Centri urbani tra alluvioni e siccità

ripensare la città in funzione del cambiamento climatico

venerdì 4 aprile 2025 Ancona

Alluvioni e siccità due facce della stessa medaglia

Presentazione di casi di studio locali e nazionali

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- Affiliazione: Dip. Geologia UNICAM
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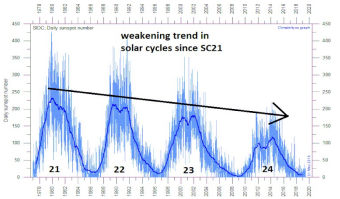
Un clima sempre più estremo

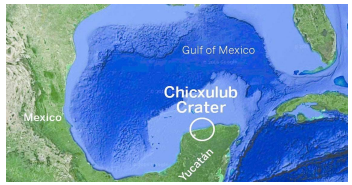
FORZANTI RADIATIVI → AUMENTO DELL'ENERGIA IN ATMOSFERA

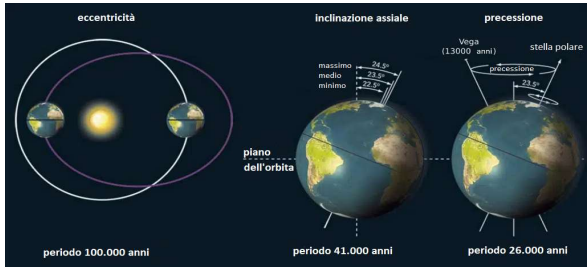
- Cicloni tropicali
- Ondate di calore
- Alluvioni
- Siccità
- Eventi estremi precipitazione



ESOGENI

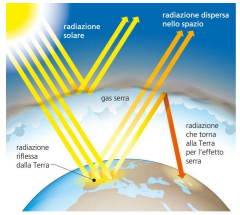
- VARIAZIONI DELLA RADIAZIONE SOLARE
- CICLI DI MILANKOVITCH
- IMPATTO DI ASTEROIDI

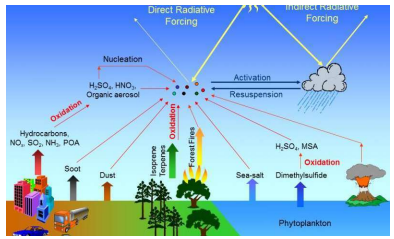


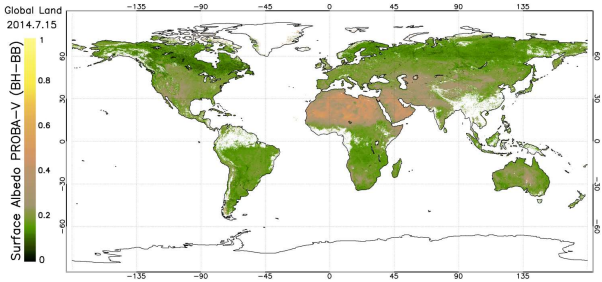


ENDOGENI

- GAS SERRA
- AEROSOL
- CAMBIAMENTI DI USO DEL SUOLO
- ERUZIONI VULCANICHE







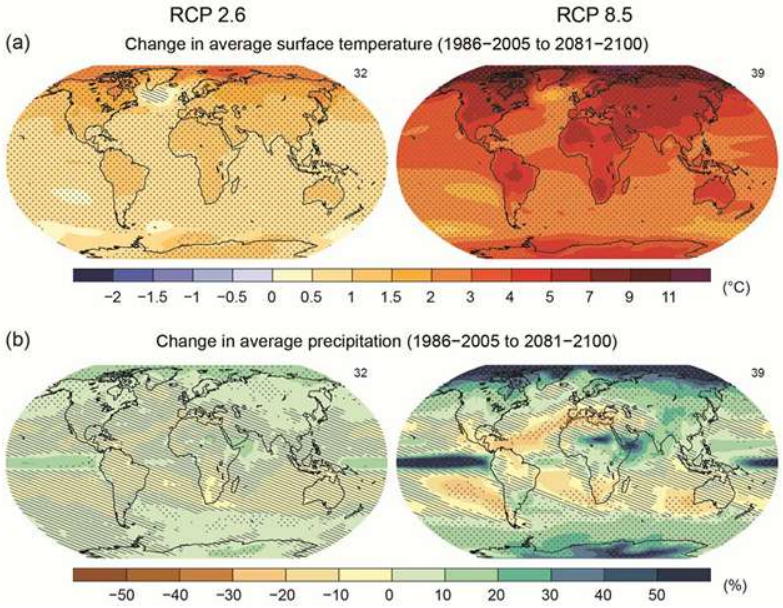
Un clima sempre più estremo

ALLUVIONI

CAUSE CLIMATICHE DIRETTE O INDIRETTE
- Precipitazioni estreme
- Scioglimento neve
- Terreno impermeabilizzato
- Deforestazione

