



METEOROLOGIA

MERCOLEDÌ 11 OTTOBRE 2023

Quanta energia c'è nell'aria? Atmosfera e Oceani in una danza termodinamica

MERCOLEDÌ 25 OTTOBRE 2023

L'uomo o la macchina: chi sbaglia le previsioni?

MERCOLEDÌ 15 NOVEMBRE 2023

Prevedere il tempo a lunga scadenza è possibile?

MERCOLEDÌ 29 NOVEMBRE 2023

Il meraviglioso complesso che si chiama Clima

MERCOLEDÌ 13 DICEMBRE 2023

L'effetto serra: amico o nemico?

MERCOLEDÌ 10 GENNAIO 2024

E se guardassimo al Sole?



RMetS
Royal Meteorological Society

November 2023 78:11

Weather

The marine heatwave of June 2023 • The history of UK weather forecasting: Part 6
Dante and Meteorology

WILEY

www.rmets.org



Meteorologia

Prevedere il tempo
a lunga scadenza è possibile?

Inferno X - Gli Eretici



El par che voi veggiate, se ben odo,
dinanzi quel che 'l tempo seco adduce,
e nel presente tenete altro modo».

«Noi veggiam, come quei c'ha mala luce,
le cose», disse, «che ne son lontano;
cotanto ancor ne splende il sommo duce.

Quando s'appressano o son, tutto è vano
nostro intelletto; e s'altri non ci apporta,
nulla sapem di vostro stato umano.



perchè volse veder troppo davante....

Inferno XX – Gli Indovini



Come 'l viso mi scese in lor più basso,
mirabilmente apparve esser travolto
ciascun tra 'l mento e 'l principio del casso;

ché da le reni era tornato 'l volto,
e in dietro venir li convenia,
perché 'l veder dinanzi era lor tolto.



Previsione Ariccia a 15 giorni

Meteo ARICCIA ► Previsioni fino a 15 giorni 

Lazio ▼ Roma (RM) ▼ Ariccia ▼ Scopri di più: Webcam e altro ▼

Aggiornamento delle ore 7:00 - Prossimo alle 8:15

 Condividi la previsione [Qualità dell'aria »](#)  Accettabile Novità Previsioni 365 giorni ►

Meteo Giornaliero	Mer 15  13° 19°	Gio 16  8° 17°	Ven 17  11° 15°	Sab 18  5° 13°	Dom 19  2° 13°	Lun 20  8° 13°	Mar 21  8° 14°	Fino al 29
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Meteo Ariccia - Previsioni a lungo termine - Mercoledì 22

Lazio ▼ Roma (RM) ▼ Ariccia ▼ Scopri di più: Webcam e altro ▼

Aggiornamento delle ore 0:20 - Prossimo alle 7:00

 Condividi la previsione [Leggi le Ultime Notizie Meteo](#) Novità Previsioni 365 giorni ►

7gg 	Mer 22  7° 13°	Gio 23  5° 13°	Ven 24  5° 12°	Sab 25  5° 12°	Dom 26  5° 11°	Lun 27  4° 10°	Mar 28  4° 10°	Mer 29  4° 11°
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Ariccia

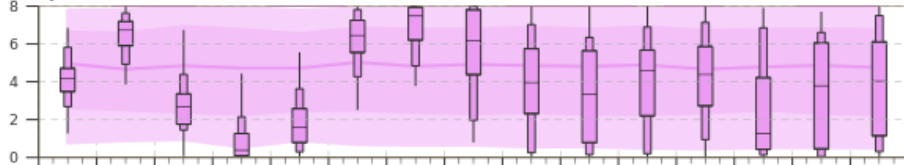
15 giorni

ENS Meteogram

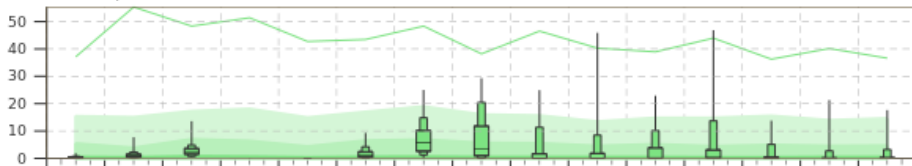
Ariccia - Latium - Italy 41.72°N 12.63°E (ENS land point) 487 m

Forecast based on ENS distribution Wednesday 15 November 2023 00 UTC

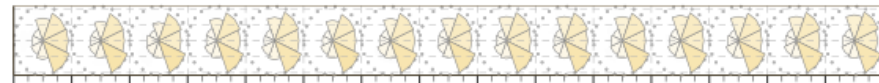
Daily mean of Total Cloud Cover (okta)



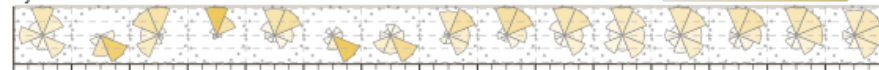
Total Precipitation (mm/24h)



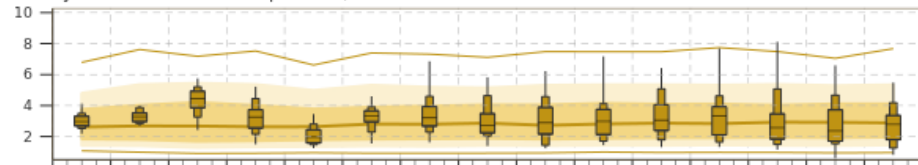
M-Climate of the distribution of 10m Wind Direction



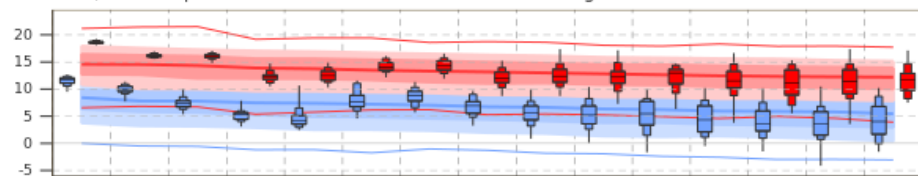
Daily Distribution of 10m Wind Direction



Daily mean of 10m Wind Speed (m/s)



2m min/max Temperature (°C) reduced to 487 m (station height) from 260 m (ENS)



Wed15 Thu16 Fri17 Sat18 Sun19 Mon20 Tue21 Wed22 Thu23 Fri24 Sat25 Sun26 Mon27 Tue28 Wed29

Nov

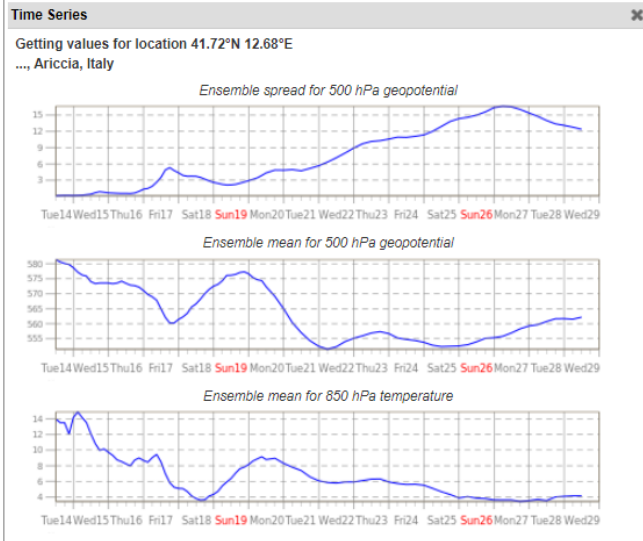
2023

M-Climate
99%
90%
75%
median
25%
10%
1%

max
90%
75%
median
25%
10%
min

M-Climate: this stands for Model Climate. It is a function of lead time, date (+/-15days), and model version. It is derived by rerunning a 11 member ensemble over the last 20 years twice a week (1980 realisations). M-Climate is always from the same model version as the displayed ENS data.

Previsione Ariccia a 15 giorni



City Finder

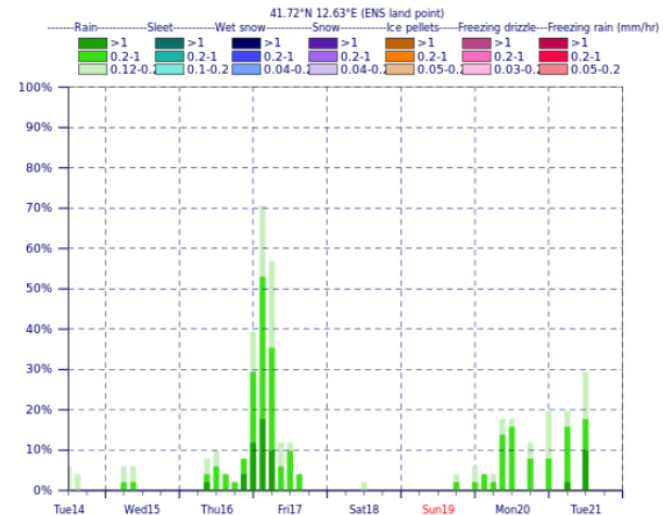
Ariccia 1 match [view](#)

Meteograms

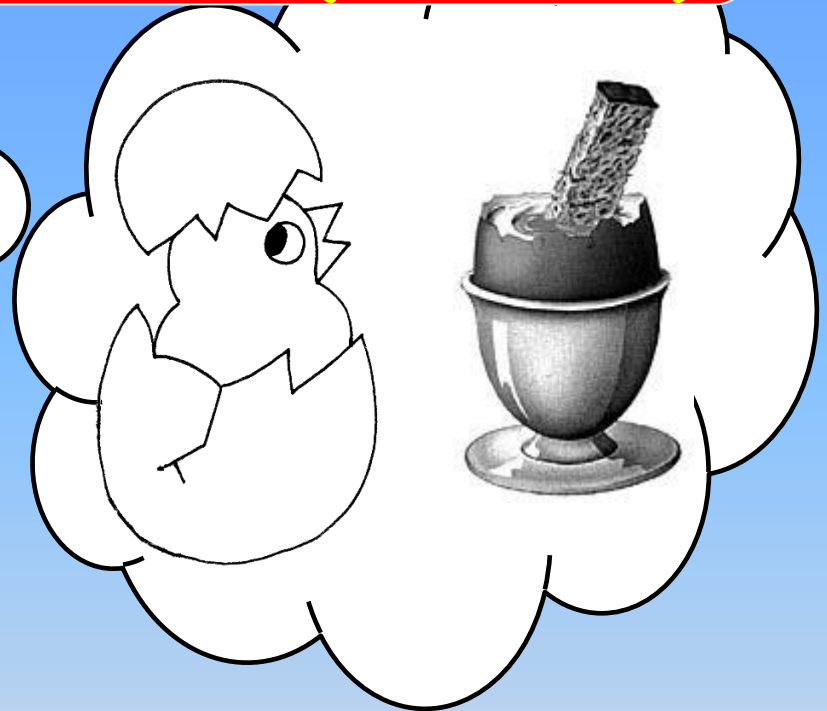
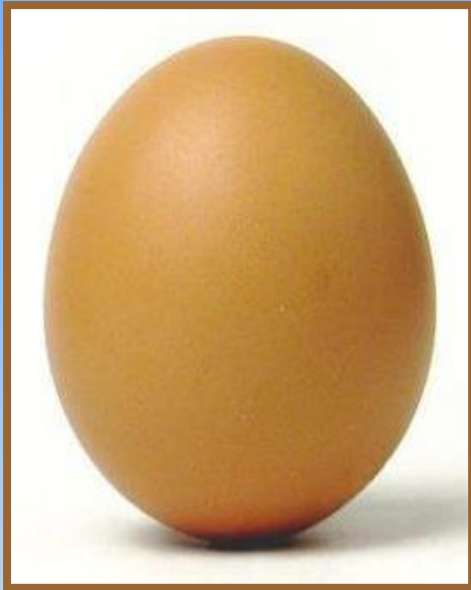
Location: 41.72°N 12.68°E, Ariccia, Italy

Help + More ... + Load ...

