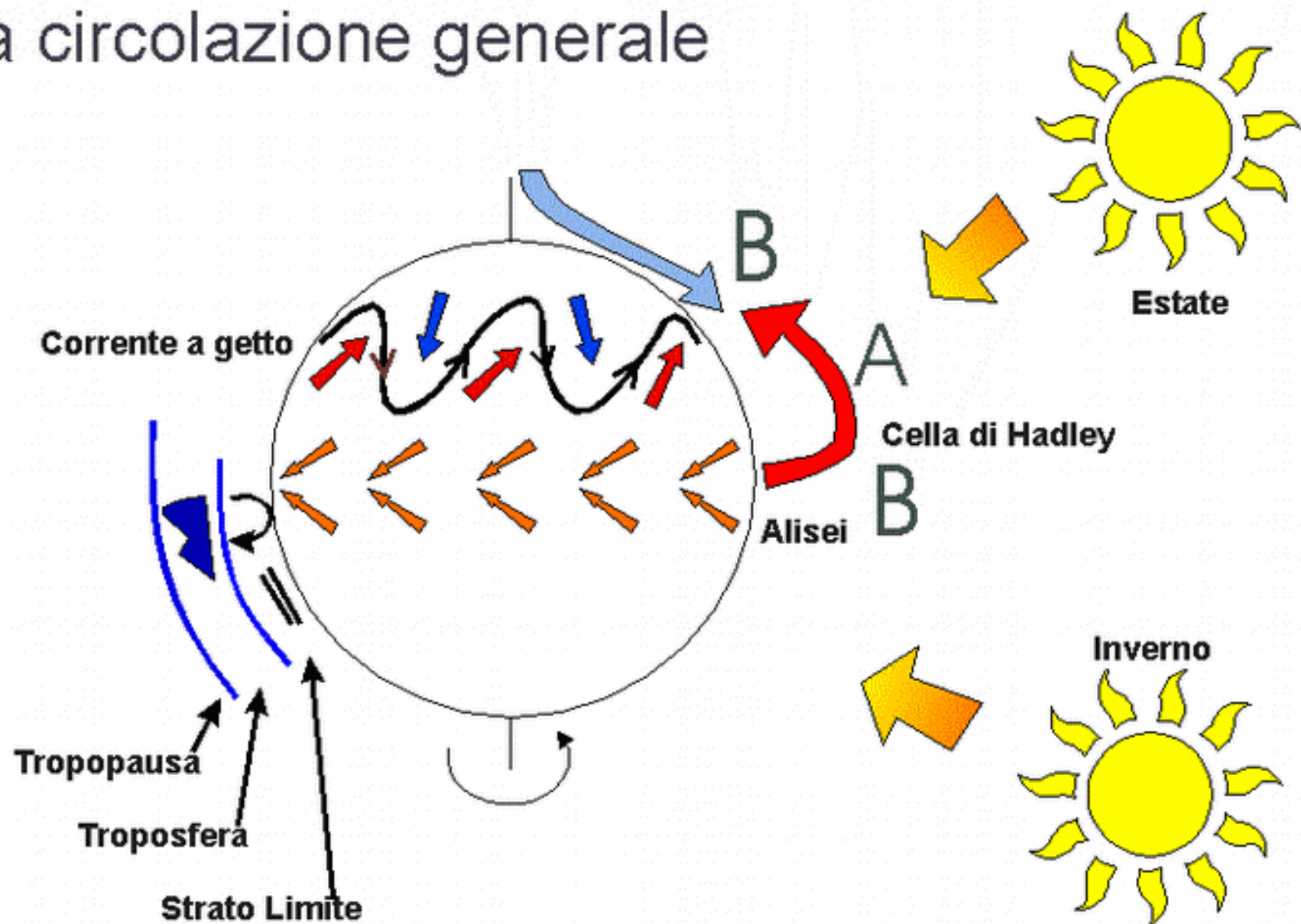
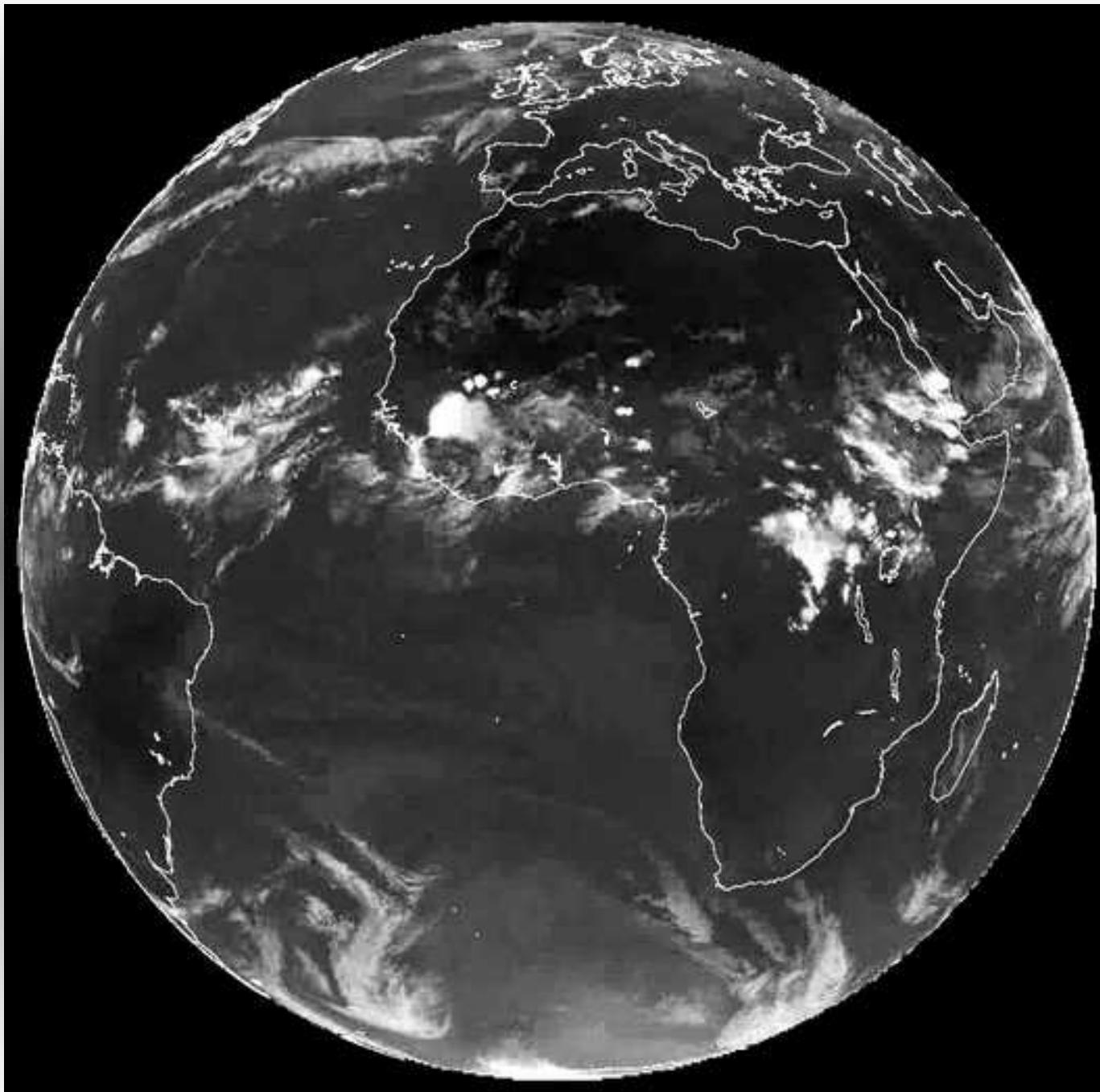


Meteorologia per Alpinisti - Paolo Valisa (CGP)