SICCITA’

CAUSE CLIMATICHE DIRETTE O INDIRETTE
- Scarse Precipitazioni
- Aumento temperature
- Deforestazione

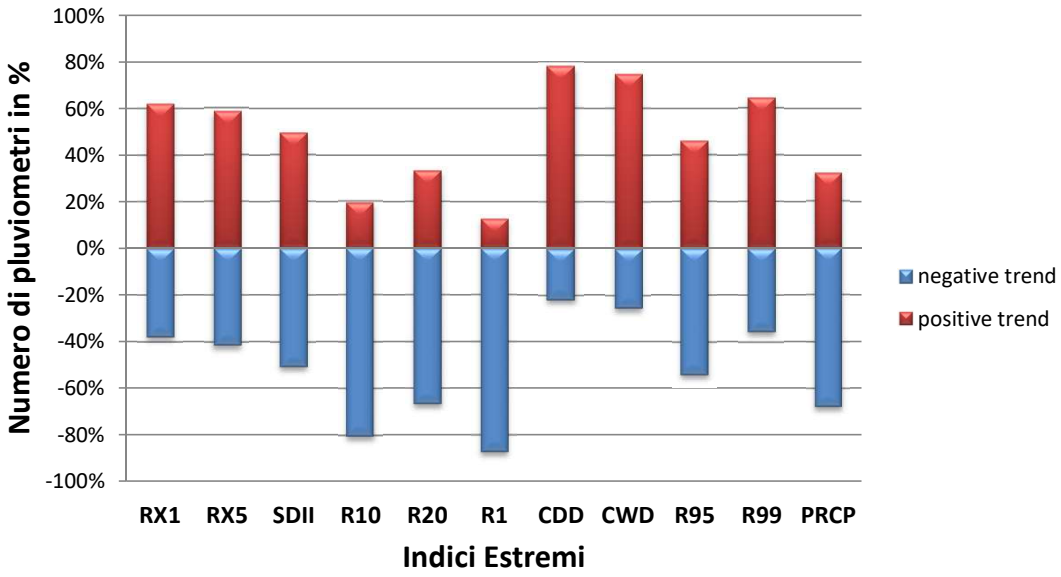


Indici climatici

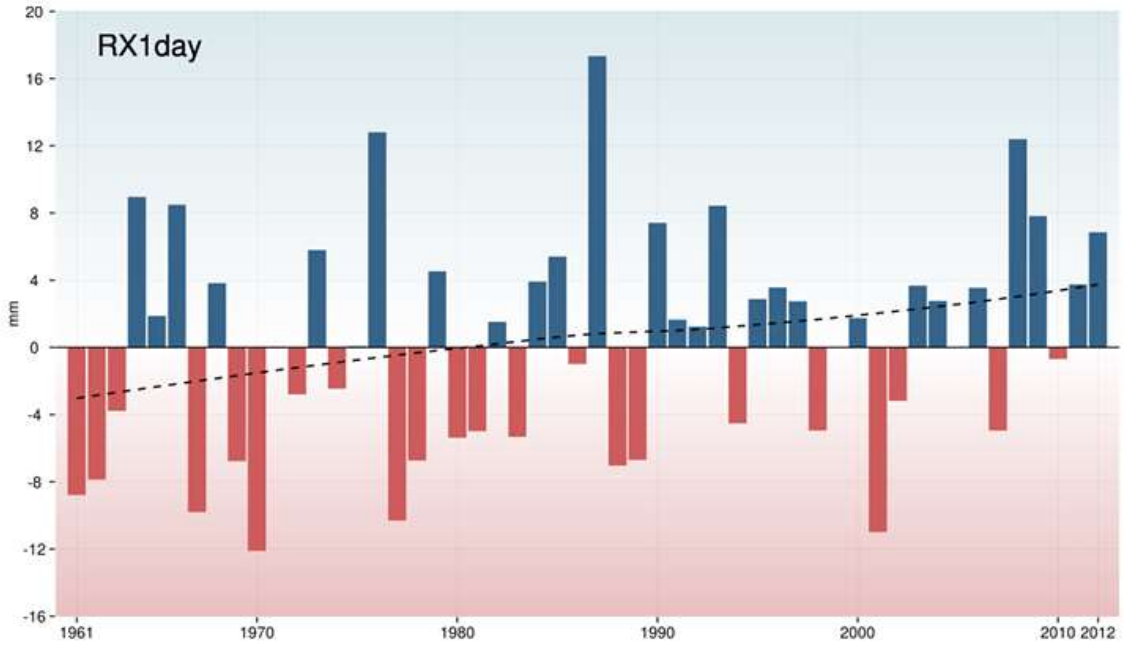
ETCCDI (Expert Team on Climate Change Detection Indices)