Probability of precipitation type (%) in precipitation rate categories (mm/hr)
Base date: Tuesday 14 Nov, 12 UTC



**Prediction is very difficult,
especially about the future (N. Bohr)**



Prevedere: DESCRIVERE IL FUTURO

MEDIANTE due fasi

- CHE TEMPO STA FACENDO ORA?**
- COME SI COMPORTERA' L'ATMOSFERA?**

LA DANZA dell' ATMOSFERA

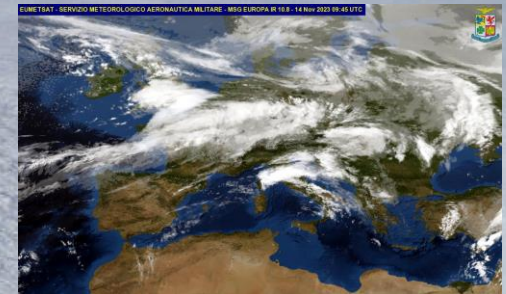
✓ **Scala planetaria o globale (~ 12000 km)**

Onde di Rossby

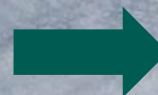


✓ **Scala sinottica (~ 2500 km)**

Cicloni delle medie latitudini

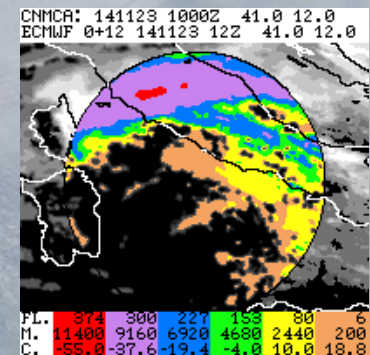
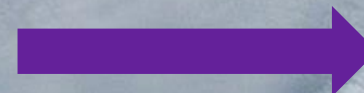


✓ **Mesoscala (~ 250 km)**



✓ **Scala locale (~ 2.5 - 25 km)**

Temporali, Brezze



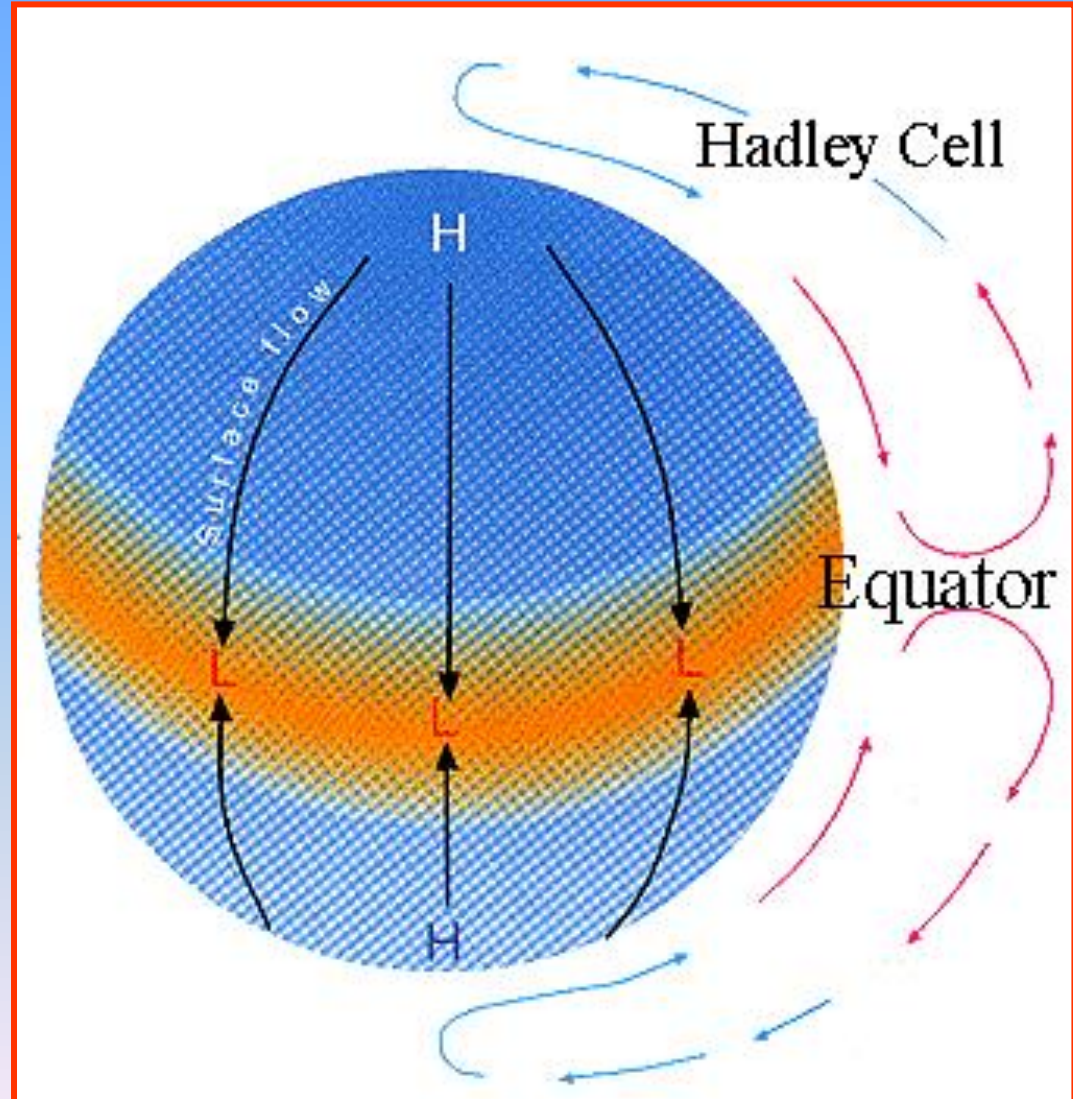
Circolazione generale

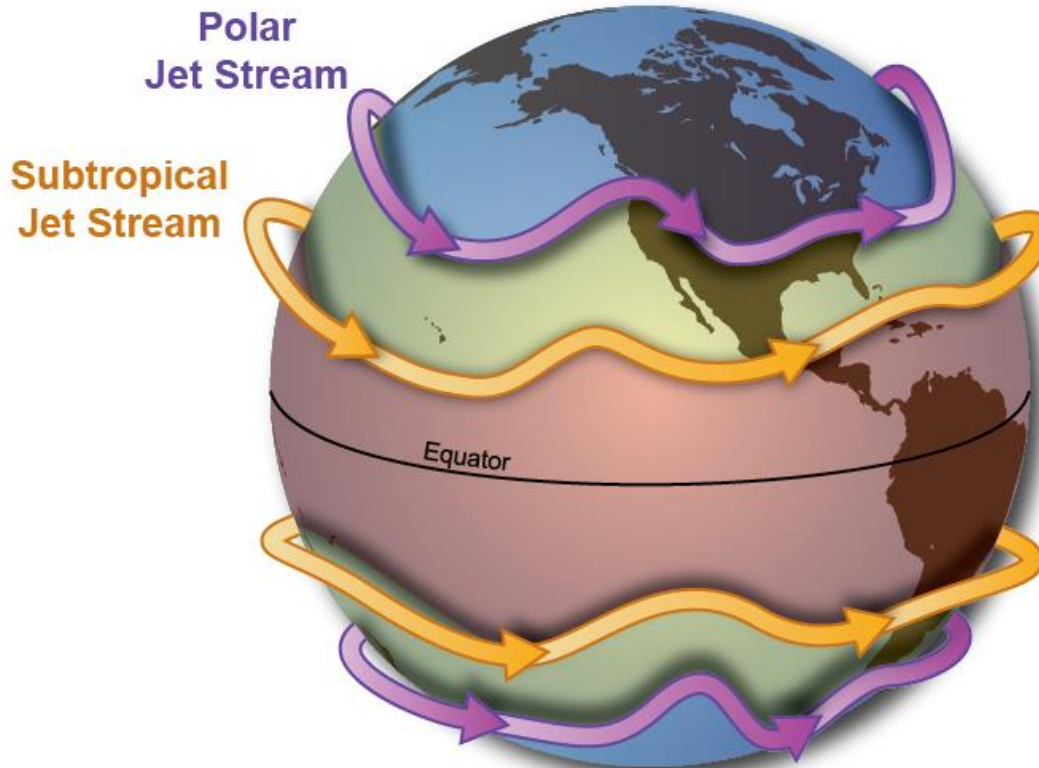
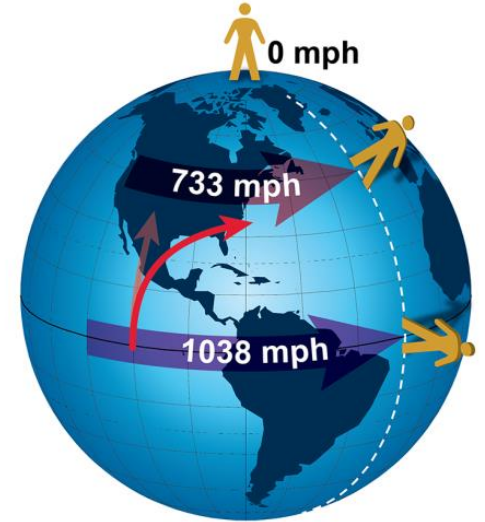
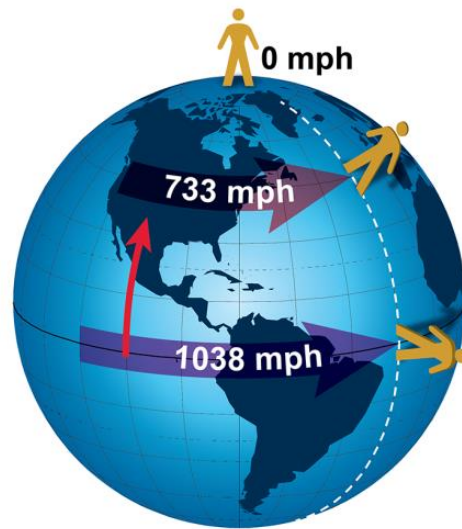
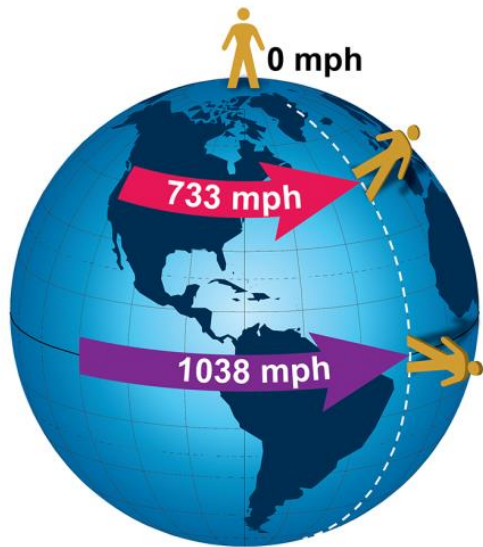
**Hadley 1735,
Ferrel 1850**

**Senza rotazione
terrestre**

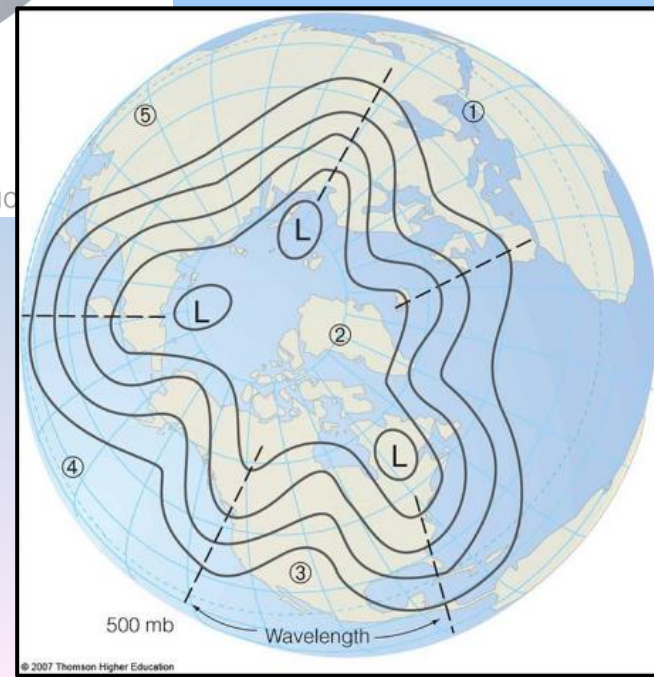
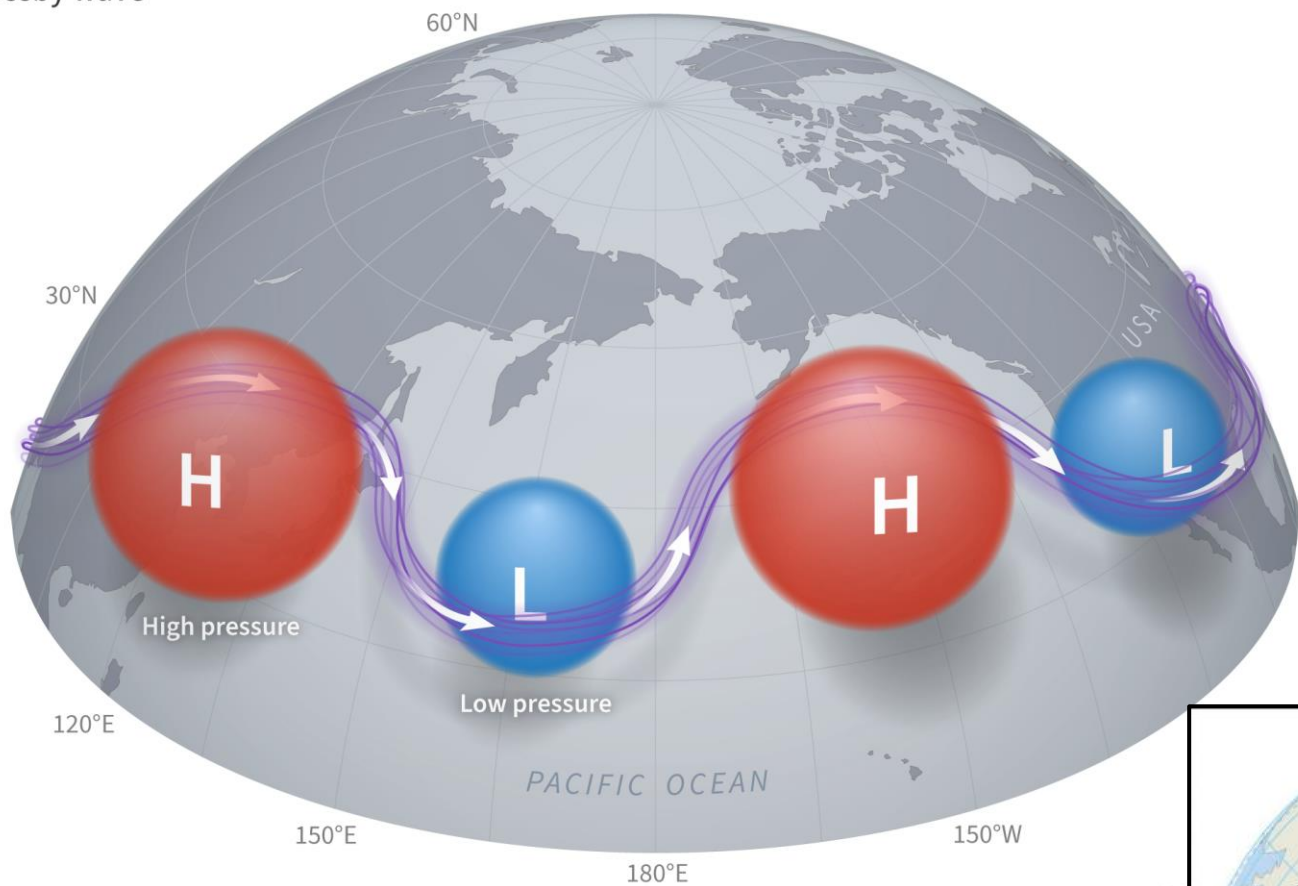
.....

