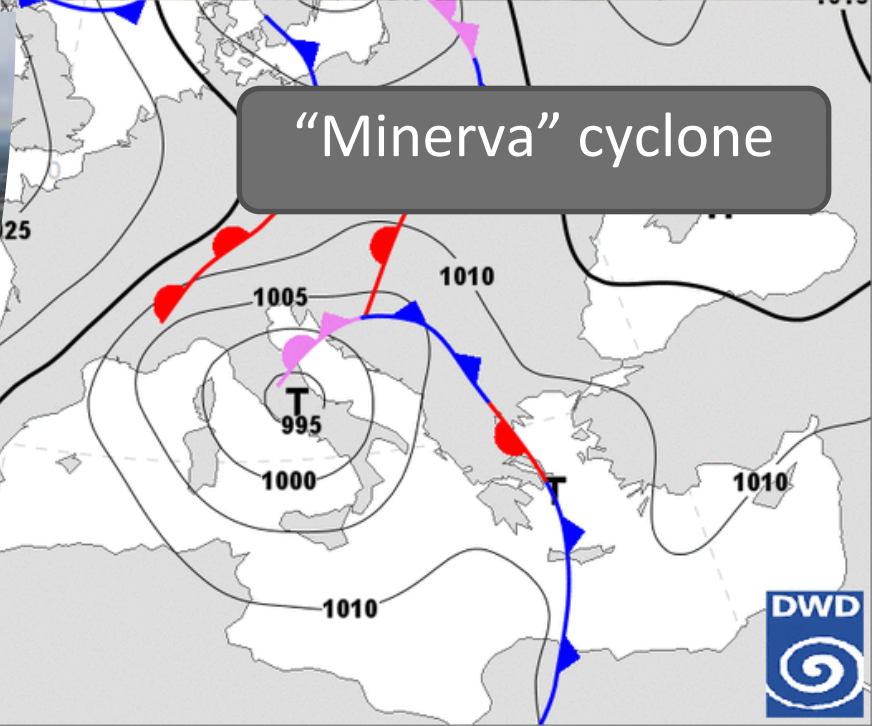




- Is May becoming extreme month?