27 indici estremi per valutare il cambiamento termico e pluviometrico

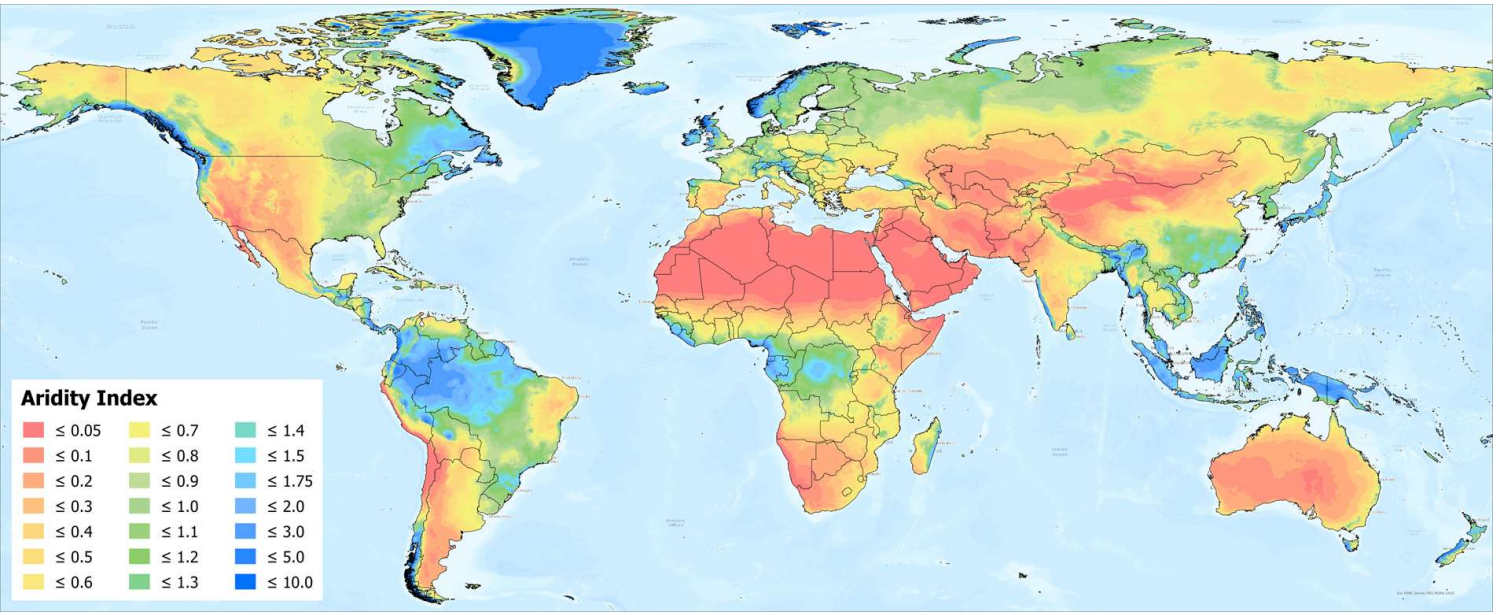
Trend dei pluviometri per alcuni indici estremi nel periodo 1961-2020 Regione Marche