Ma la Terra ruota!





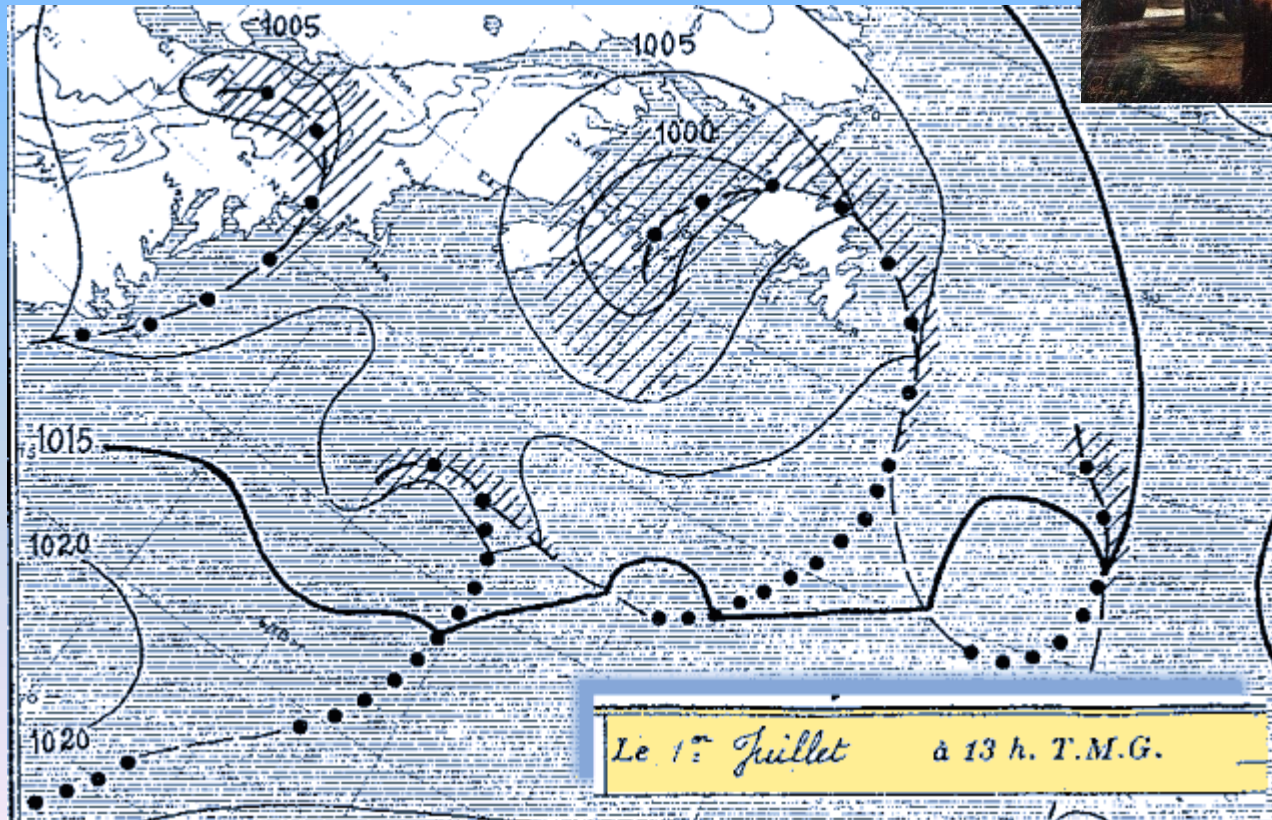
Rossby wave



La Teoria del Fronte Polare

Norvegia inizio XX sec.

Vilhelm Bjerknes - Scuola Bergen



Anni '20

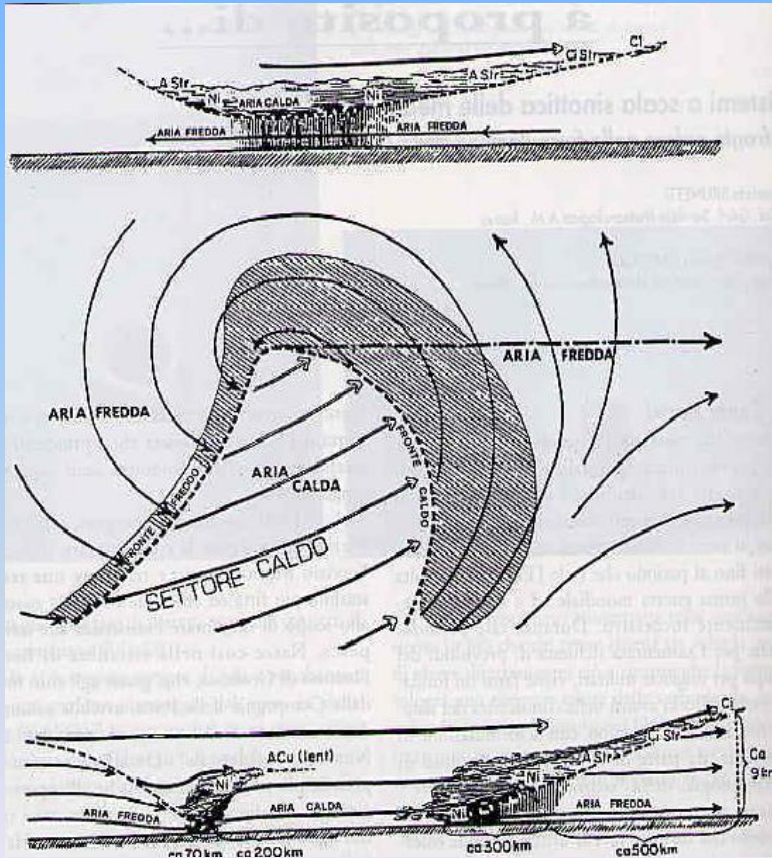
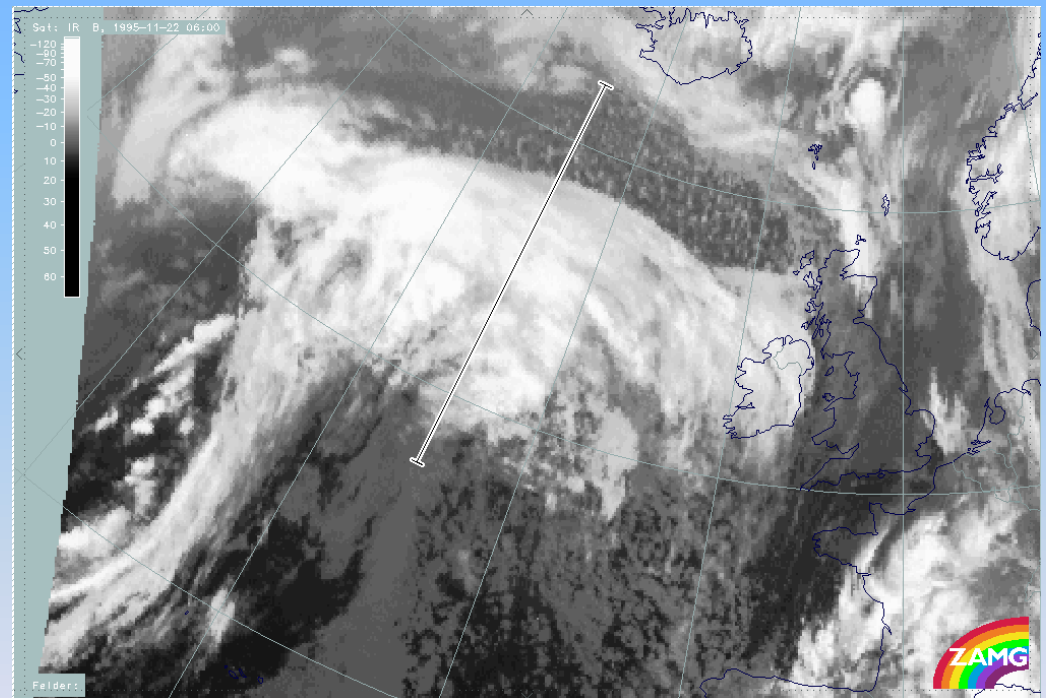
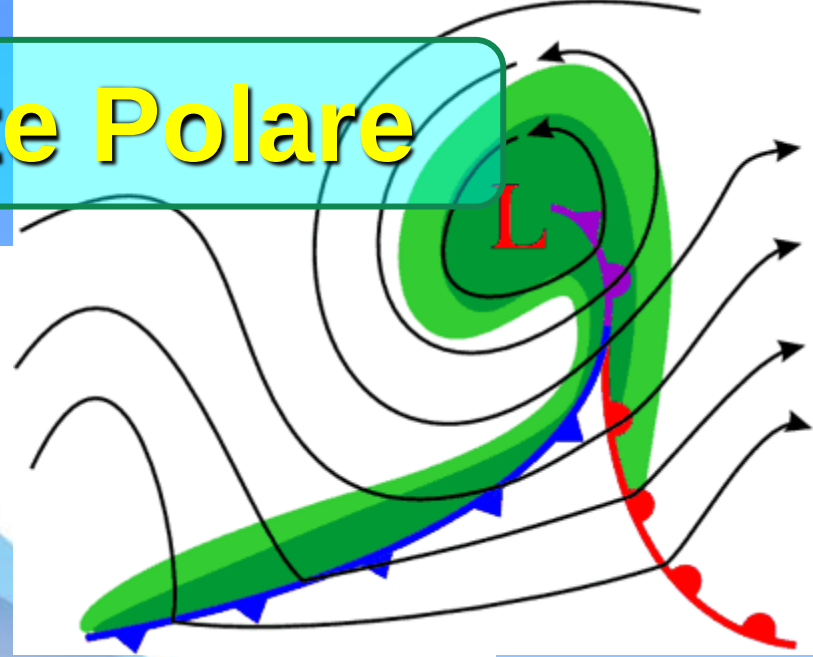
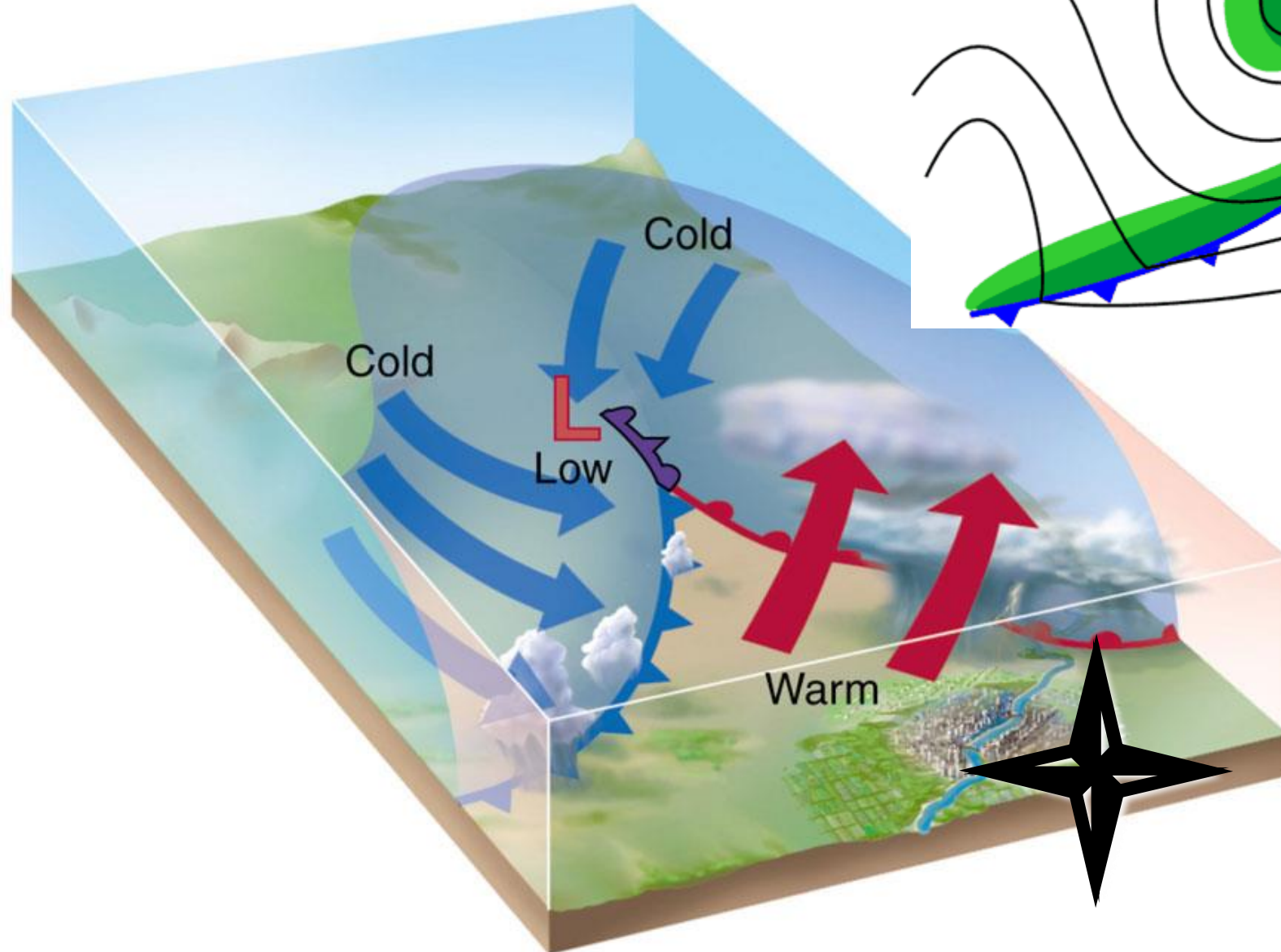