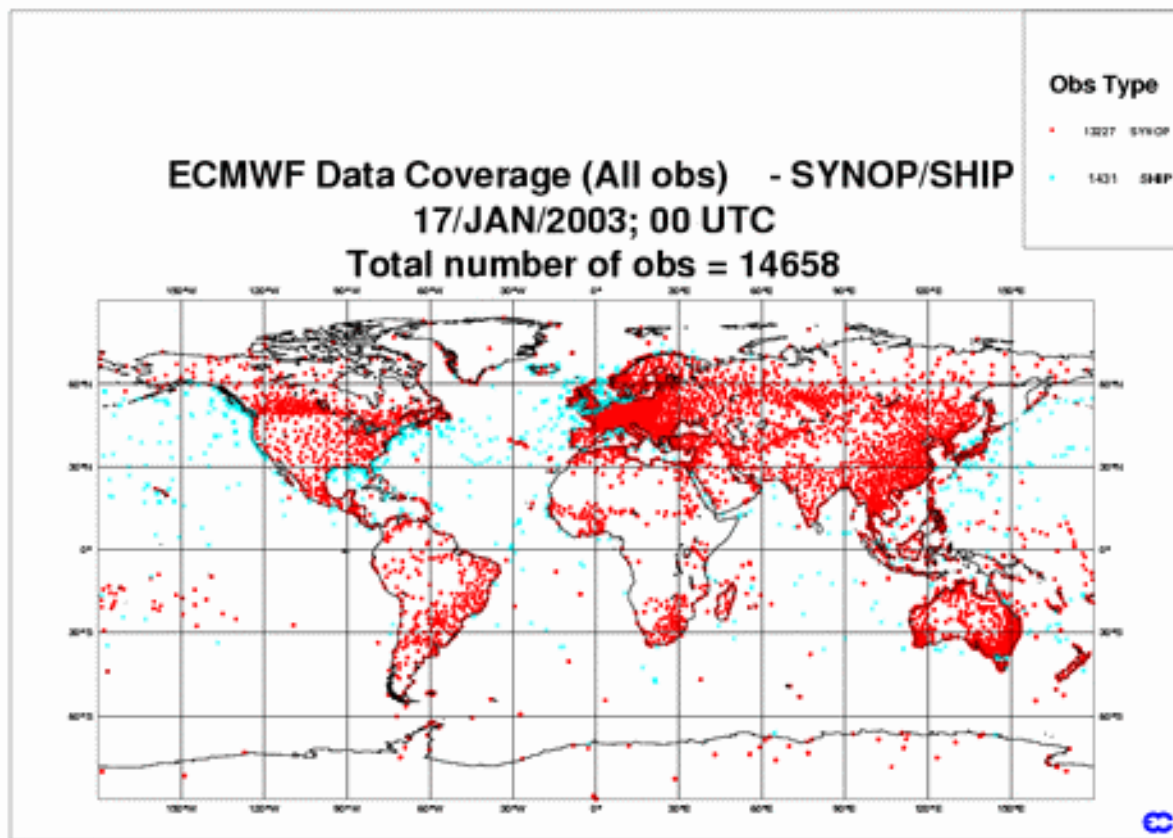


La circolazione generale





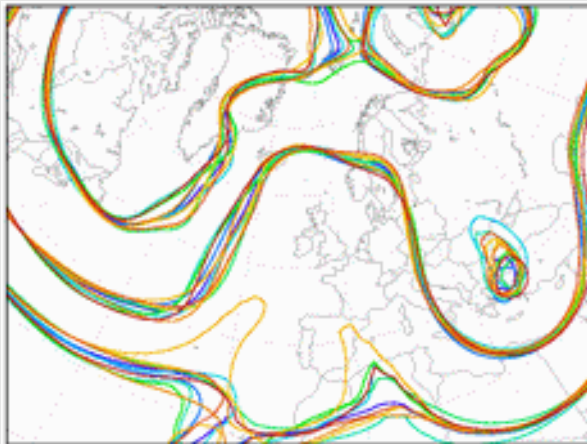
**3 giorni della
nostra atmosfera**



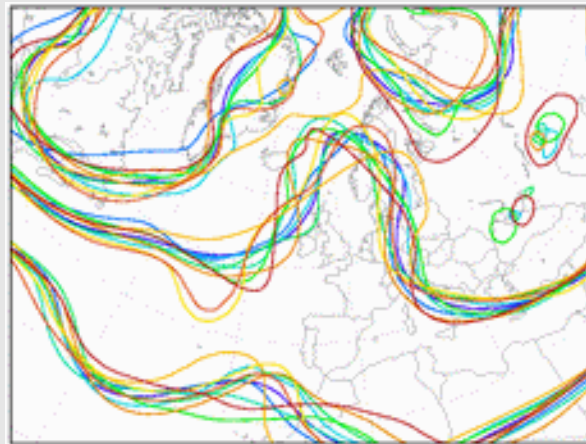
→ **Analisi**
↓



↓
Modello
↓



1 giorno



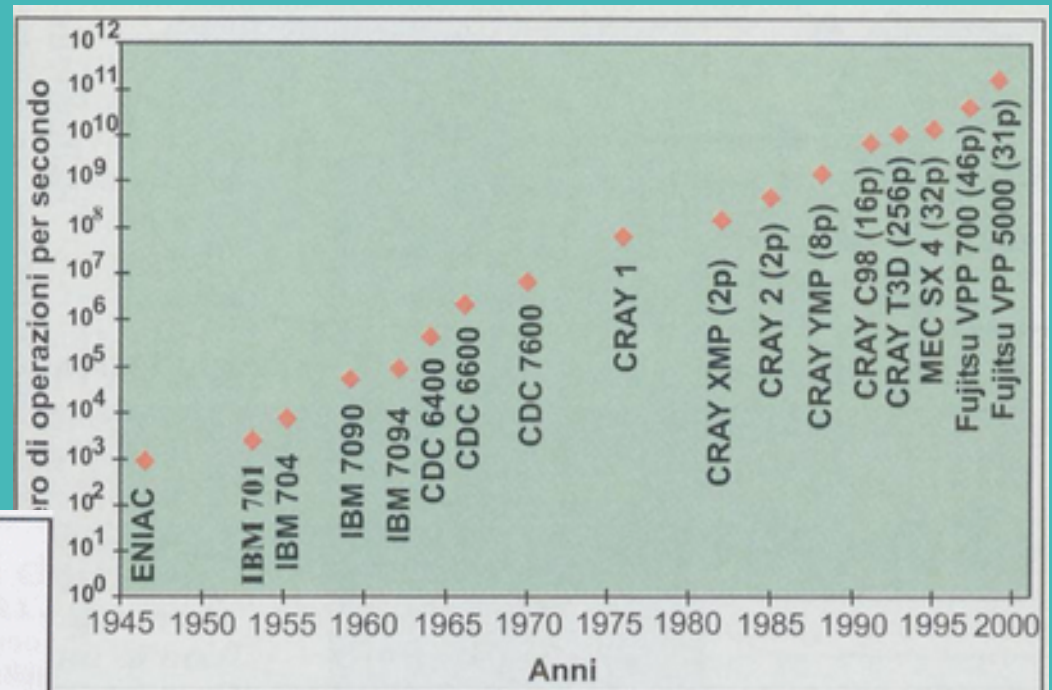
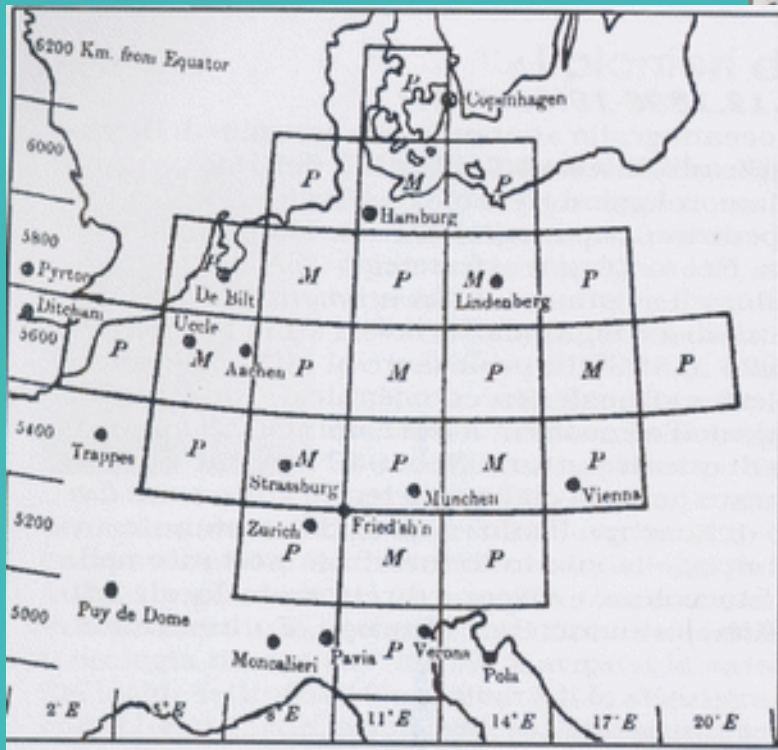
3 giorni



6 giorni

La nascita della previsione numerica

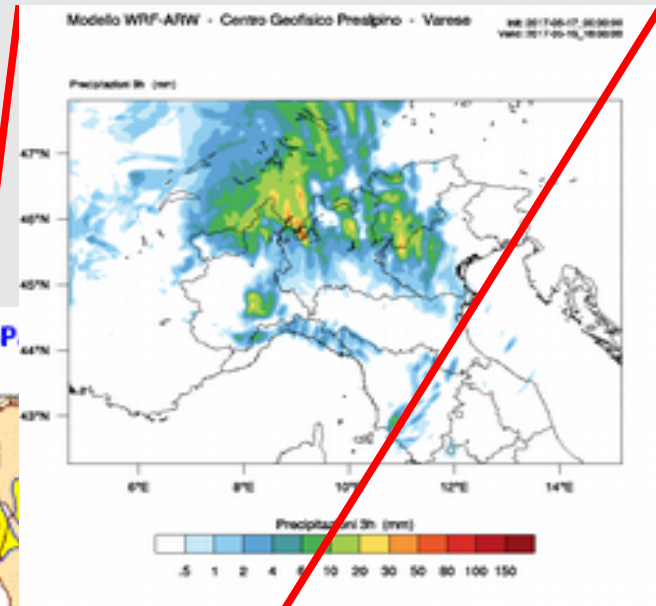
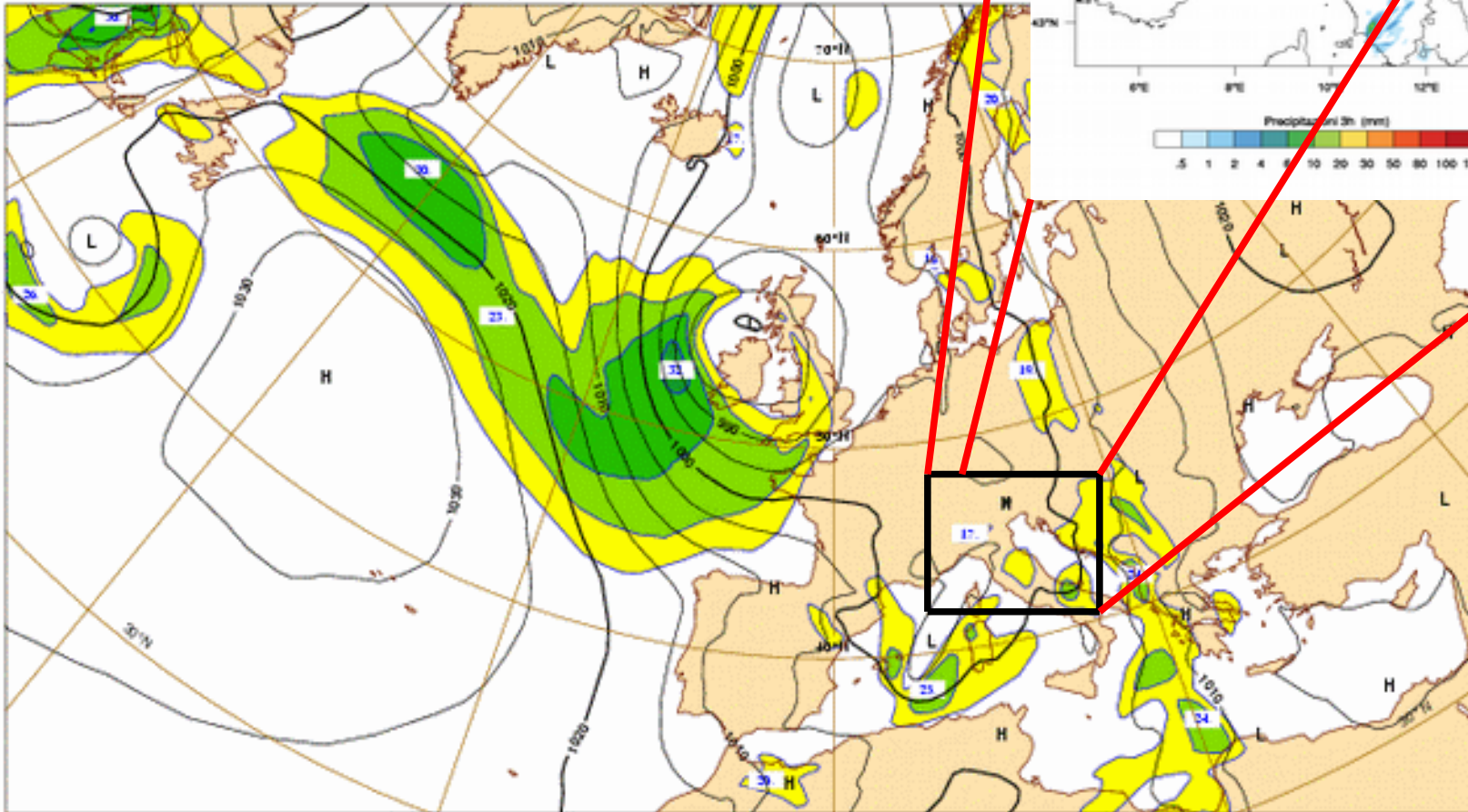
Tra il 1916 e il 1920 Lewis F. Richardson prova a calcolare a mano l'evoluzione dell'atmosfera per le 6 ore successive. Le soluzioni trovate sono assolutamente irrealiste poiché mancano di inizializzazione e i metodi di integrazione non sono stabili.