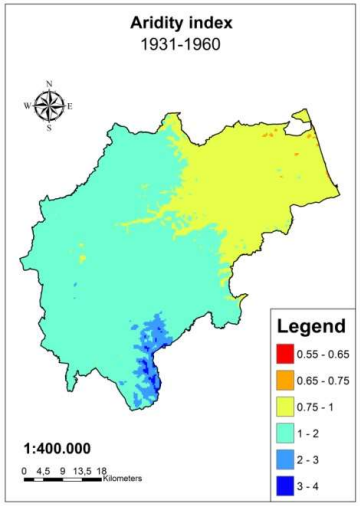


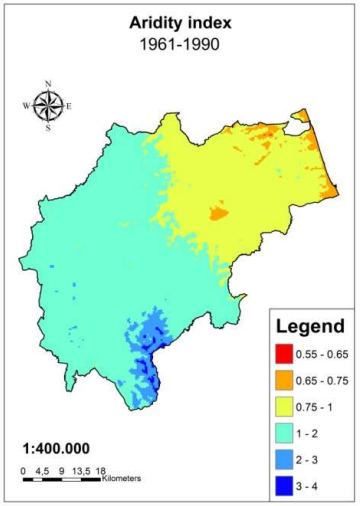
Italia rapporto Ispra 2013

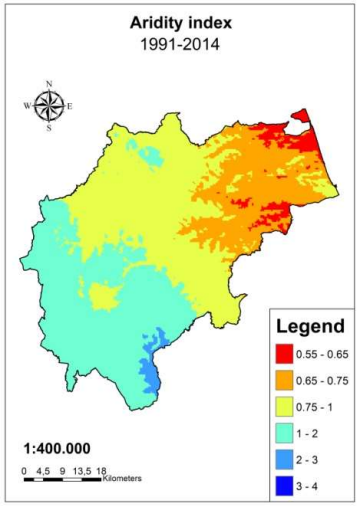


Indici climatici







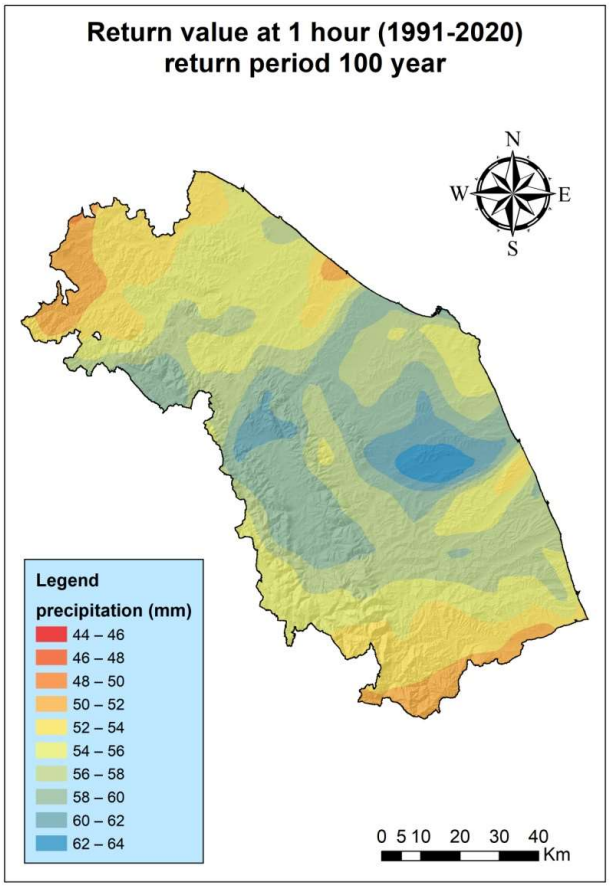


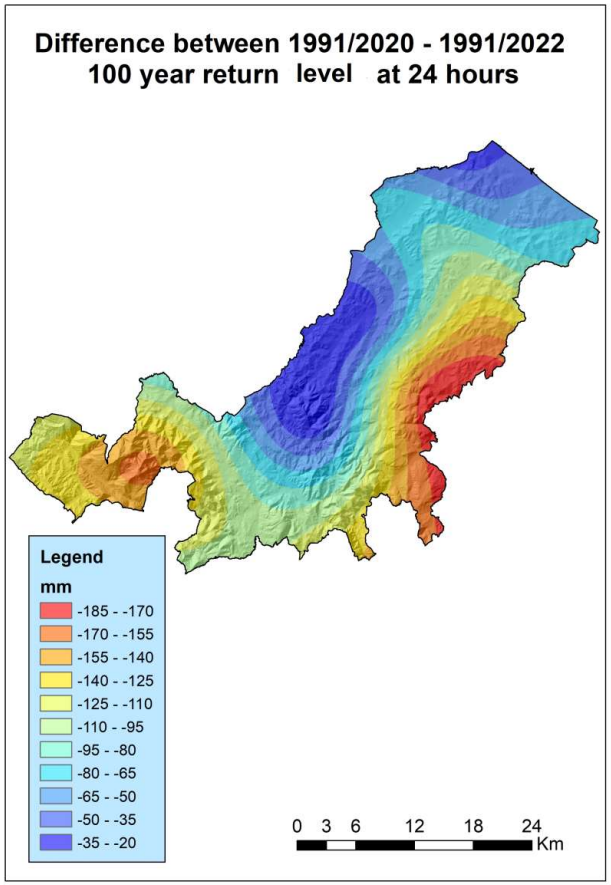
Zomer, R.J., Xu, J. & Trabucco, A. Version 3 of the Global Aridity Index and Potential Evapotranspiration Database. *Sci Data* **9**, 409 (2022). https://doi.org/10.1038/s41597-022-01493-1

Indice di aridità	Classificazione climatica
< 0.03	Iperarido
0.03-0.2	Arido
0.2-0.5	Semiarido
0.5-0.65	Secco sub-umido
>0.65	umido