IMMAGINE METEOSAT

Anni 2000

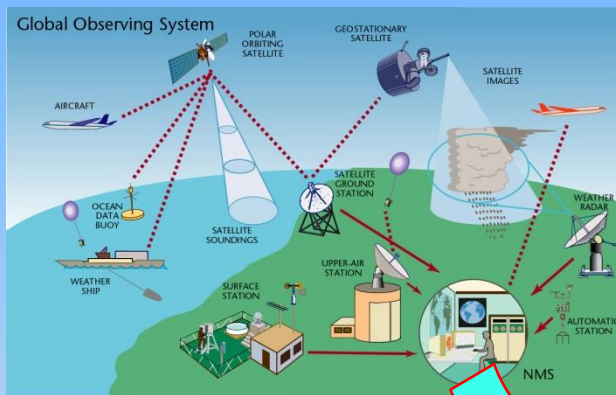


La Teoria del Fronte Polare



LA PREVISIONE METEO

OSSERVAZIONI



$$\frac{\partial \mathbf{v}_g}{\partial t} + (\mathbf{v} \cdot \nabla_p) \mathbf{v}_g + \omega \frac{\partial \mathbf{v}_g}{\partial p} = \frac{D \mathbf{v}_g}{Dt} = -f \hat{\mathbf{k}} \times \mathbf{v} - \nabla_p \Phi$$

MODELLI MATEMATICI



Utenti
Es APP



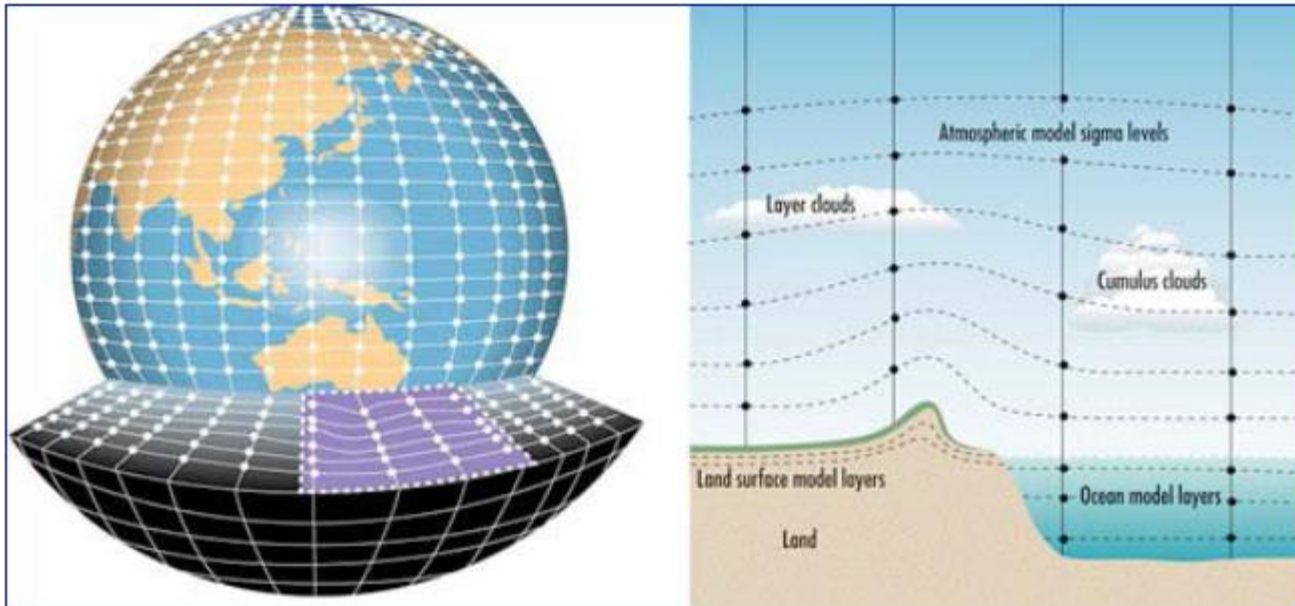
Meteorologi

MODELLO MATEMATICO

- **Modello:** rappresentazione
che det

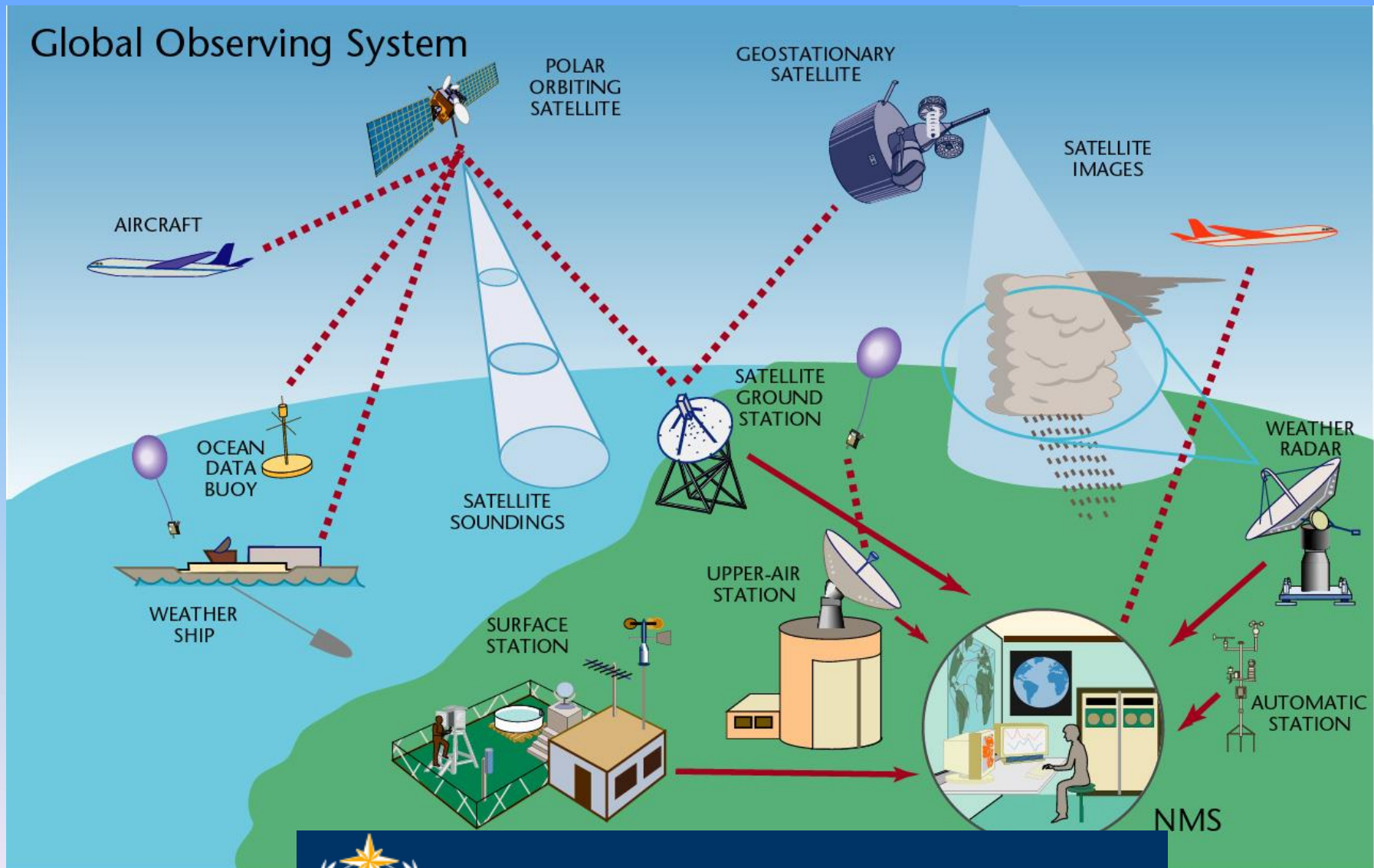
Ordo et connexio idearum idem est ac
ordo et connexio rerum
(Spinoza, *Ethica*, II, pr. VII)

Questo sistema di equazioni richiede la conoscenza
delle condizioni iniziali.

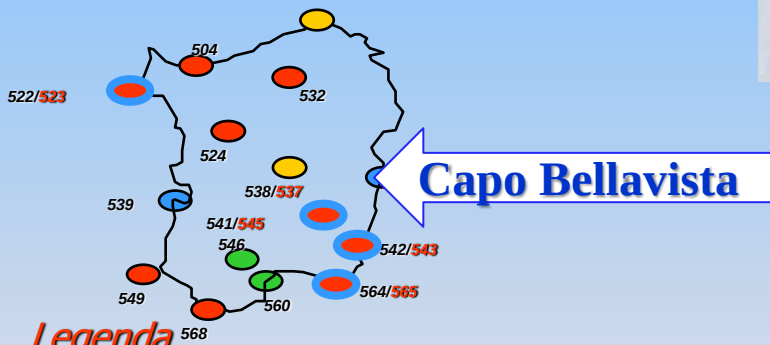
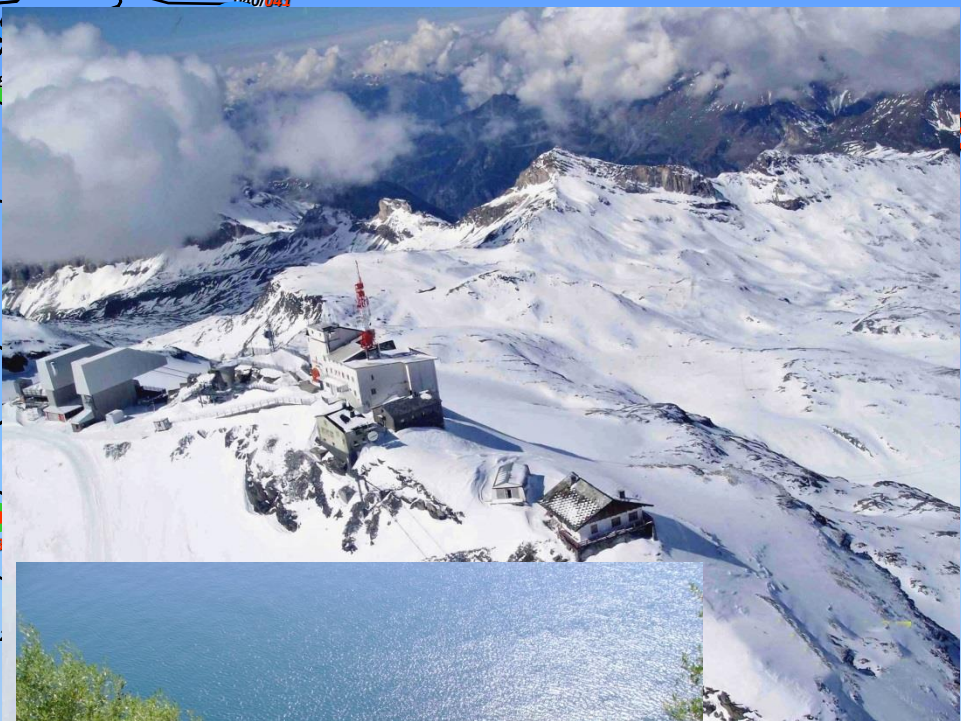
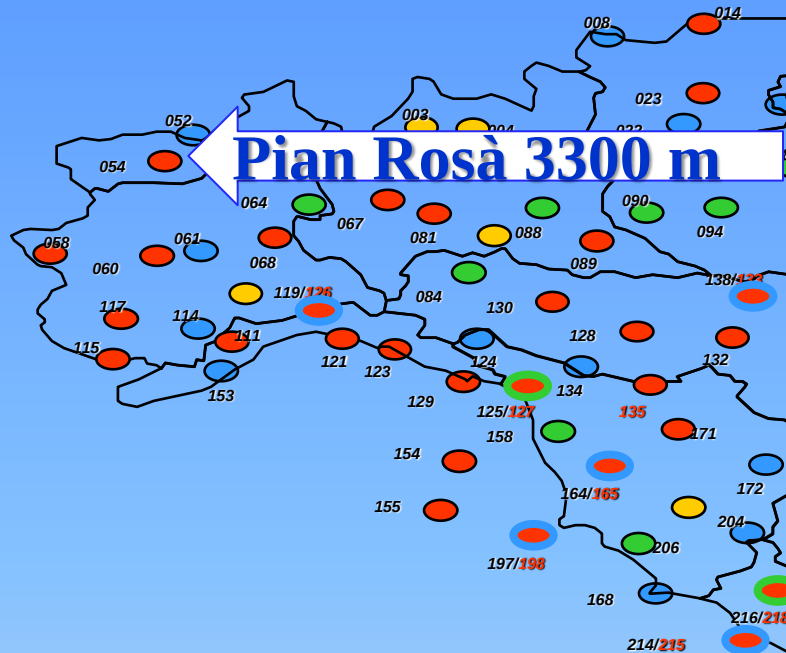