- Secchia River
- May 2023

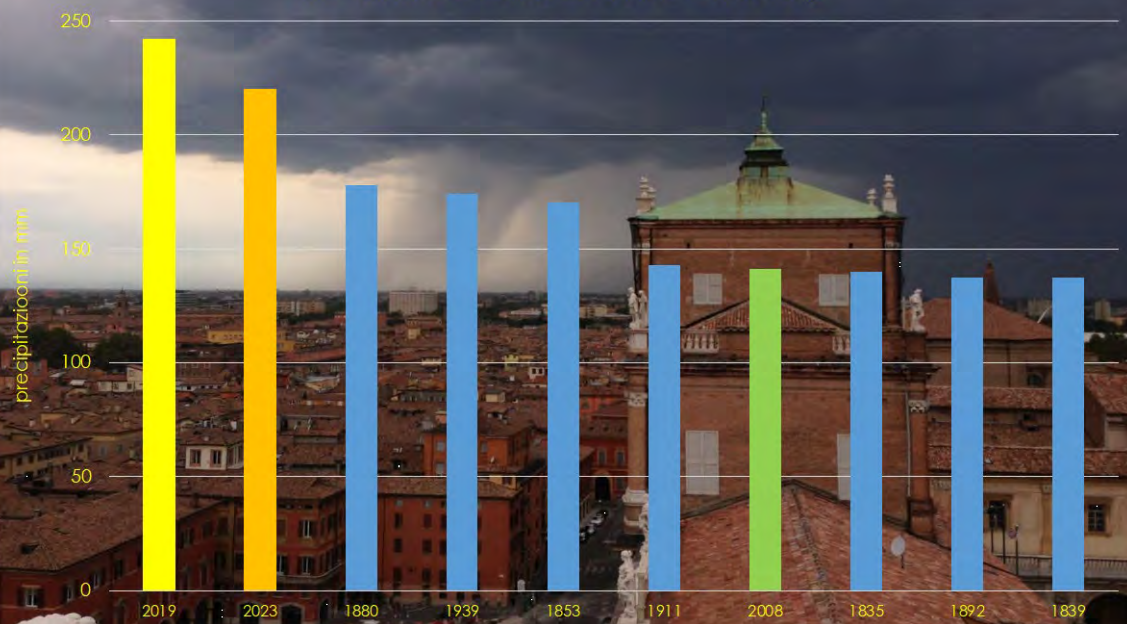
- Secchia river
- May 2019



“Minerva” cyclone

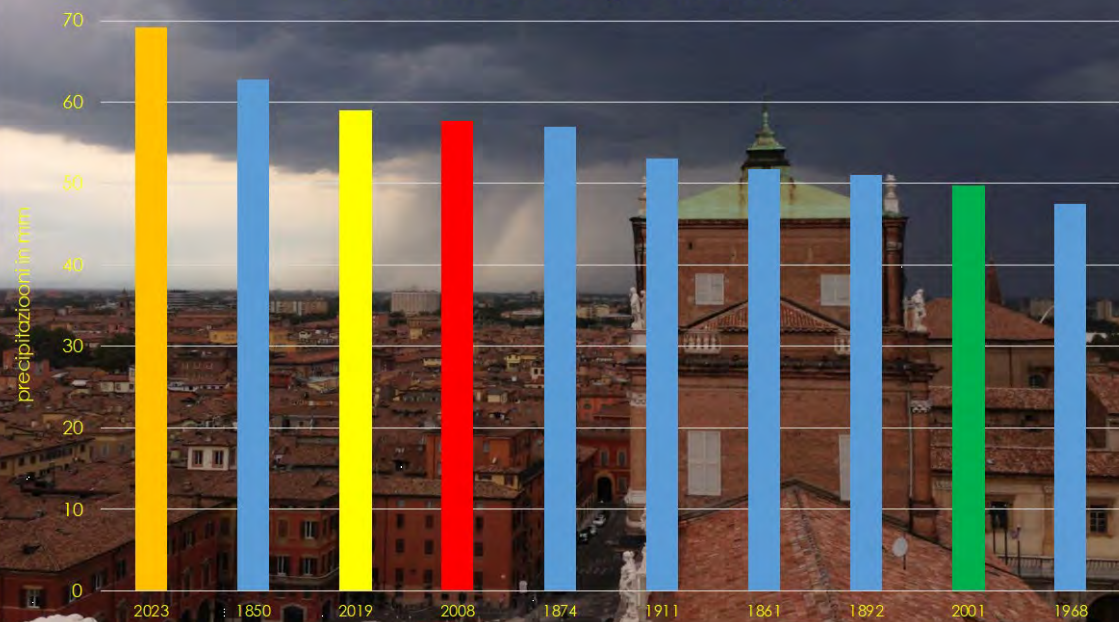


## Geophysical Observatory of Modena: the 10 rainiest months of May



The two rainiest months of May have been in the last 4 years.

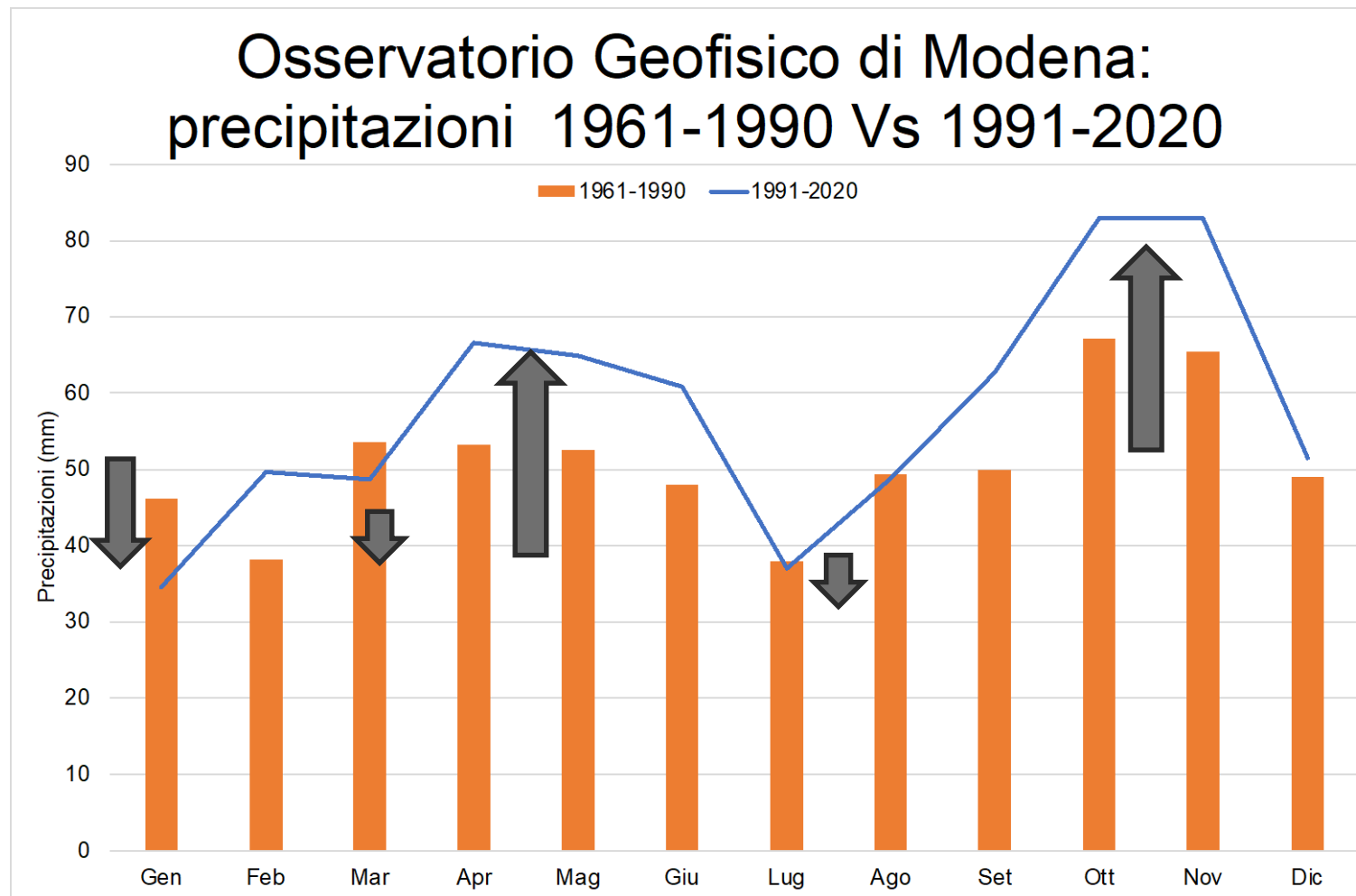
## Geophysical Observatory of Modena: the 10 rainiest days in May