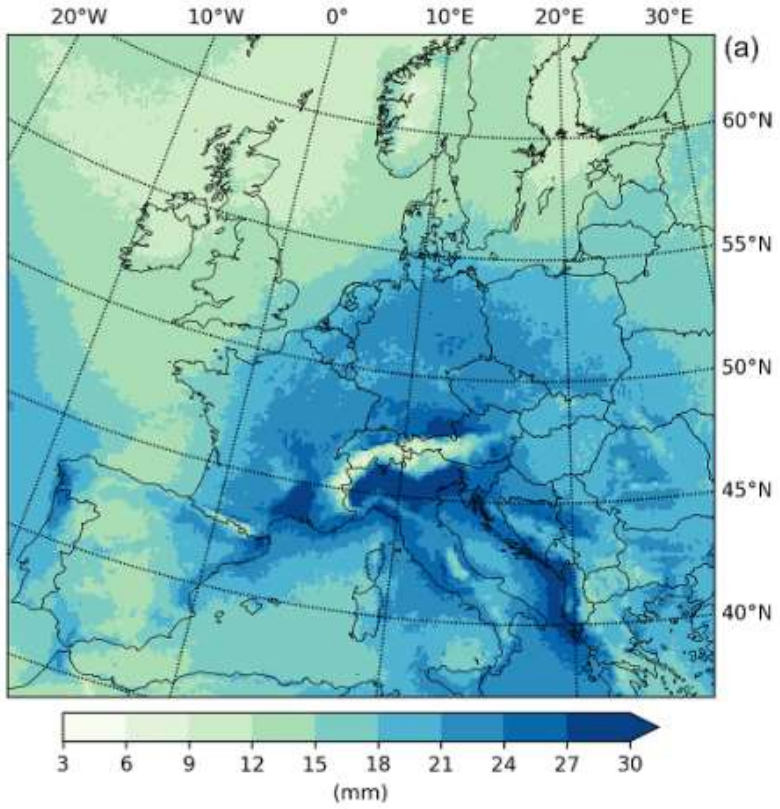
$$Ia = \frac{P}{ET_0}$$

Eventi estremi



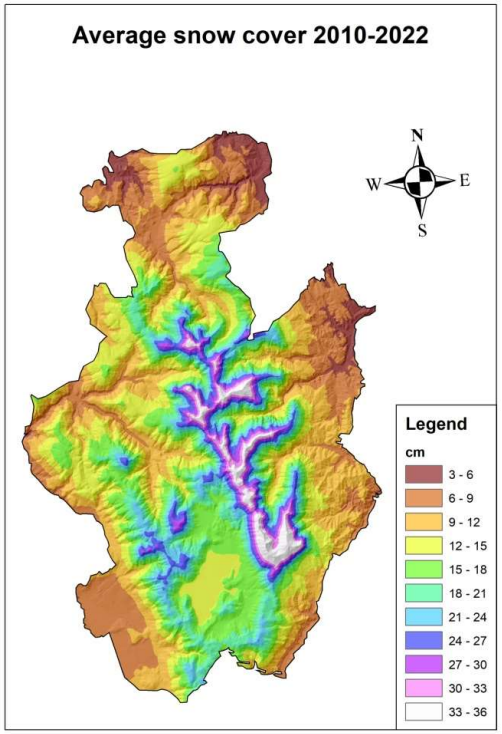


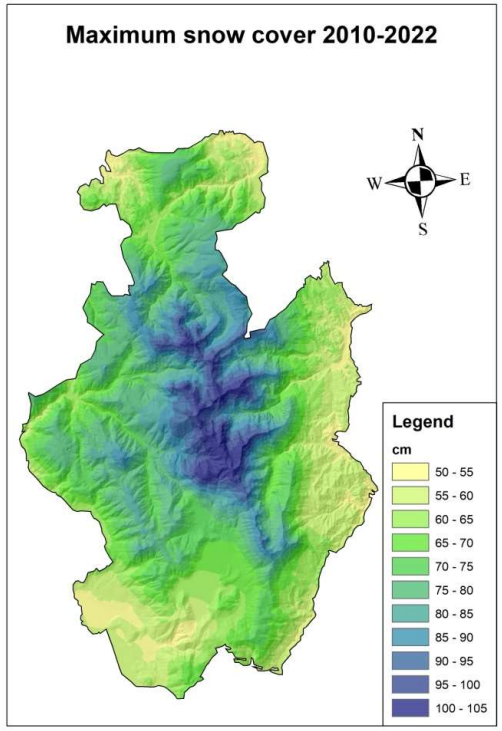
The 10-year return levels of hourly precipitation