IL SISTEMA MONDIALE DELLE OSSERVAZIONI

Global Observing System

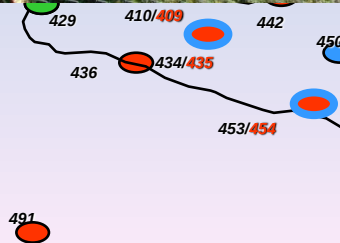


World Meteorological Organization
Weather • Climate • Water



Legenda

- Stazioni A.M. aeroportuali
- Stazioni A.M. isolate
- Stazioni A.M. automatiche DCP
- Stazioni A.M. DCP in fase di installazione
- Stazione A.M. aeroportuale + DCP
- Stazione A.M. isolata + DCP



RETE RADIOSONDAGGI



I SATELLITI METEOROLOGICI

EUMETSAT

13 Dicembre
2022



www.eumetsat.int

(EUMETSAT)
0°

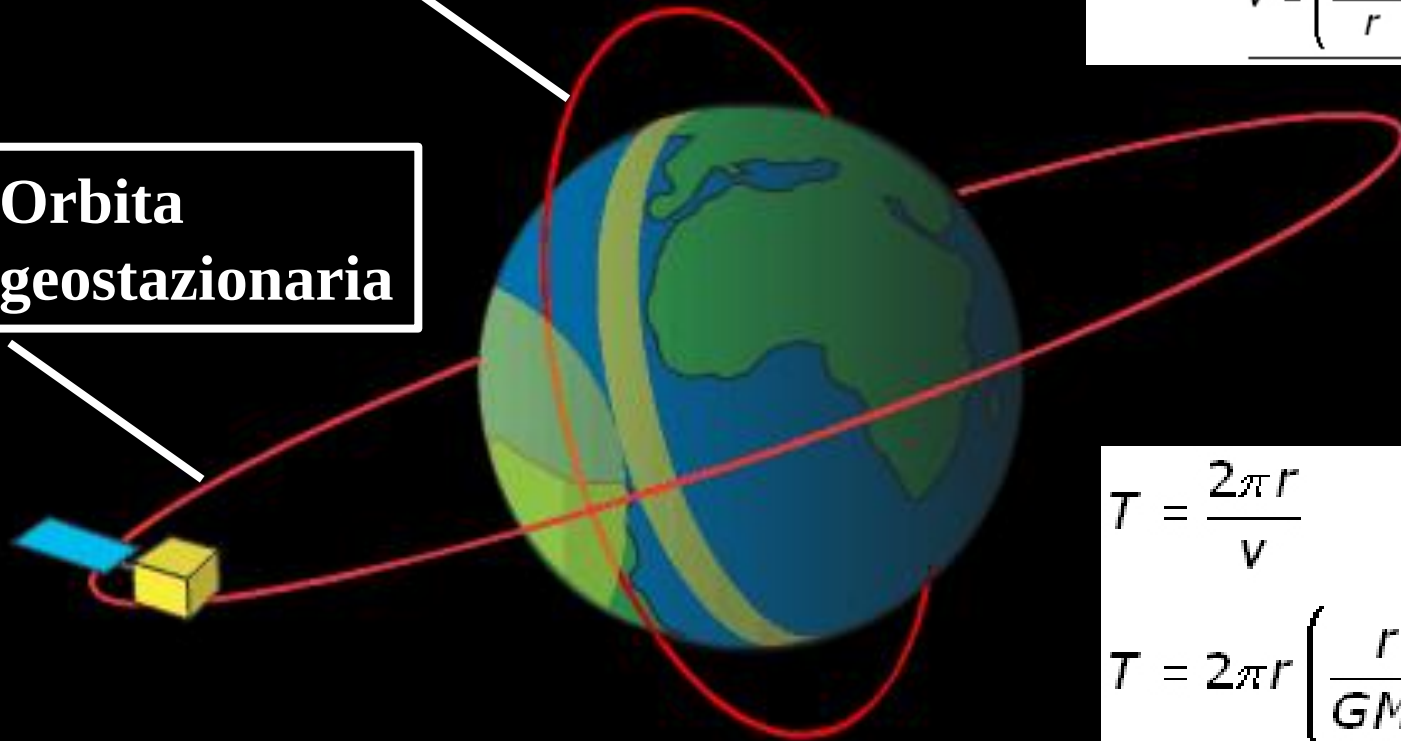
METEOSAT-10
(EUMETSAT)
57.5°E

(Russia)
76°E



Orbita polare

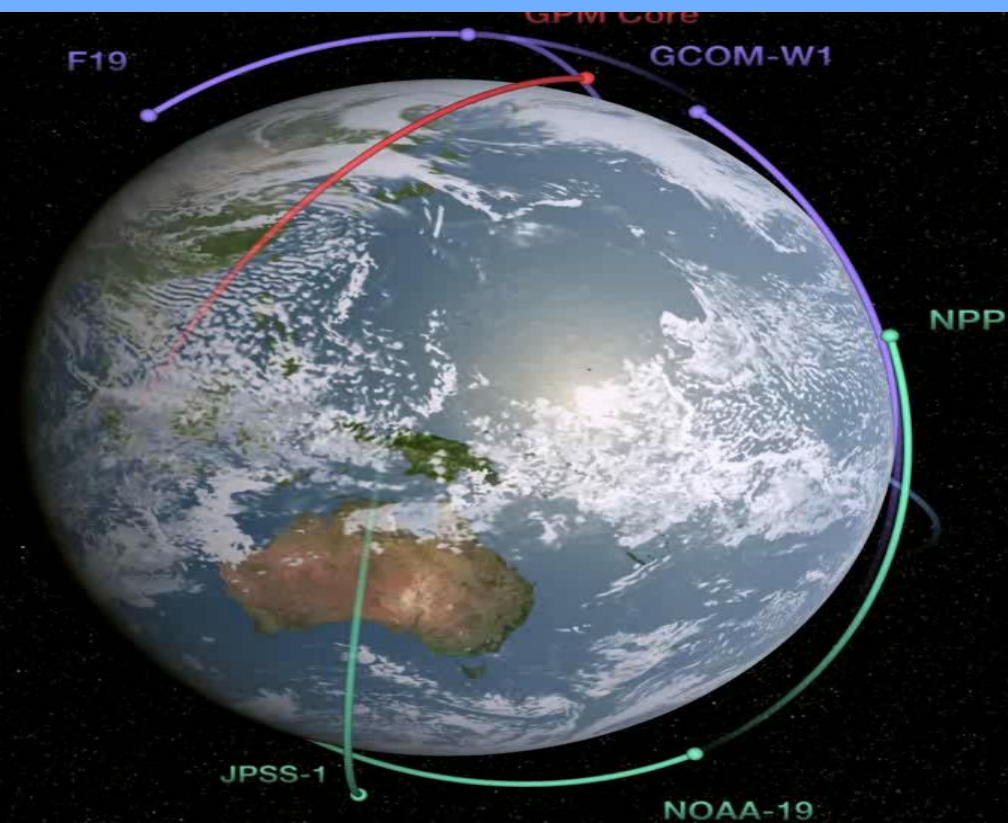
Orbita
geostazionaria



$$F = \frac{mv^2}{r} \quad F = \frac{GM_E m}{r^2}$$
$$\frac{mv^2}{r} = \frac{GM_E m}{r^2}$$
$$v = \left(\frac{GM_E}{r} \right)^{\frac{1}{2}}$$

$$T = \frac{2\pi r}{v}$$
$$T = 2\pi r \left(\frac{r}{GM_E} \right)^{\frac{1}{2}}$$
$$T = 2\pi \left(\frac{r^3}{GM_E} \right)^{\frac{1}{2}}$$

I SATELLITI POLARI

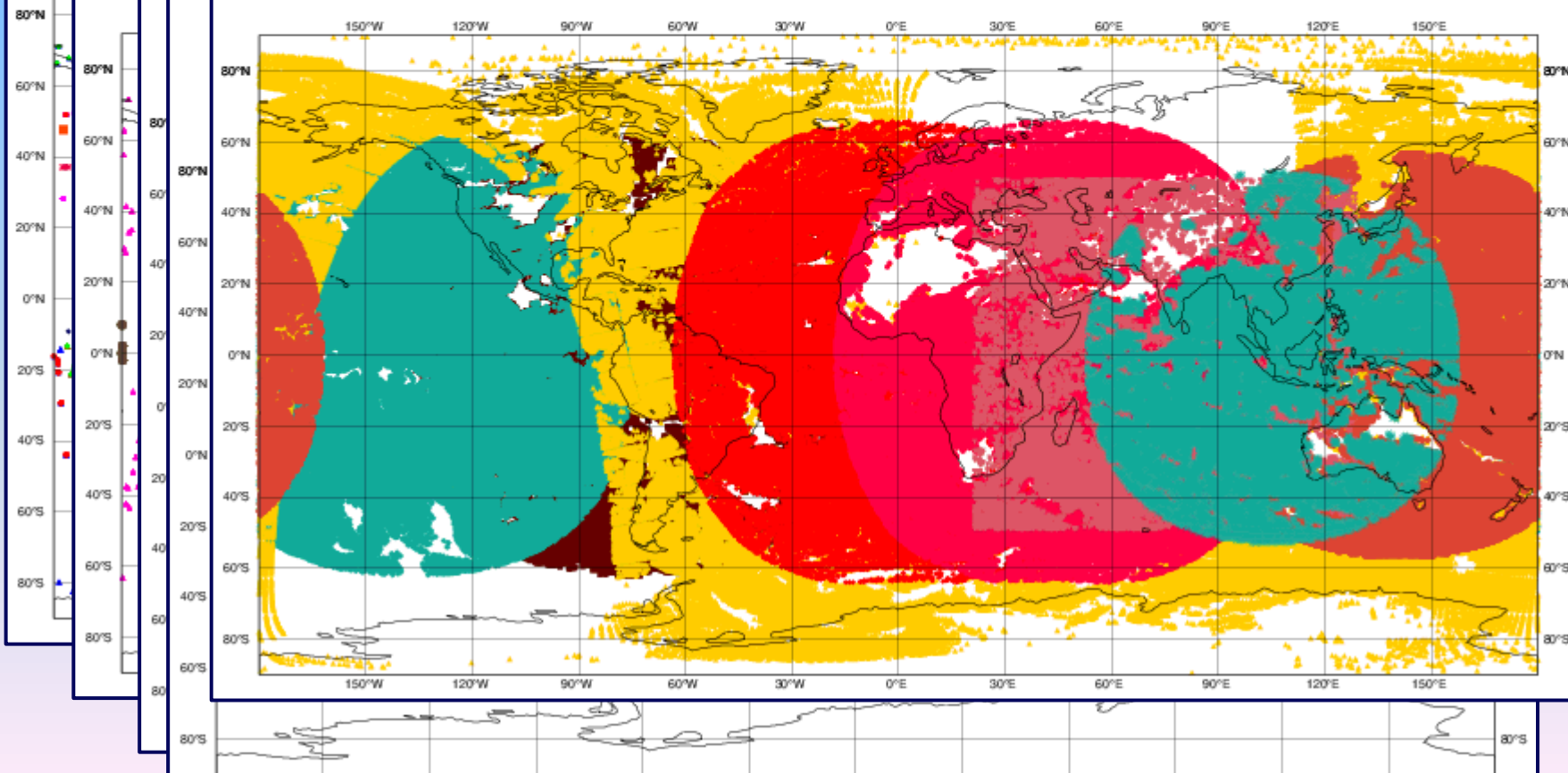


LE OSSERVAZIONI (SPARSE)