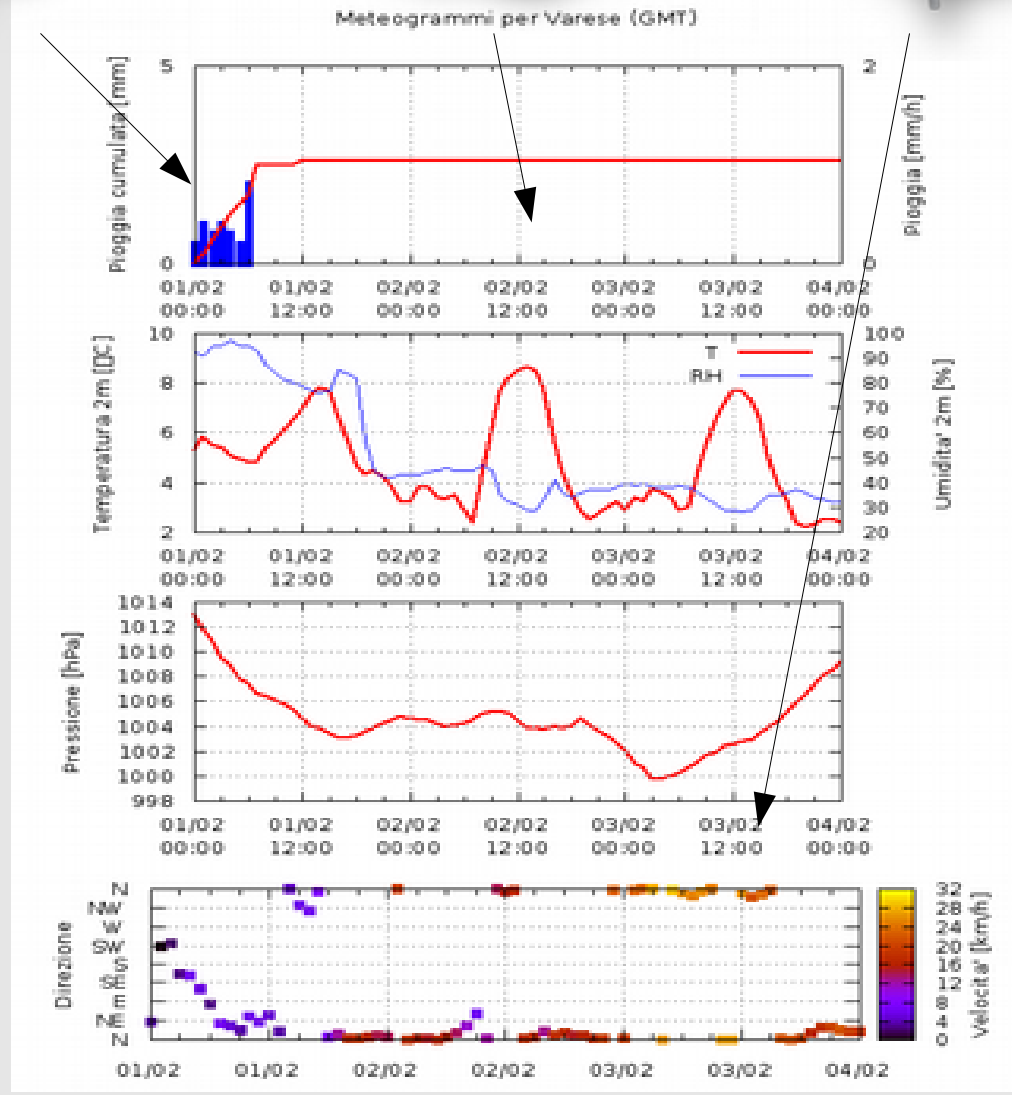
Forse un tempo, nel lontano futuro, sarà possibile procedere coi calcoli più velocemente di quanto procedono i fenomeni meteorologici, a un costo inferiore ai risparmi che l'umanità potrà fare grazie alle informazioni ricevute. Ma questo è un sogno ... (Lewis Fry Richardson - 1922)

Dai modelli numerici
globali ai LAM
(Local Area Models)

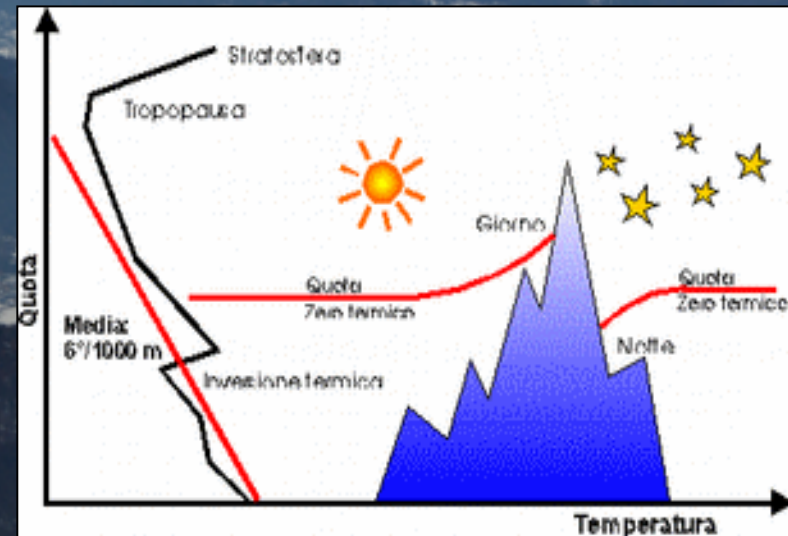
Saturday 1 May 2004 12UTC ECMWF Forecast 14-72 VT: Tuesday 4 May 2004 12UTC 850 hPa
SURFACE: MSL Pressure / 850-hPa wind speed