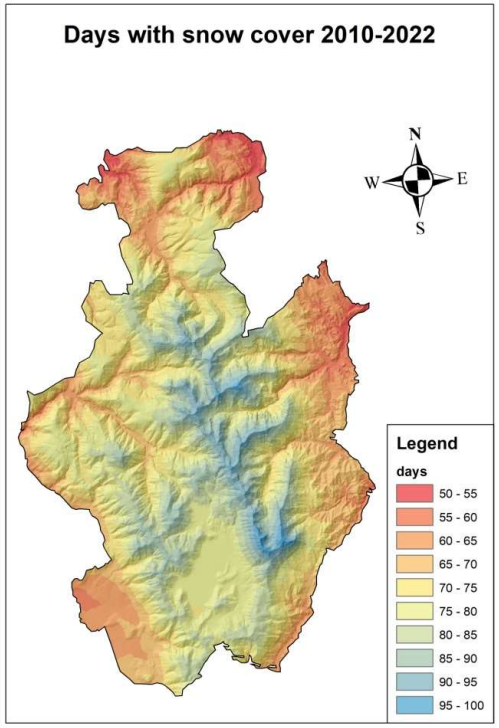


Poschlod, B., Ludwig, R., & Sillmann, J. (2021). Ten-year return levels of sub-daily extreme precipitation over Europe. Earth System Science Data, 13(3), 983-1003.