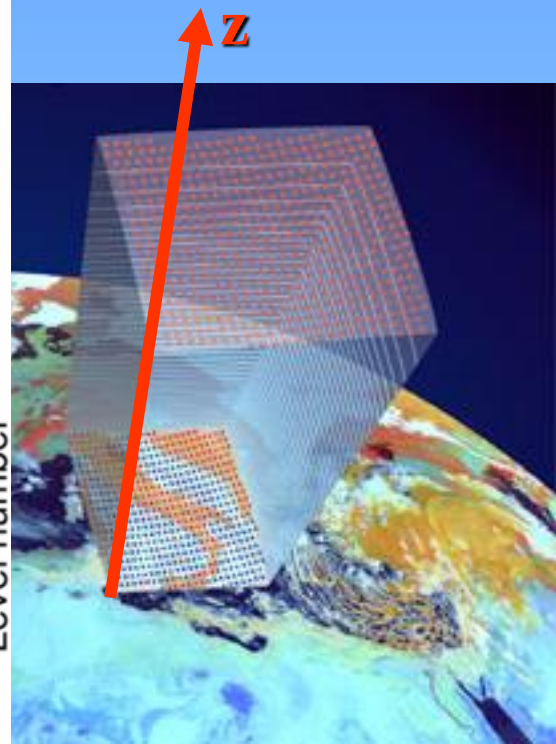
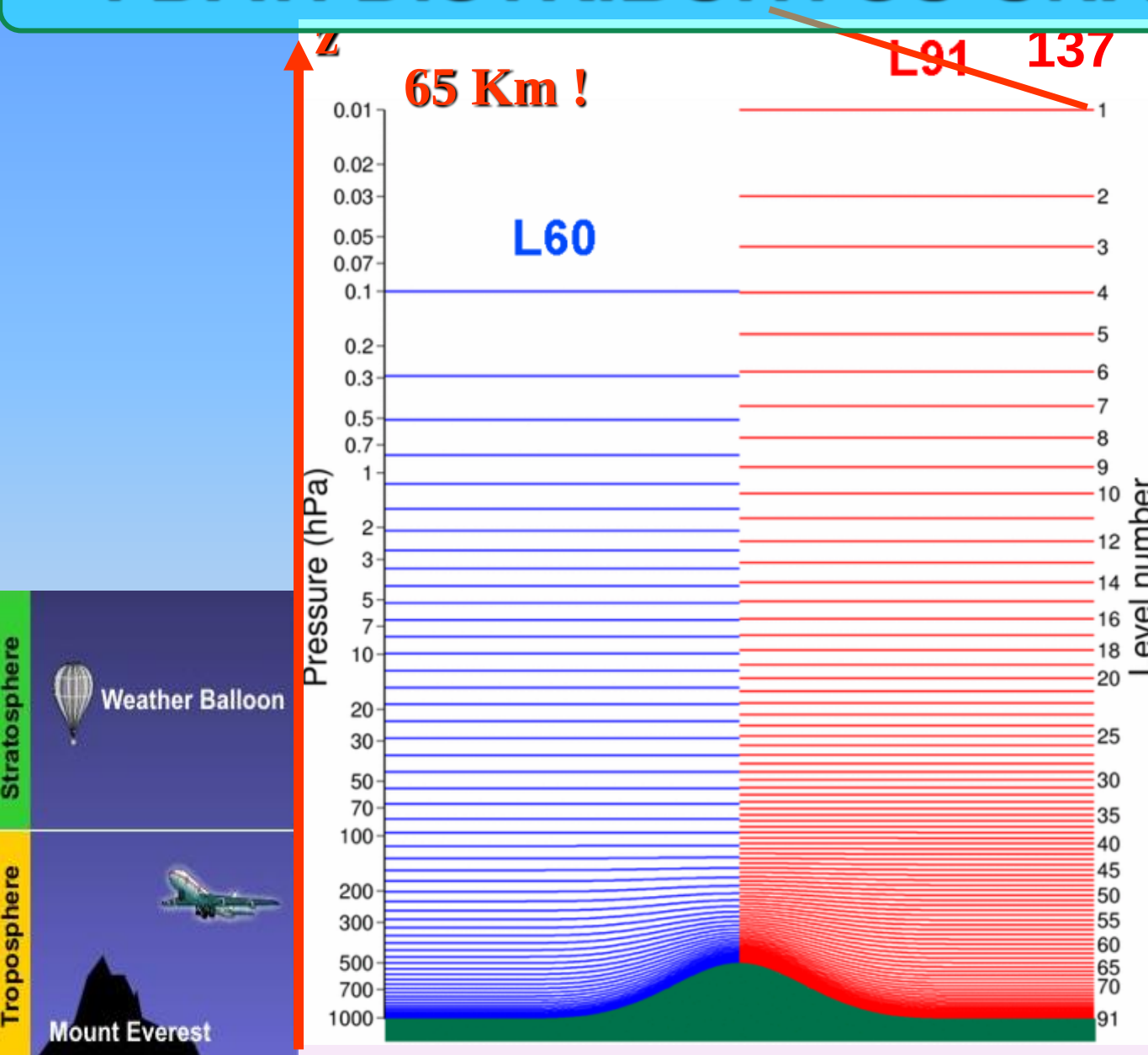
ECMWF data coverage (all observations) - SYNOP-SHIP-METAR

ECMWF data coverage (all observations) - AMV IR
2023111421 to 2023111503
Total number of obs = 1331822

- METEOSAT-9 (75722)
- ◆ METEOSAT-10 (77011)
- ▲ Dual-Metop (229467)
- ▼ INSAT-3D (38943)
- × FY-2G (24416)
- GOES-16 (377218)
- HIMAWARI-9 (148699)
- ◆ GOES-18 (360346)



I DATI DISTRIBUITI SU UNA GRIGLIA



PREVISIONE

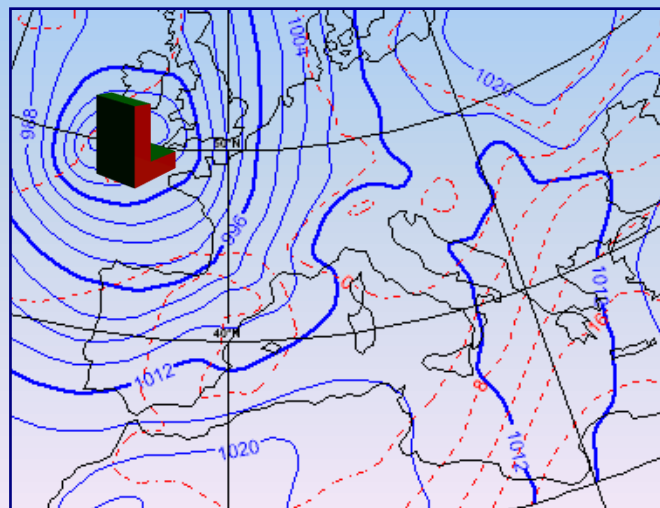
CHE TEMPO FARA' TRA UN'ORA
DOMANI, DOPODOMANI....????????

STATO INIZIALE
MAPPE
DIAGNOSI

ELABORAZIONE
PROGNOSI
OGGETTIVA

STATO FUTURO
MAPPE
PROGNOSI

OGGI



Leggi

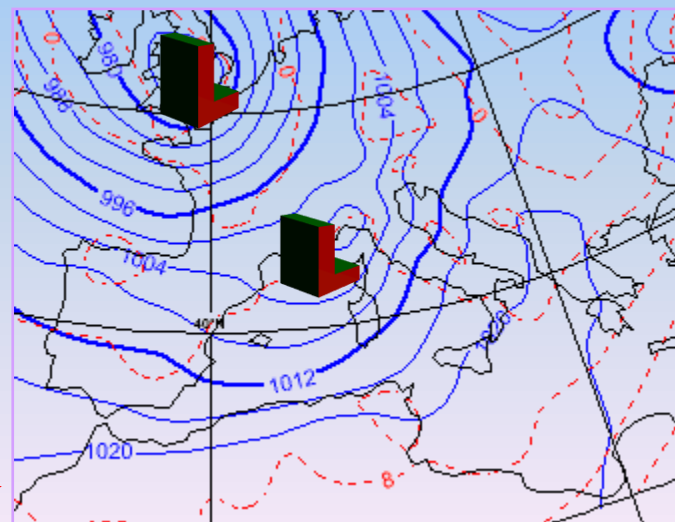
Fisica Atmosfera

Equazioni

Prognostiche

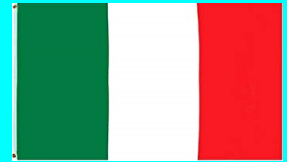
tempo

DOMANI

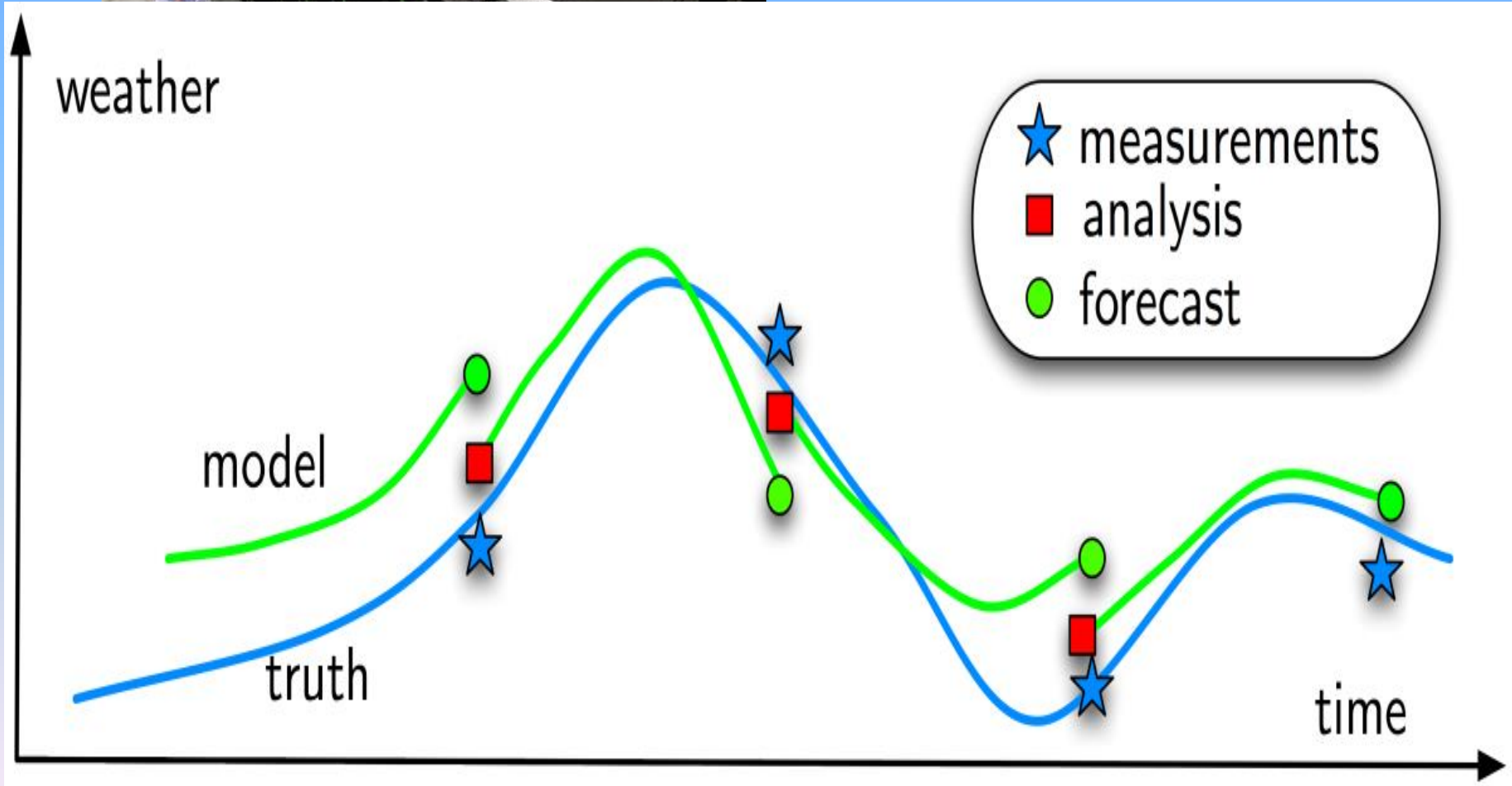


IL SUPERCALCOLO

Nuova sede europea Bologna!



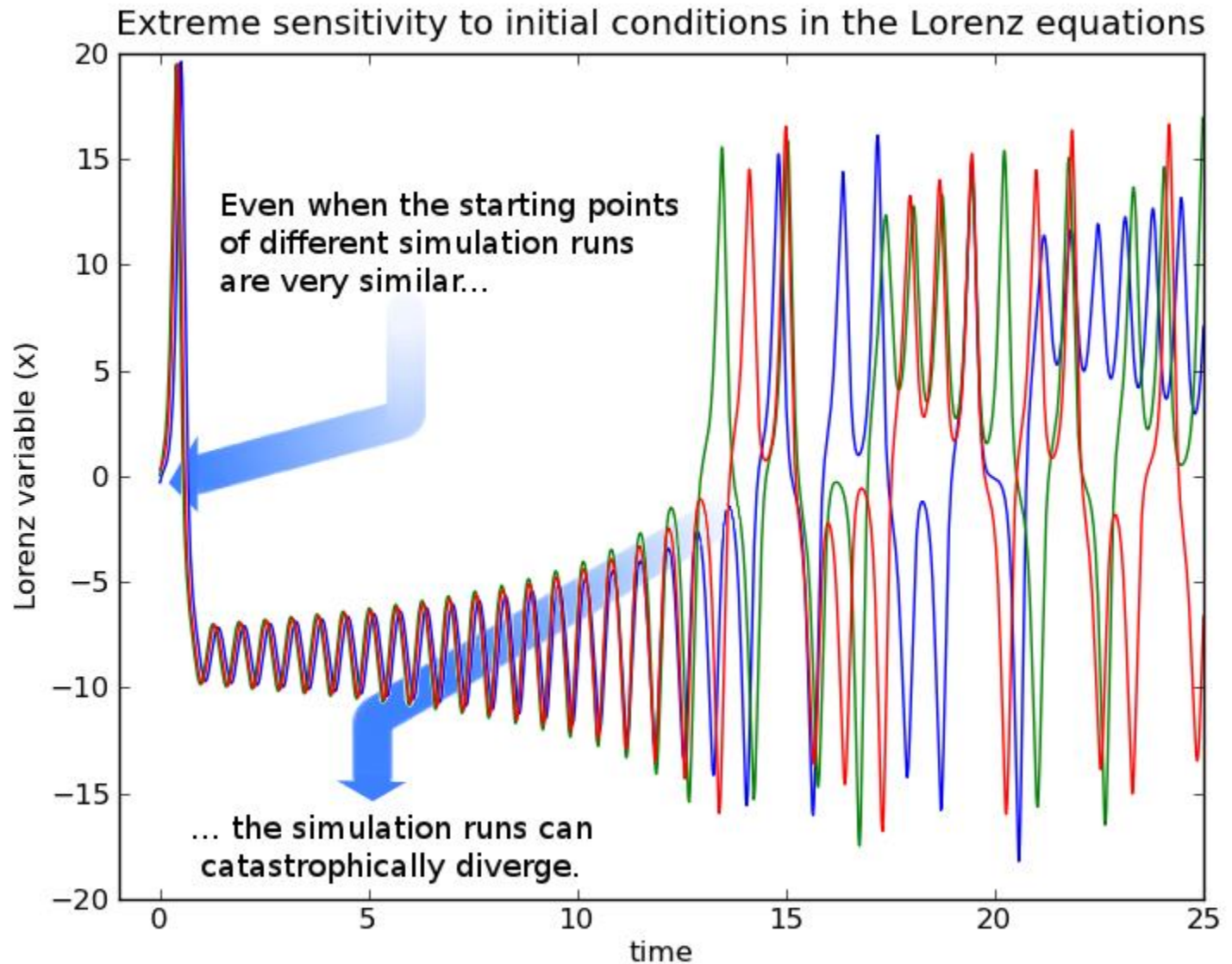
Ordo et connexio idearum idem est ac ordo et connexio rerum
(Spinoza, *Ethica*, II, pr. VII)