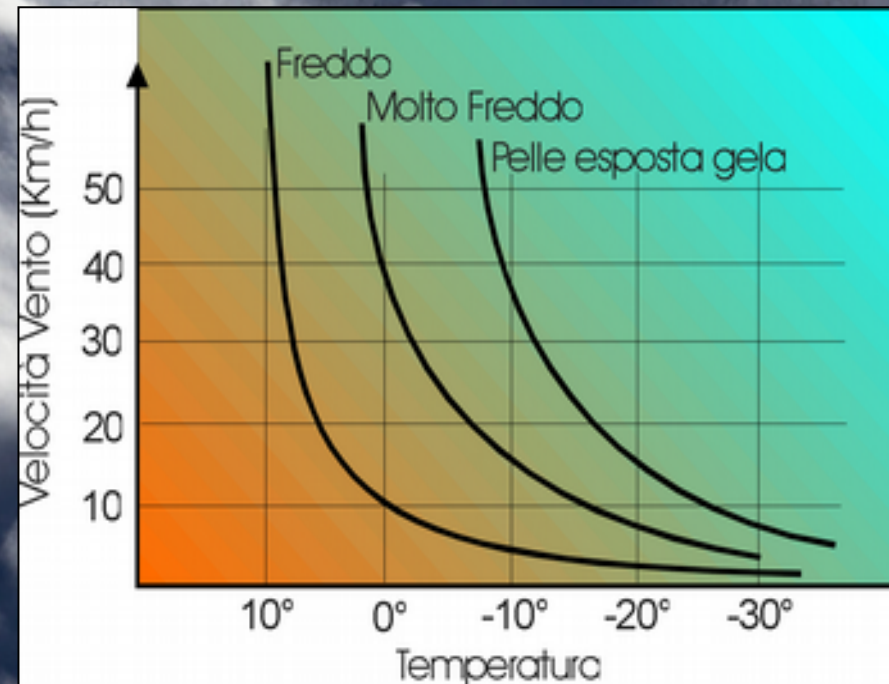
Dal meteogramma ai pittogrammi



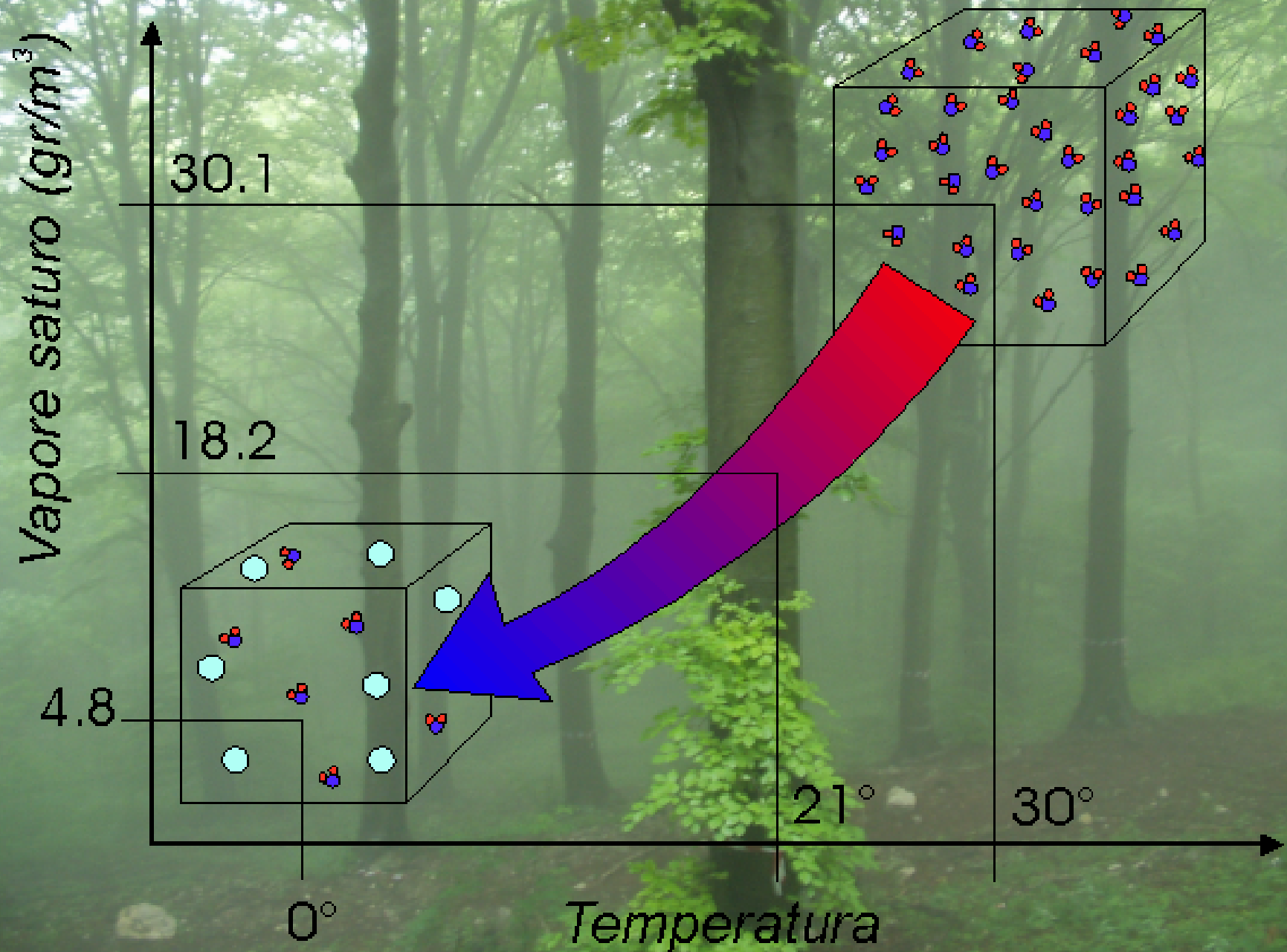
La temperatura: Zero termico e limite della neve



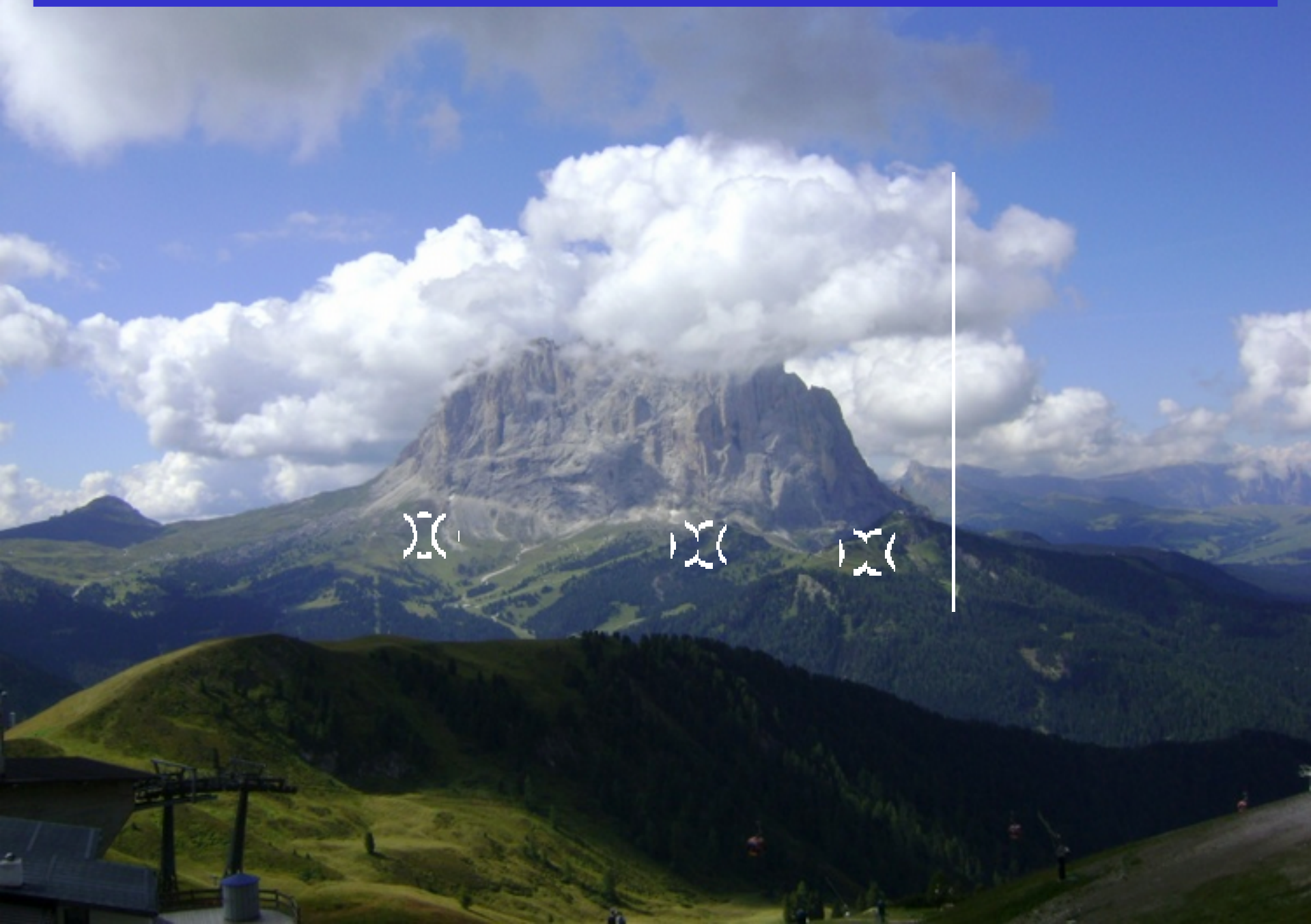
Temperatura e sensazione di freddo. L'effetto del vento (windchill)