May 2, 2023, was the "rainiest day" of May. Among the 4 rainiest days in May, 3 occurred in the last 15 years

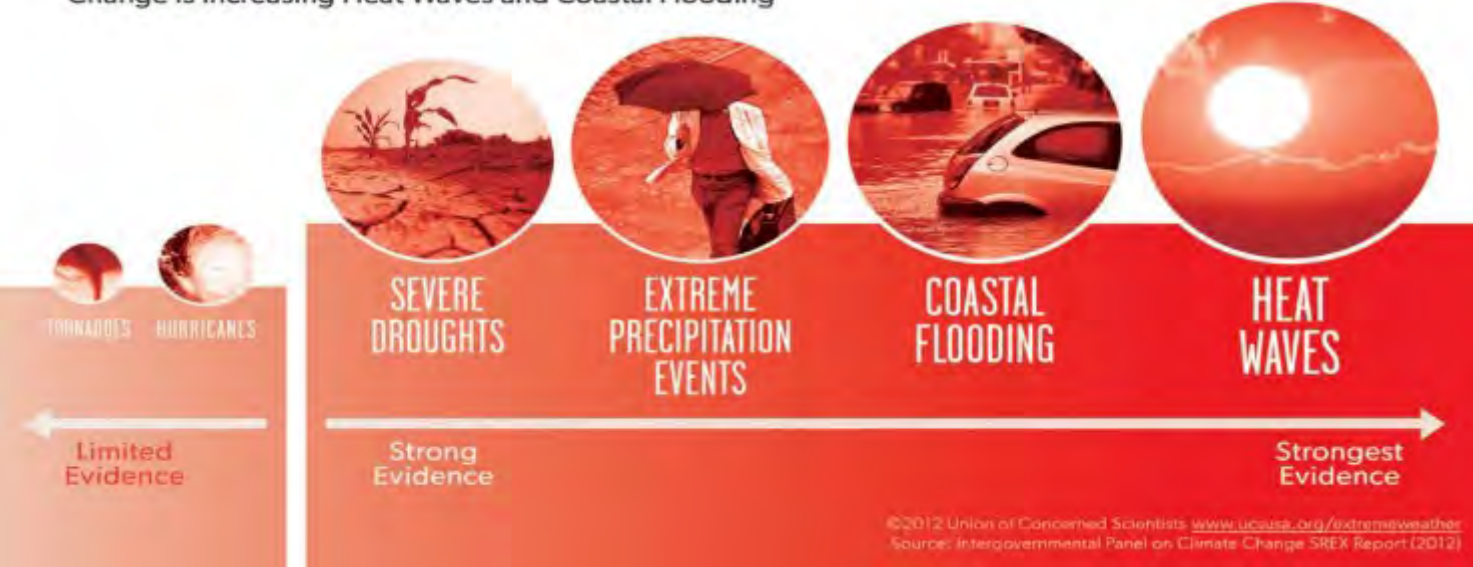


Is the difference between "rainy seasons" and "dry seasons" becoming more pronounced?