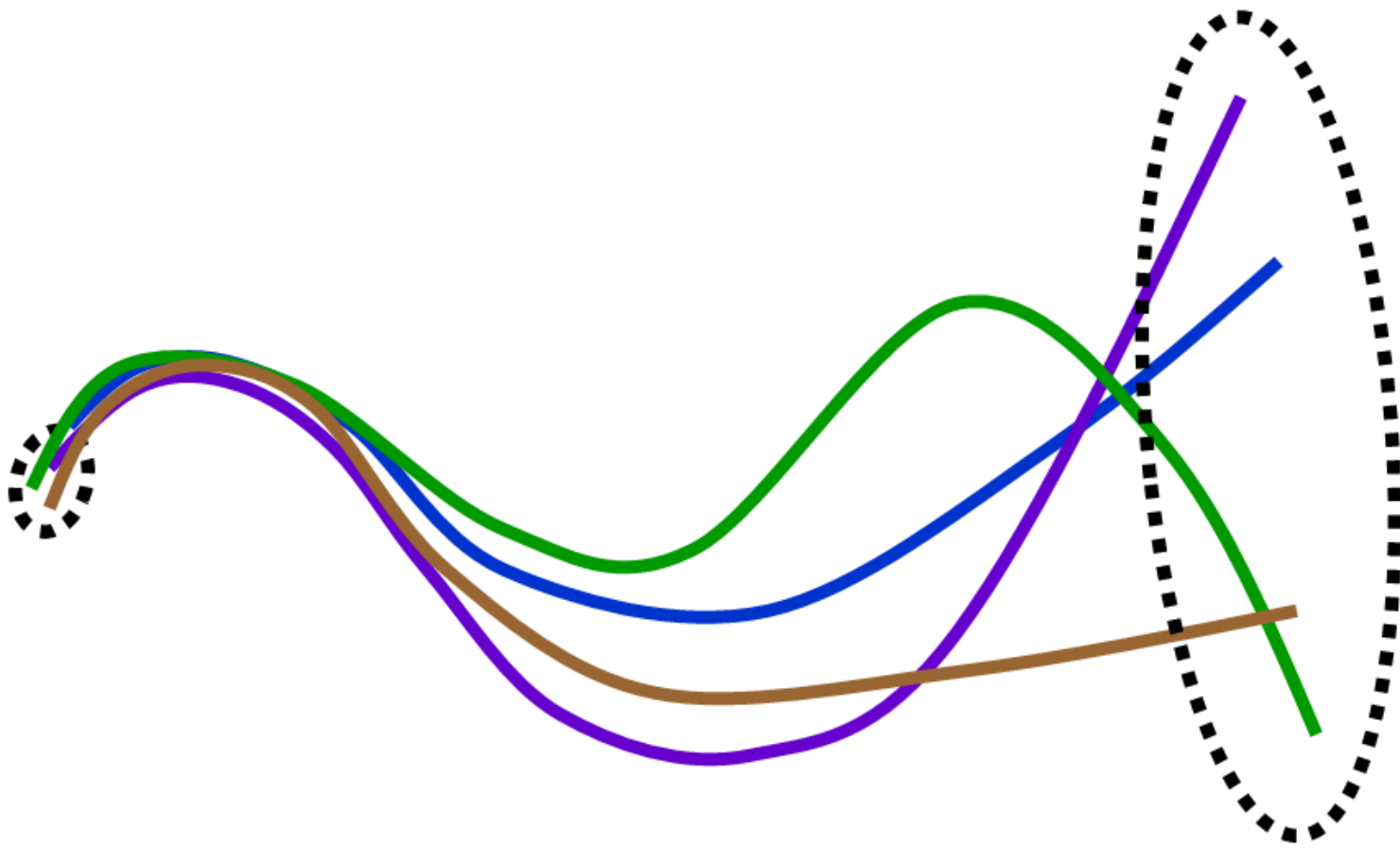
Teoria del Caos



E. Lorenz
(1960)



Previsioni di insieme



PREVISIONI A 30-45 GIORNI

2 m temperature: Weekly mean anomalies

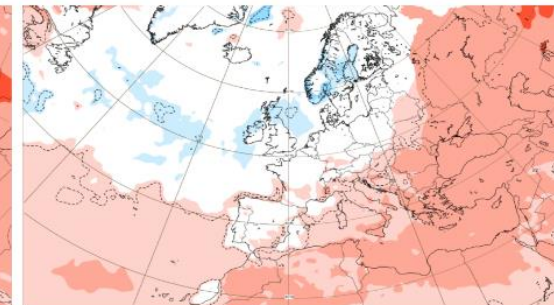
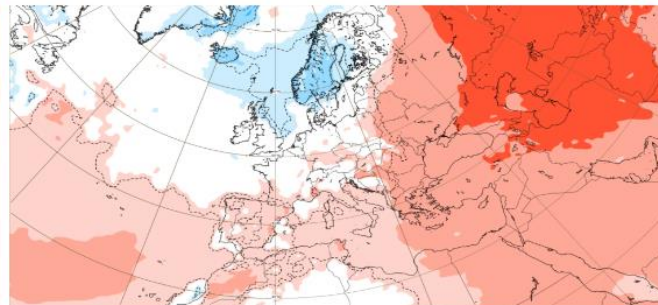
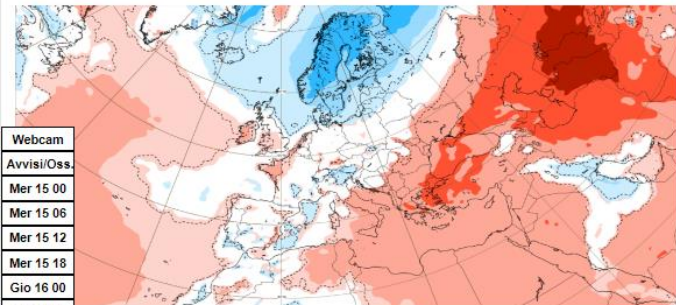
Base time: Tue 14 Nov 2023 Valid time: Mon 20 Nov 2023 - Mon 27 Nov 2023 (+12h) Area: Europe

2 m temperature: Weekly mean anomalies

Base time: Tue 14 Nov 2023 Valid time: Mon 27 Nov 2023 - Mon 04 Dec 2023 (+48h) Area: Europe

2 m temperature: Weekly mean anomalies

Base time: Tue 14 Nov 2023 Valid time: Mon 04 Dec 2023 - Mon 11 Dec 2023 (+48h) Area: Europe



- Webcam
- Avvisi/Oss.
- Mer 15 00
- Mer 15 06
- Mer 15 12
- Mer 15 18
- Gio 16 00
- Gio 16 06
- Gio 16 12
- Gio 16 18
- Ven 17 00
- Ven 17 06
- Ven 17 12
- Ven 17 18
- Sab 18 00
- Sab 18 06
- Sab 18 12
- Sab 18 18
- Dom 19 00
- Dom 19 06
- Dom 19 12
- Dom 19 18
- Lun 20 00
- Lun 20 06
- Lun 20 12
- Lun 20 18
- Mar 21 00
- Mar 21 06
- Mar 21 12
- Mar 21 18
- Mer 22 00
- Plumes
- Mensili



© 2023 European Centre for Medium-Range Weather Forecasts (ECMWF)
Source: operational forecast
Dataset: EC-Earth v3.4.0 (EC-Earth v3.4.0) (https://www.ecmwf.int/en/forecasts/operational-forecast)
Created at 2023-11-15 10:15:00 UTC



© 2023 European Centre for Medium-Range Weather Forecasts (ECMWF)
Source: operational forecast
Dataset: EC-Earth v3.4.0 (EC-Earth v3.4.0) (https://www.ecmwf.int/en/forecasts/operational-forecast)
Created at 2023-11-15 10:15:00 UTC

Precipitation: Weekly mean anomalies

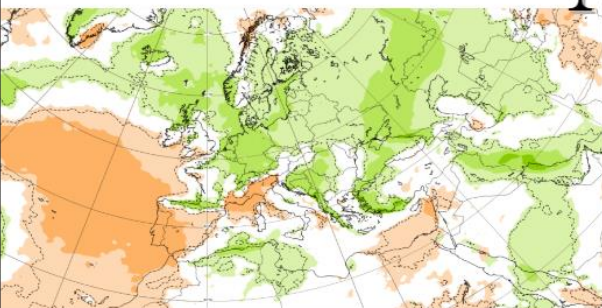
Base time: Tue 14 Nov 2023 Valid time: Mon 20 Nov 2023 - Mon 27 Nov 2023 (+12h) Area: Europe

Precipitation: Weekly mean anomalies

Base time: Tue 14 Nov 2023 Valid time: Mon 27 Nov 2023 - Mon 04 Dec 2023 (+48h) Area: Europe

Precipitation: Weekly mean anomalies

Base time: Tue 14 Nov 2023 Valid time: Mon 04 Dec 2023 - Mon 11 Dec 2023 (+48h) Area: Europe



Osservazioni

Vento e Mare

Pioggia

Neve

Gelicidio

Nebbia

Temporal

Temperatura

Avvisi

Mensili

Link utili

info

Homepage

Mensili

Uno sguardo alle prossime settimane, Periodo: 13 NOVEMBRE – 10 DICEMBRE 2023 (EMISSIONE: Venerdì 10/11/2023– PROSSIMA EMISSIONE Venerdì 17/11/2023)

Il carattere caotico dell'atmosfera comporta che le previsioni meteorologiche con indicazioni di dettaglio sull'evoluzione del tempo in singole località (previsioni di tipo classico), non possano estendersi temporalmente solo a pochi giorni: oltre tale termine la previsione risulta inaffidabile. Le previsioni a lunga scadenza costituiscono l'ultima frontiera della



Sintesi Previsioni Mensili sull'Italia (13 NOVEMBRE – 10 DICEMBRE 2023)

Emissione 10/11/2023 (prossima emissione Venerdì 17/11/2023)



		13 – 19 NOVEMBRE 2023	20 – 26 NOVEMBRE 2023	27 NOV–3 DIC 2023	4 – 10 DICEMBRE 2023
 NORD	Tendenza	 	 	 	 
 CENTRO	Tendenza	 	 	 	 
 SUD	Tendenza	 	 	 	 

Legenda:

tendenza pluviometrica



sotto media



in media



sopra media

tendenza termica



sotto media



in media



sopra media

NB: Per valori di periodo (*in media*) si intende il manifestarsi di condizioni che non si discostano in modo significativo dalle medie climatologiche del periodo;
Le colorazioni associate ai simboli di *temperatura* e *precipitazione* indicano il manifestarsi di valori più bassi (*sotto media*) o più alti (*sopra media*) rispetto ai valori di periodo.

Come nella settimana precedente sembra confermarsi una circolazione caratterizzata da una lieve curvatura ciclonica. I valori pluviometrici risultano nel complesso in linea con la media climatologica, mostrando solamente un lieve segnale sopra la media sulle regioni centrali tirreniche e sulle Isole Maggiori. Ancora anomalia positiva per il quadro termico, specie al Nord-Ovest.