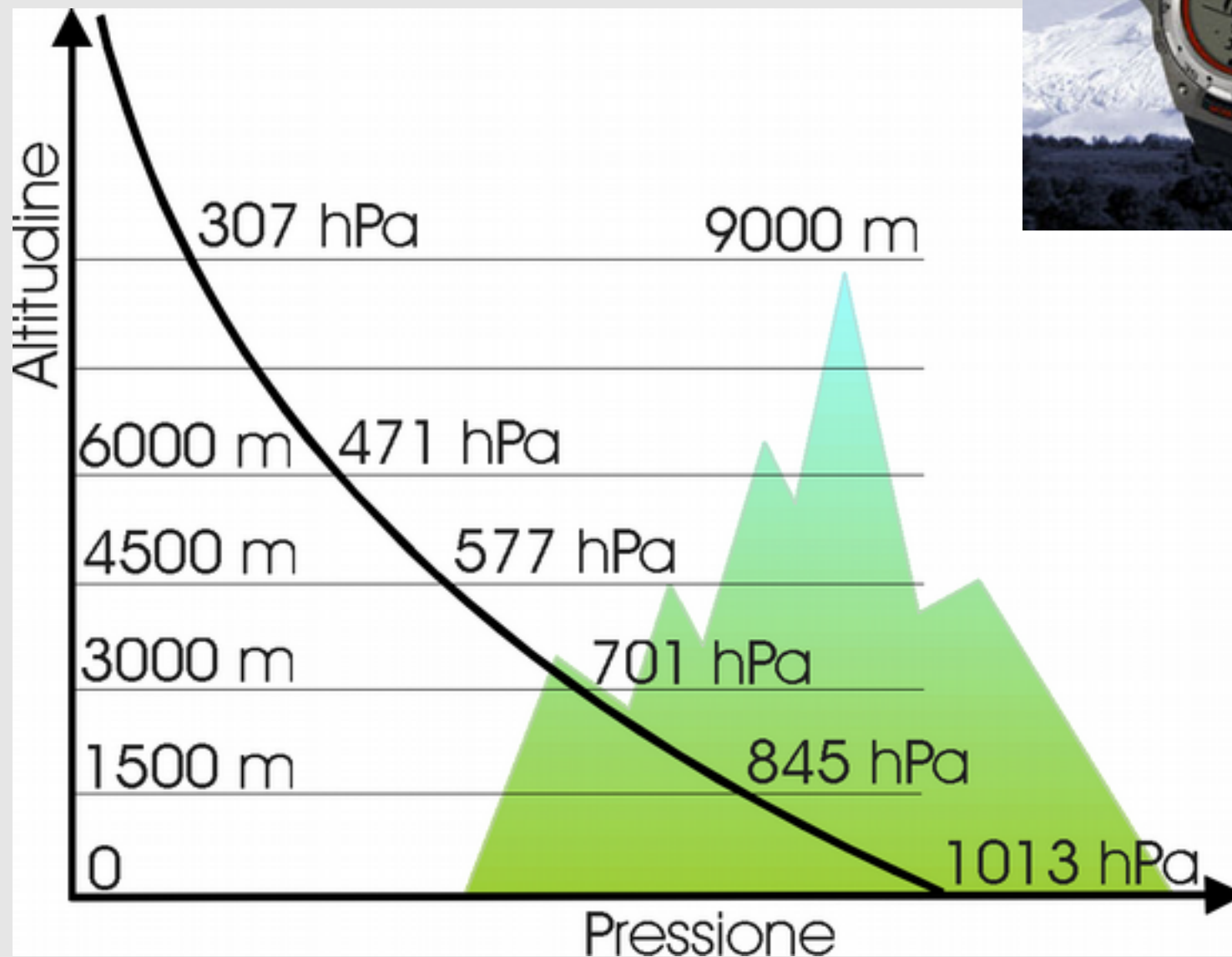
Il vapor acqueo nell'atmosfera: L'umidità relativa



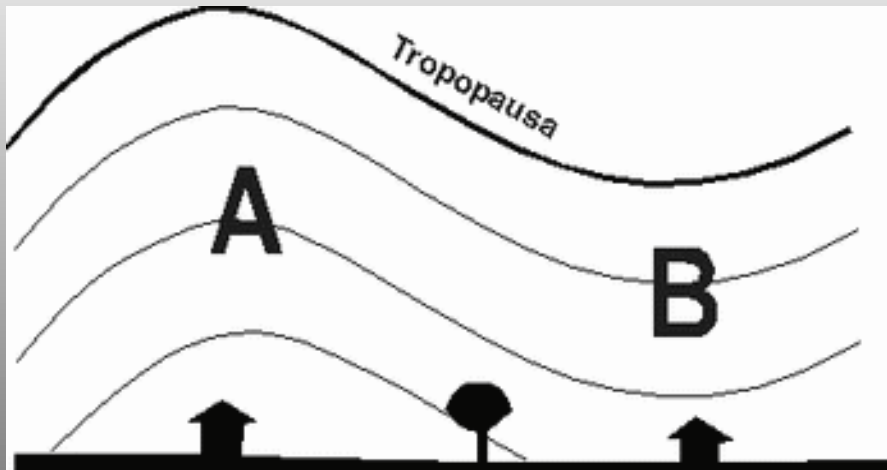
L'aria che sale si raffredda e arriva a condensazione: è nata una nube!