**SCIENCE CONNECTIONS** → **EXTREME WEATHER & CLIMATE CHANGE**

→ Strongest Scientific Evidence Shows Human-Caused Climate Change Is Increasing Heat Waves and Coastal Flooding

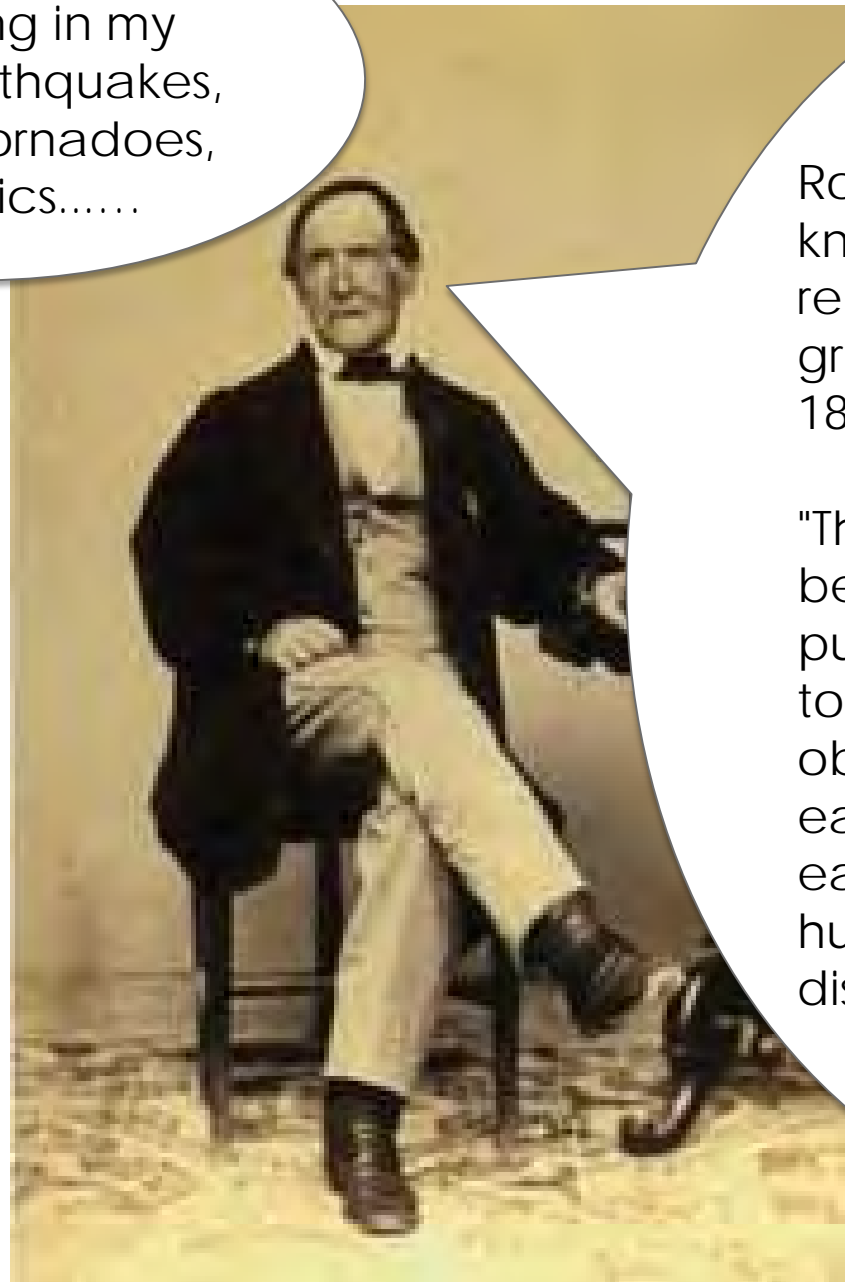


“It is important to point out that just because an event is low on the scale, that doesn't mean there is no climate change influence; it simply means scientific evidence is not strong enough at this time to draw stronger conclusions ”.  
 Dr Marshall Shepherd, <https://www.carbonbrief.org/tornadoes-and-climate-change-what-does-the-science-say-2/>





Director, but what is happening in my Duchy? Earthquakes, pollution, tornadoes, epidemics.....



Royal Highness, I wouldn't know... but I would like to remind that when you granted me the tower in 1826, I said,

"The Modenese Observatory benefits from a generally pure air and a favorable topographic position for observations, and it is not easily subjected to threats of earthquakes, lightning, hurricanes, and similar disasters."

[www.ossgeo.unimore.it](http://www.ossgeo.unimore.it)

facebook

[www.facebook.com/ossvatoriogeofisico](http://www.facebook.com/ossvatoriogeofisico)



[www.instagram.com/ossgeo](http://www.instagram.com/ossgeo)

*Thank you for your attention*