PREVISIONI A 3-6 MESI

ECMWF Seasonal Forecast

Prob(2m temperature > upper tercile)

Forecast start is 01/11/23, climate period is 1991-2020

Ensemble size = 51, climate size = 600

System 5

Dec 2023/24

Dic – Gen- Feb



ECMWF Seasonal Forecast

Prob(precipitation > upper tercile)

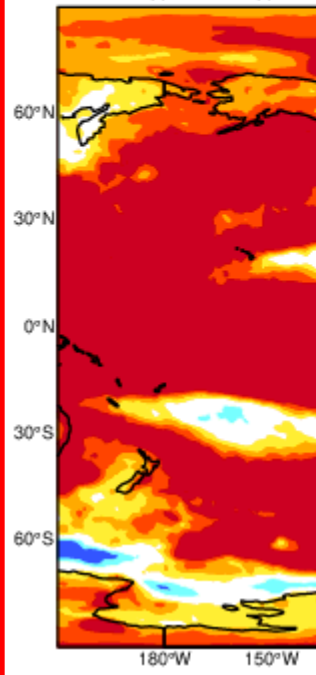
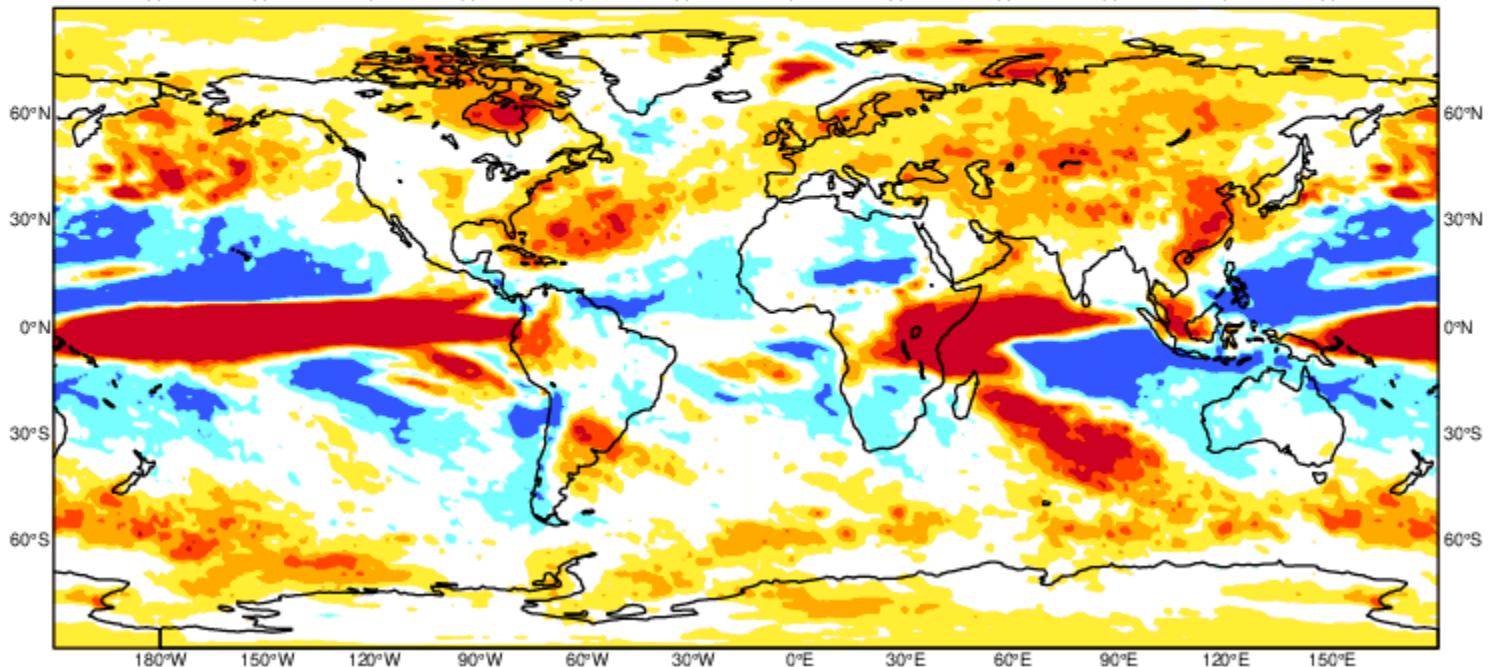
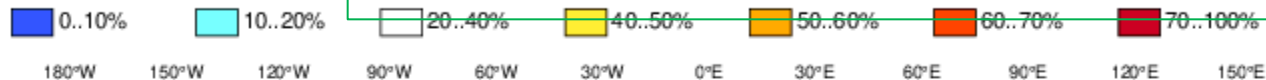
Forecast start is 01/11/23, climate period is 1991-2020

Ensemble size = 51, climate size = 600

System 5

Dec 2023/24

Dic – Gen- Feb

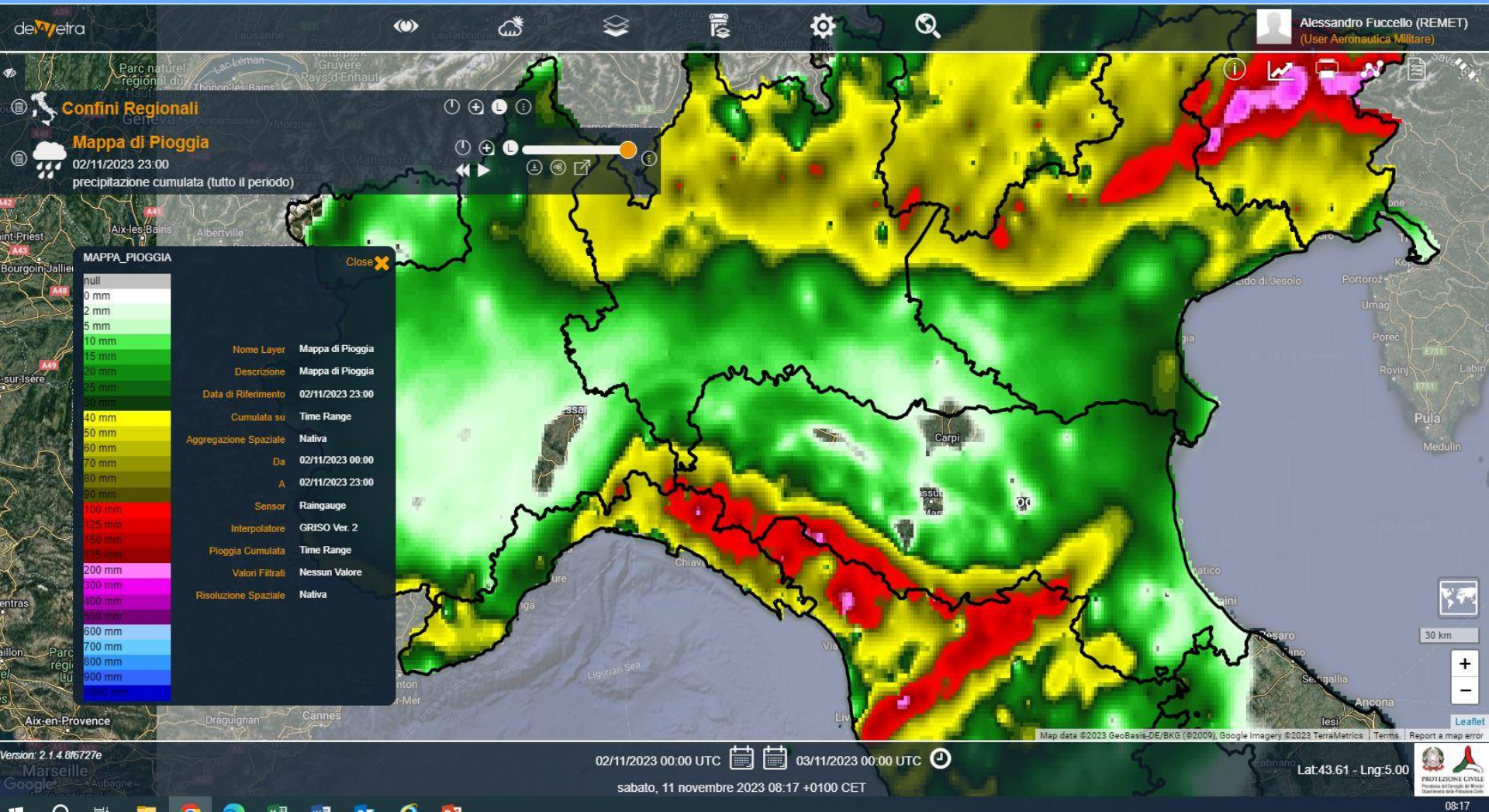


Alluvione Toscana 2-3 novembre 2023



Aumenta il bilancio dei morti per l'alluvione in Toscana, trovato il corpo dell'ottava vittima a Prato





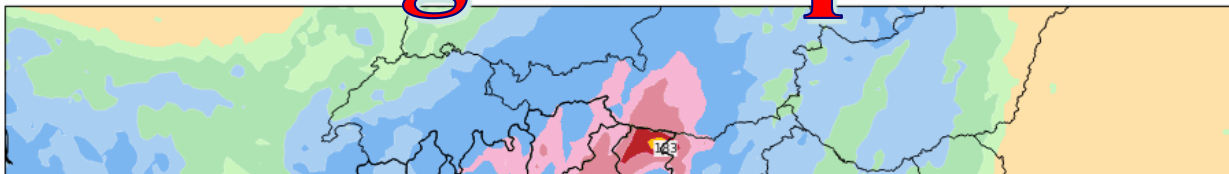


2 giorni prima

ECMWF 01 November 2023 00UTC

Prognosis + 48 V. Friday 03 November 2023 12UTC

24h accumulated precipitation (mm)

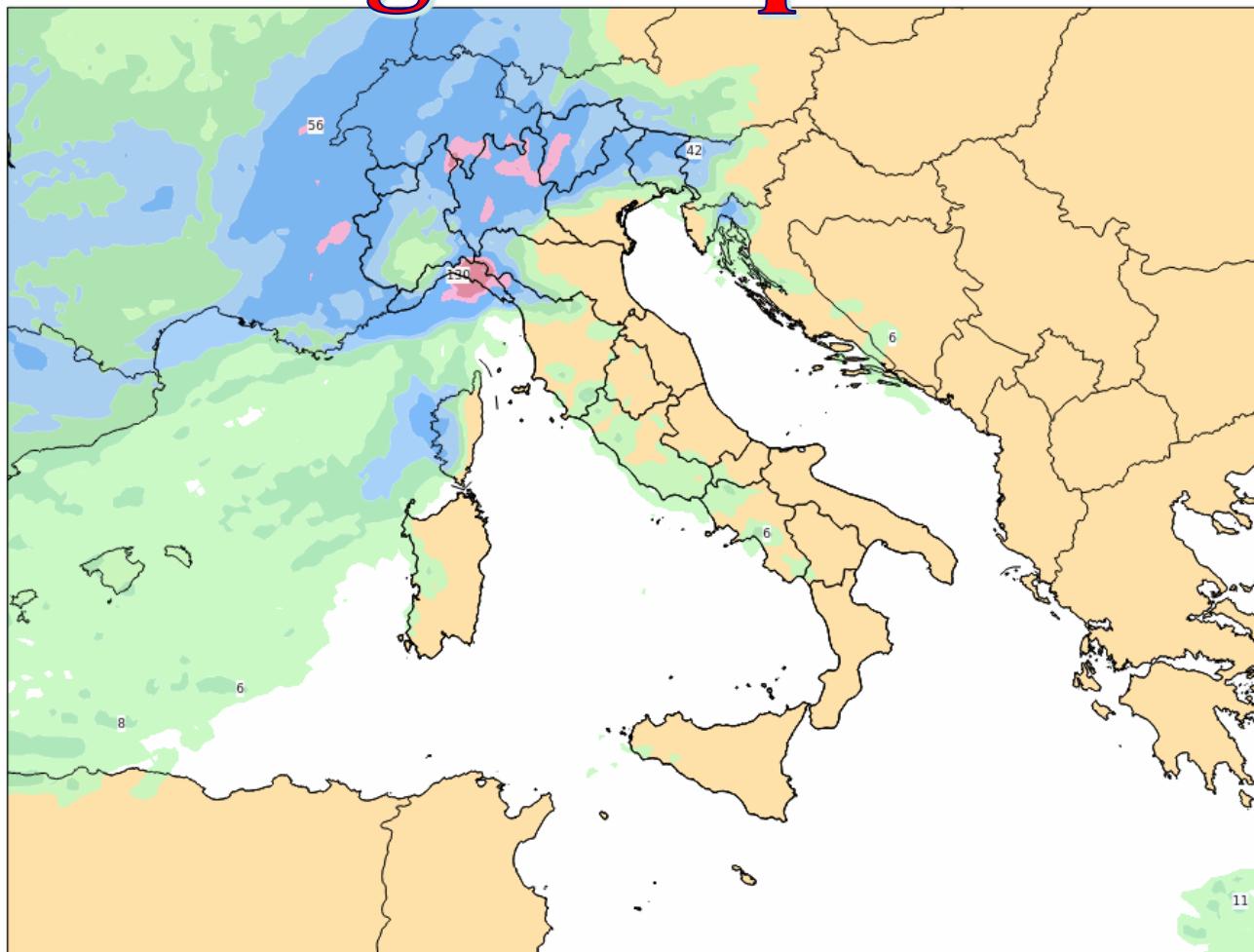


7 giorni prima

ECMWF 27 October 2023 12UTC

Prognosis + 48 V. Friday 03 November 2023 12UTC

24h accumulated precipitation (mm)

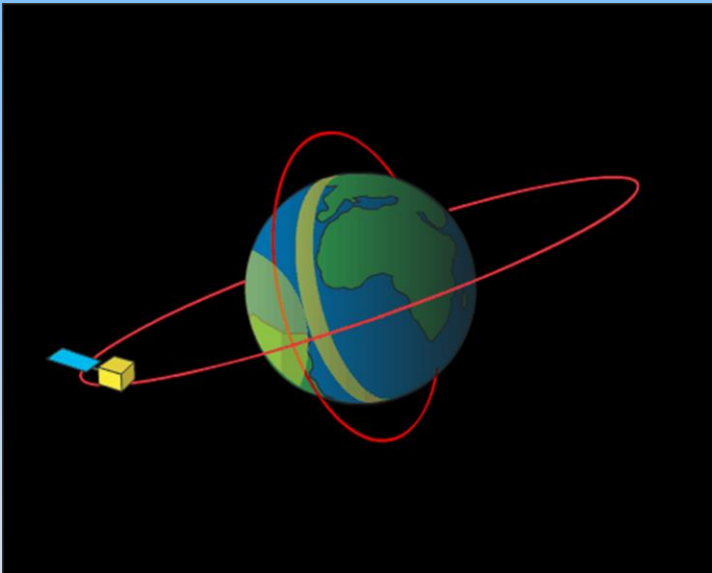


SINTESI

PREVISIONE LUNGA SCADENZA



DAL PRESENTE AL FUTURO



EFFETTO FARFALLA