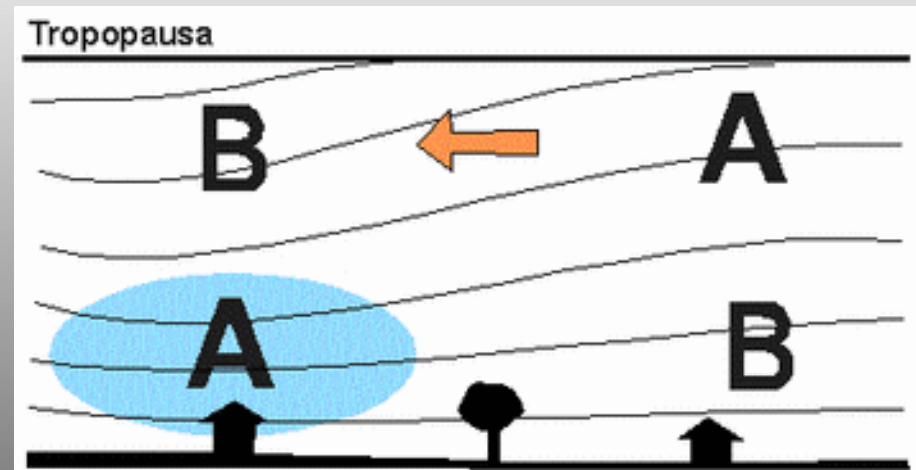
La pressione atmosferica e l'altitudine



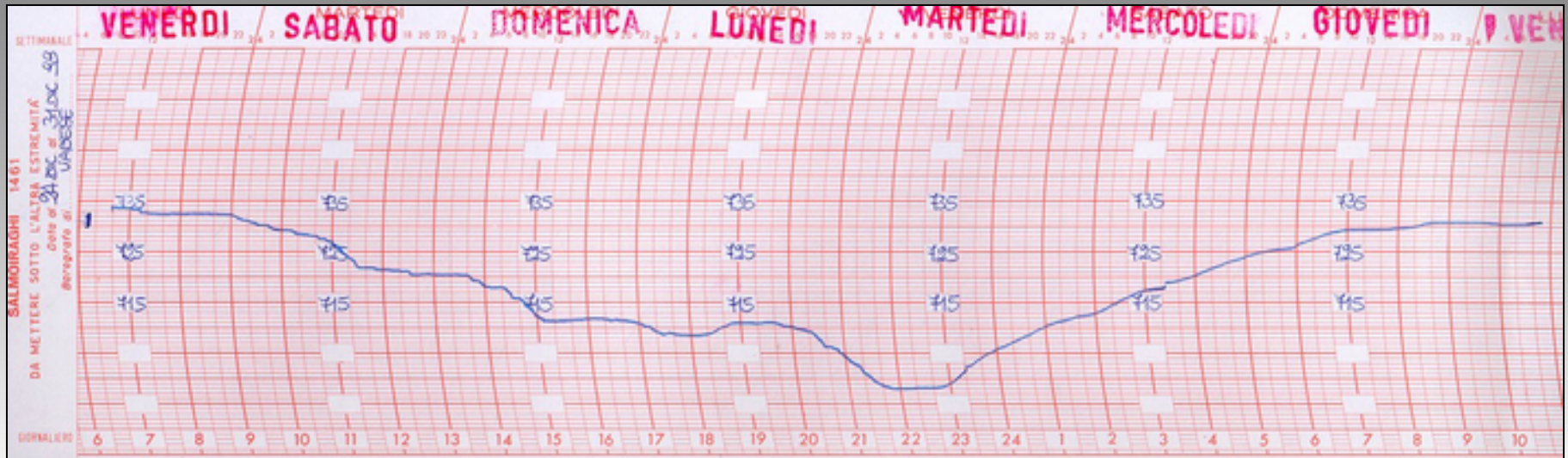
Perché varia la pressione Atmosferica



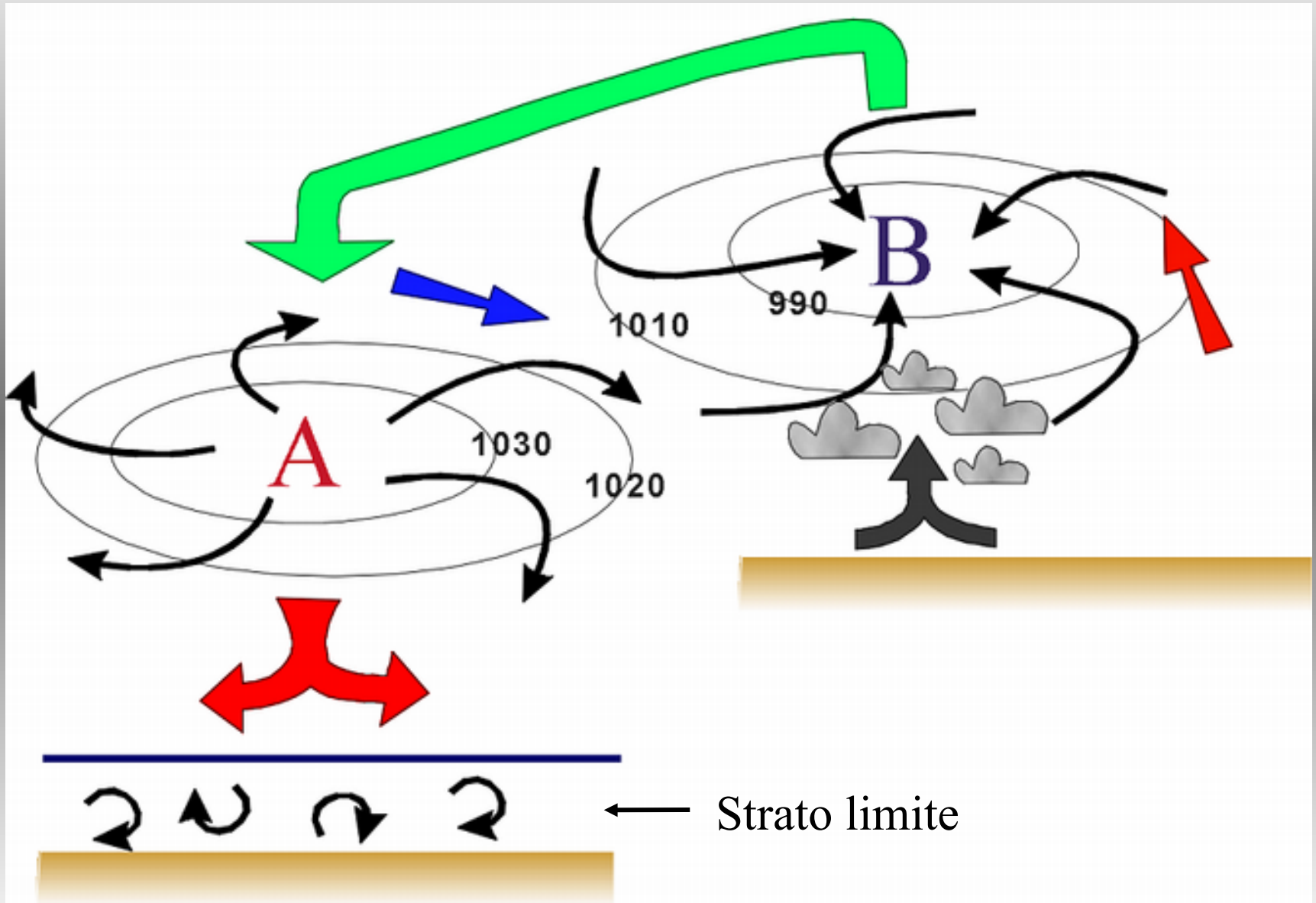
Alte e basse pressioni dinamiche

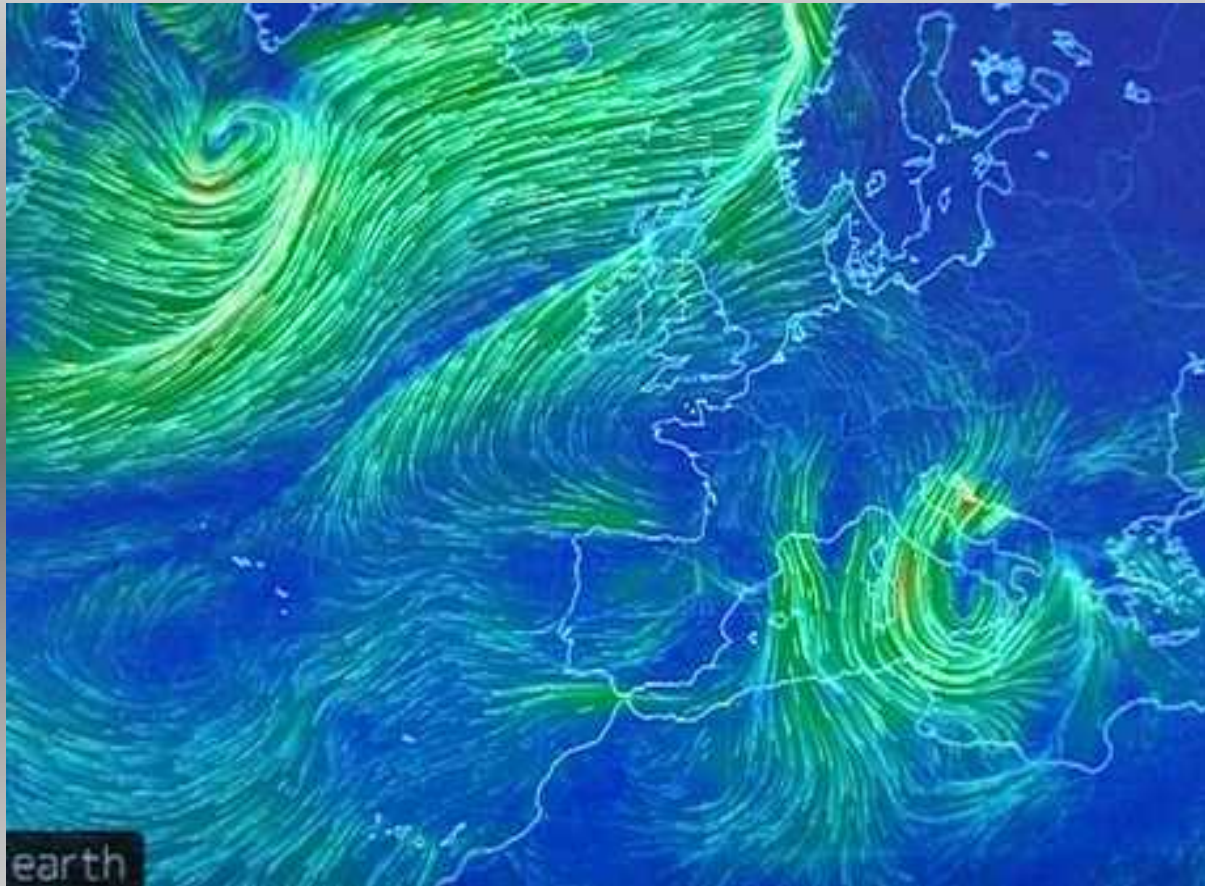


Alte e basse pressioni termiche



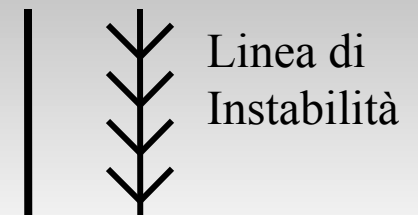
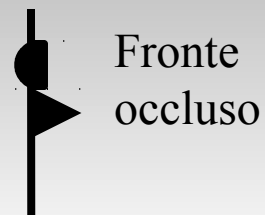
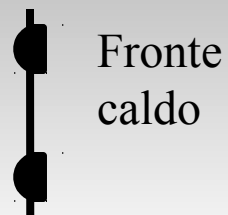
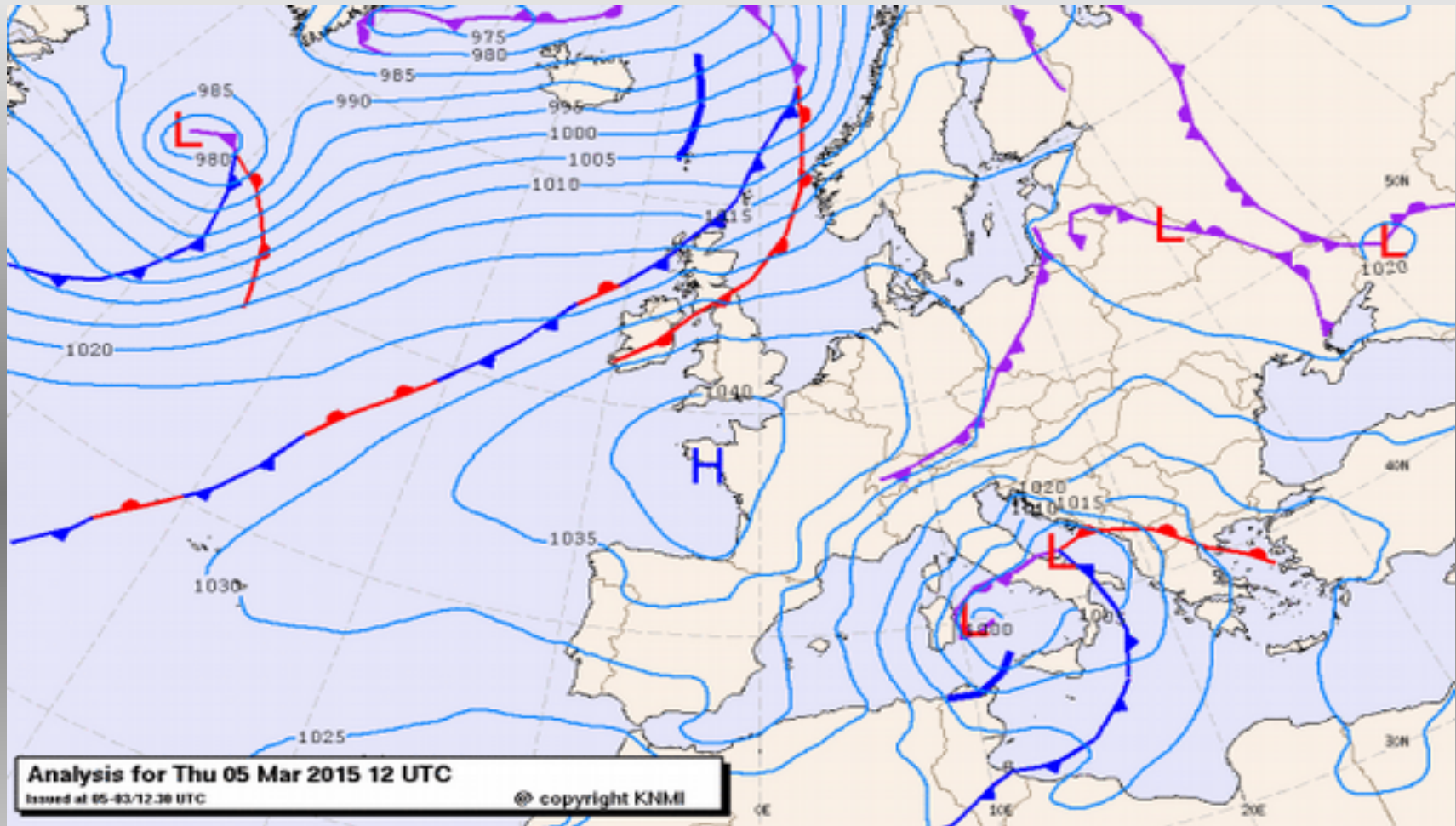
Alte e Basse Pressioni