Precipitazione nevosa

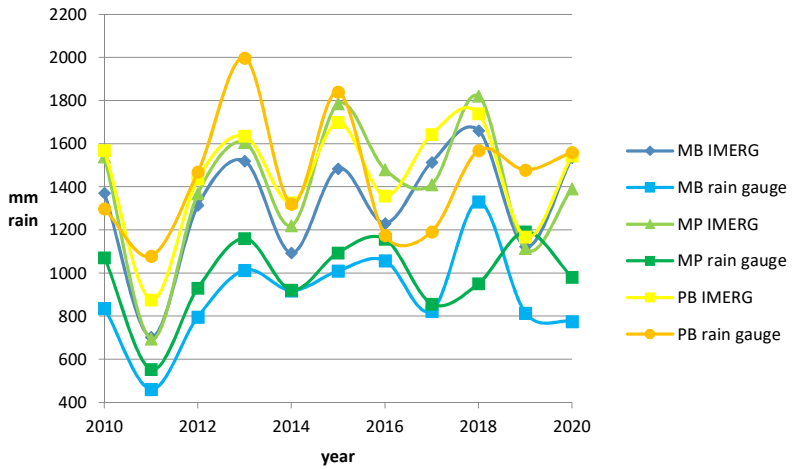






10 stazioni meteo
Periodo: 1 Novembre - 30 Aprile

Incertezza delle cumulate in zone montane

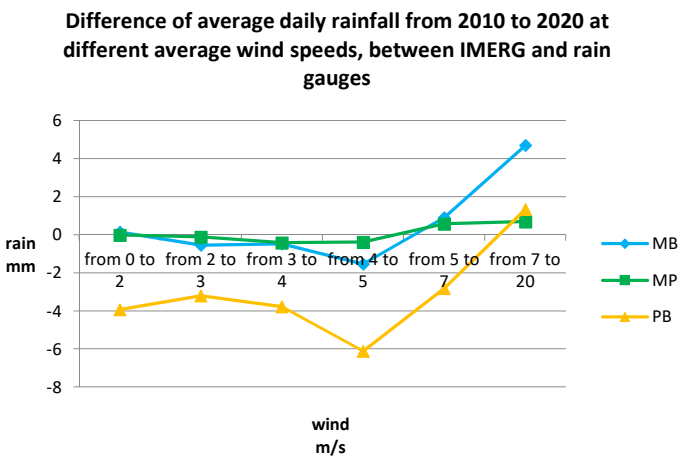


3 stazioni meteo montane con dati da pluviometri e dati IMERG, nel periodo 2010-2020:

- **MB – Monte Bove Sud**
- **MP – Monte Prata**
- **PB – Pintura di Bolognola**

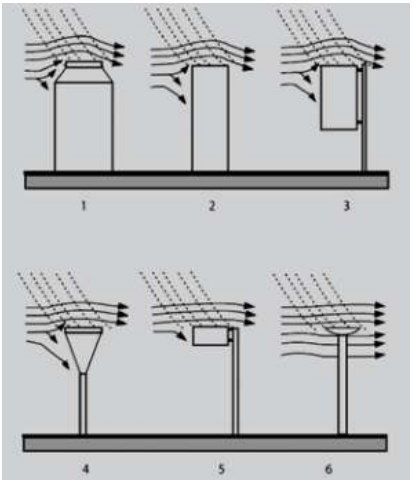
Difference	Time Interval	MB mm	MB %	MP mm	MP %	PB mm	PB %
SLWE-IMERG	2010–2020	177.1	13.4	219.3	15.6	163.3	11.2
SLWE-RG	2010–2020	193.1	21.6	234.2	23.7	96.2	6.6

I pluviometri e i dati satellitari sottostimano la precipitazione nevosa.



Pluviometri rilevano meno precipitazioni rispetto al satellite in presenza di forti venti

Wind Speed m/s	MB IM. mm	MB RG mm	MP IM. mm	MP RG mm	PB IM. mm	PB RG mm	MB IM.–RG %	MP IM.–RG %	PB IM.–RG %
0–2	3.2	3.0	3.7	3.7	4.6	8.6	0.1	0.0	−3.9
2–3	3.7	4.3	3.7	3.8	4.7	7.9	−0.5	−0.1	−3.2
3–4	4.8	5.3	4.2	4.6	5.3	9.1	−0.5	−0.4	−3.7
4–5	5.6	7.1	6.0	6.4	8.6	14.7	−1.5	−0.4	−6.1
5–7	7.4	6.5	6.9	6.3	8.0	10.8	0.9	0.6	−2.8
7–20	11.3	6.6	10.3	9.7	8.2	6.8	4.7	0.6	1.3



THANK YOU FOR YOUR ATTENTION

venerdì
4 aprile
2025
Ancona

Gentilucci, M., Bufalini, M., D'Aprile, F., Materazzi, M., & Pambianchi, G. (2021). Comparison of data from rain gauges and the IMERG product to analyse precipitation in mountain areas of central Italy. *ISPRS International Journal of Geo-Information*, *10*(12), 795.

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Gentilucci, M., Catorci, A., Panichella, T., Moscatelli, S., Hamed, Y., Missaoui, R., & Pambianchi, G. (2023). Analysis of snow cover in the Sibillini Mountains in Central Italy. *Climate*, *11*(3), 72.

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Gentilucci, M., Barbieri, M., D'Aprile, F., & Zardi, D. (2020). Analysis of extreme precipitation indices in the Marche region (central Italy), combined with the assessment of energy implications and hydrogeological risk. *Energy Reports*, *6*, 804-810.

Gentilucci, M., Barbieri, M., Lee, H. S., & Zardi, D. (2019). Analysis of rainfall trends and extreme precipitation in the Middle Adriatic Side, Marche Region (Central Italy). *Water*, *11*(9), 1948.