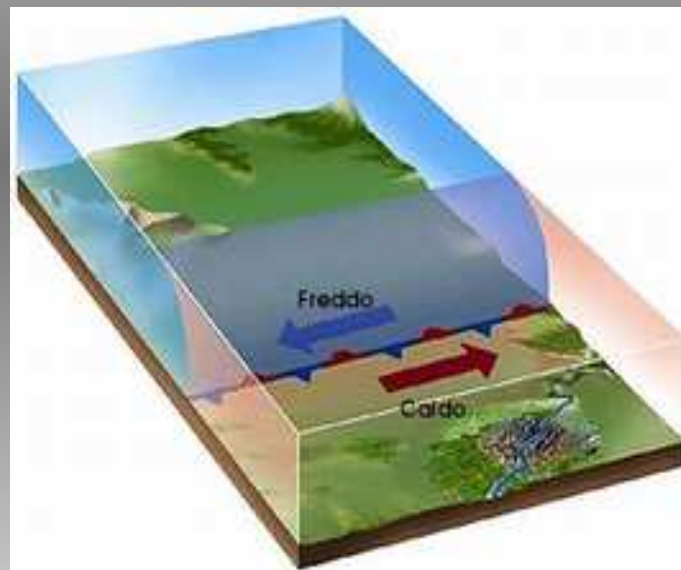
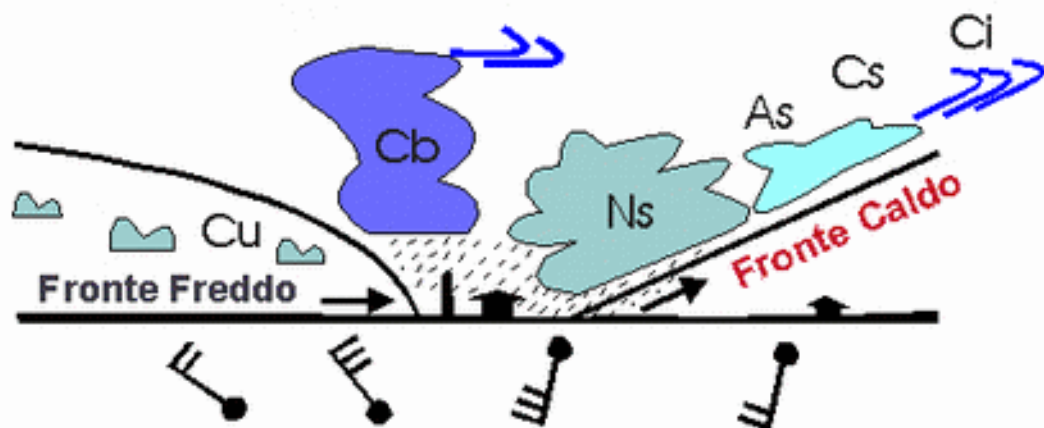
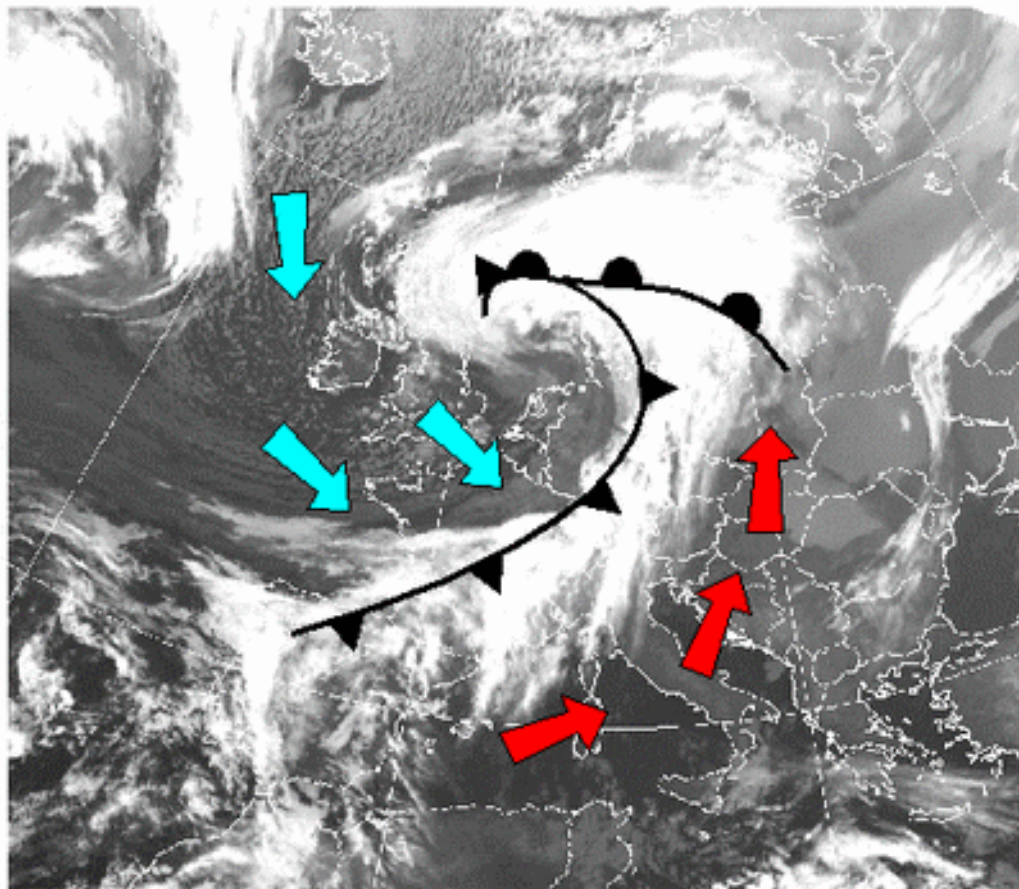
5 marzo 2015

La simbologia delle carte meteorologiche



La Perturbazione

Il vortice ciclonico, ruotando in senso antiorario mescola aria calda e fredda. Le superfici di contatto sono le zone di maggiore maltempo e furono chiamate **fronti** nel 1920 dal meteorologo norvegese Bjerknes

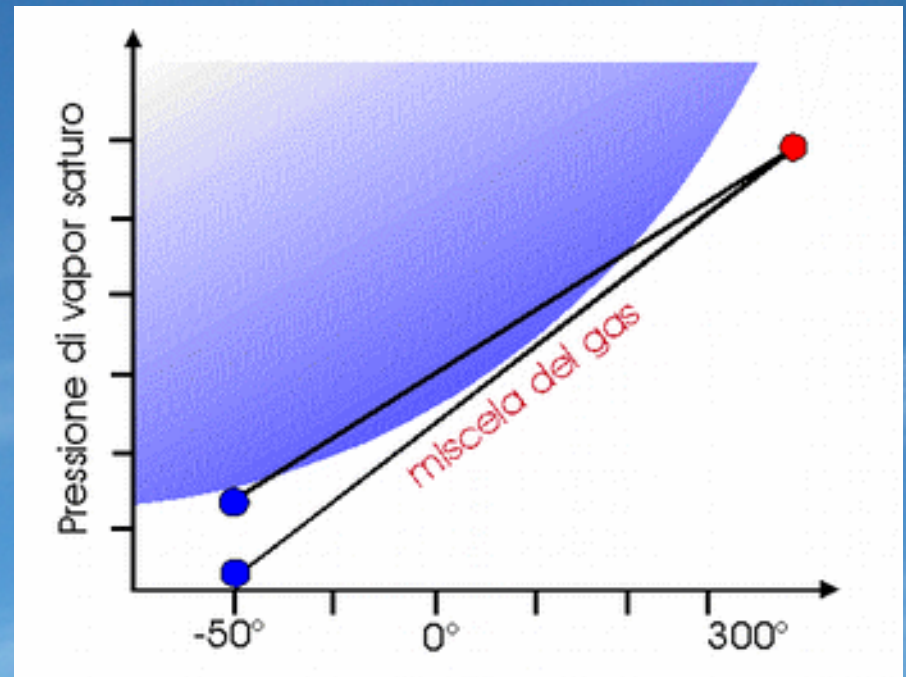




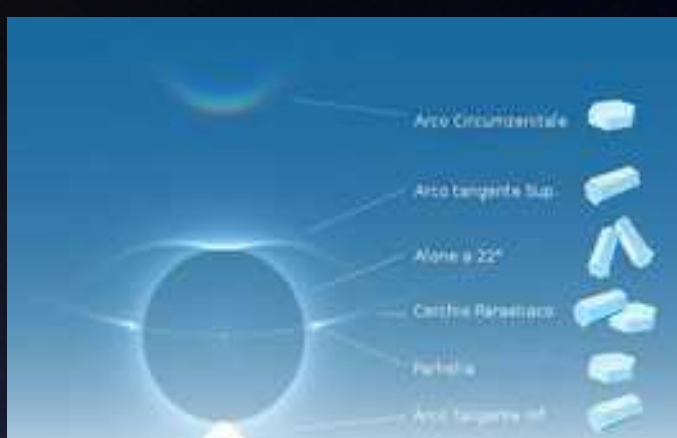
Cirri e aumento della foschia verso Sud che annunciano un fronte caldo



Formazione scie degli aerei







Arco circumzenitale

Arco tangente superiore

Alone 46°

Cerchio pareliaco

Pilastro solare

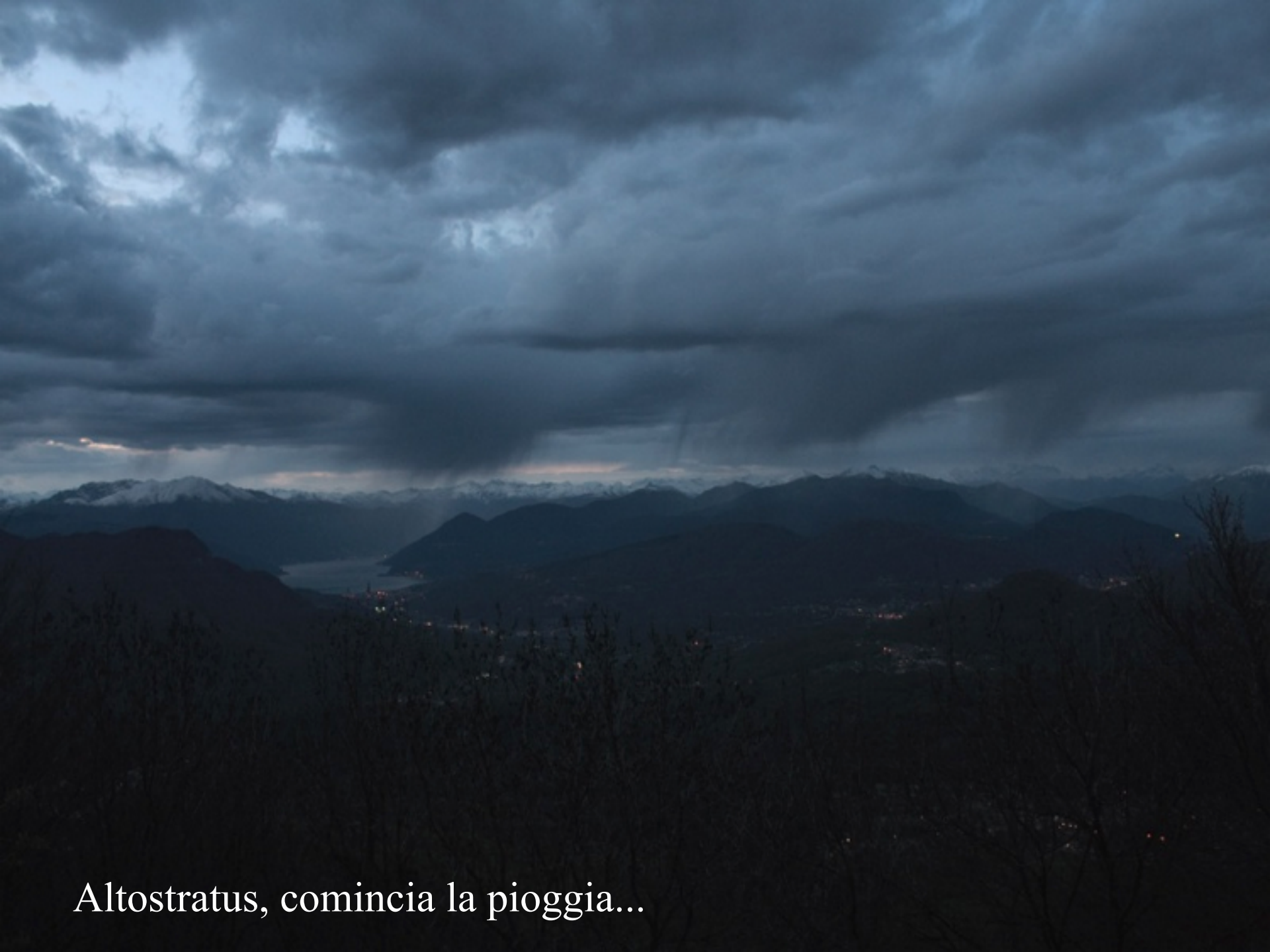
Parelio
o "sundog"

Alone 22°

Arco tangente inferiore



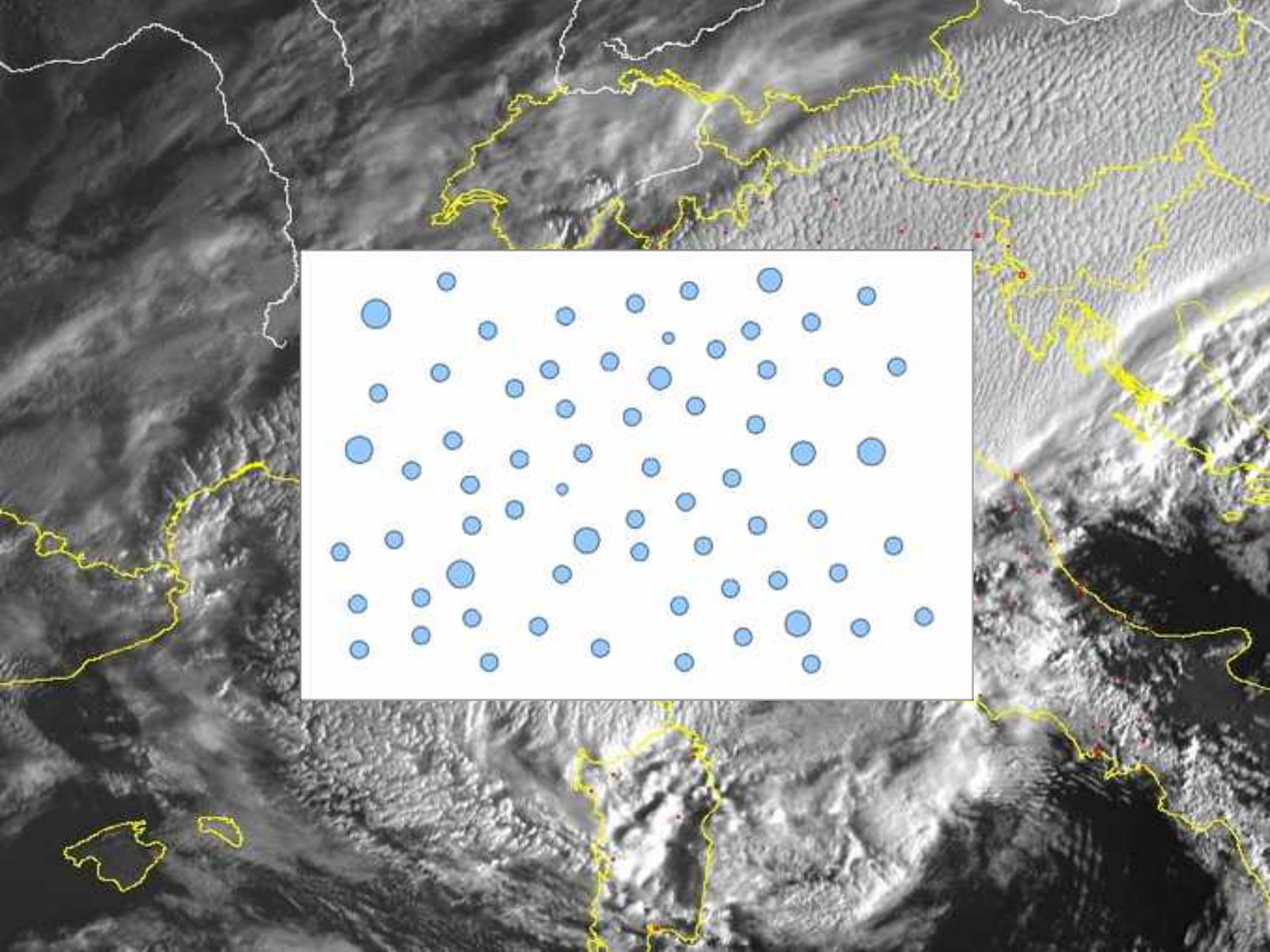
Quando il Monte Rosa mette il cappello, lascia la zappa e prendi il rastrello...

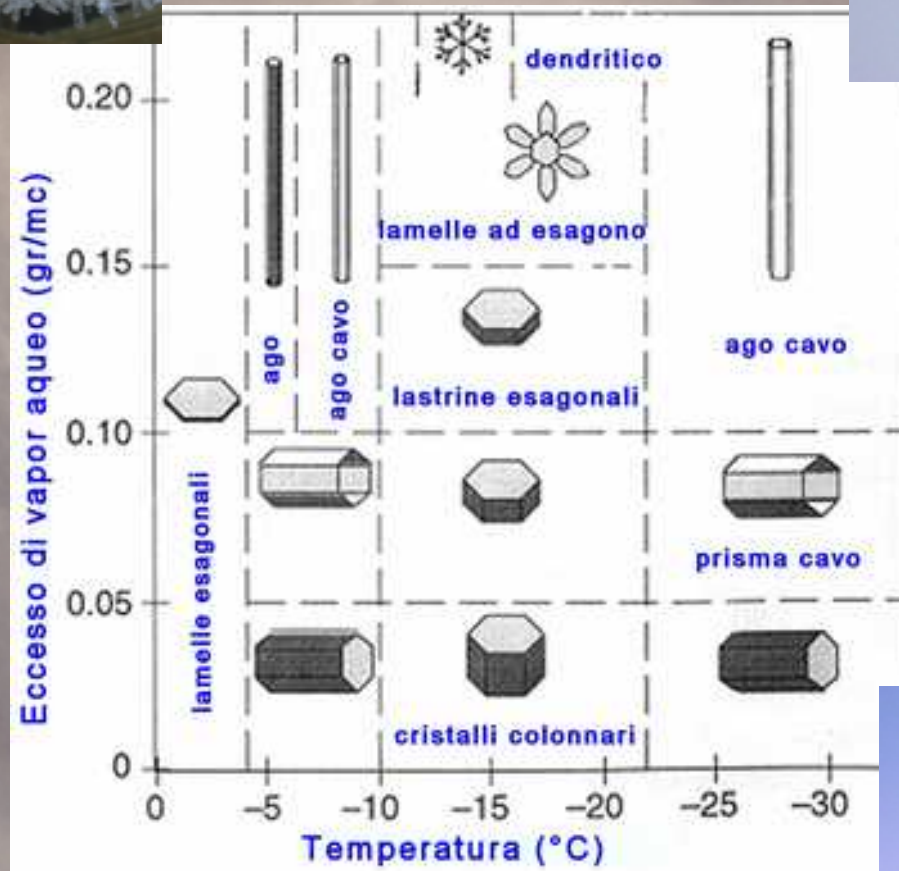
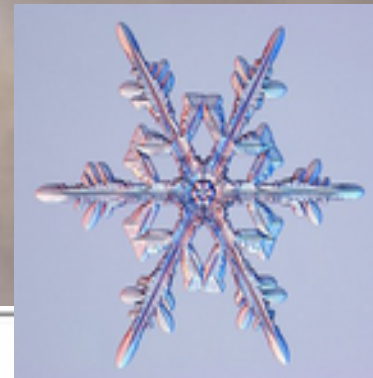


Altostratus, comincia la pioggia...

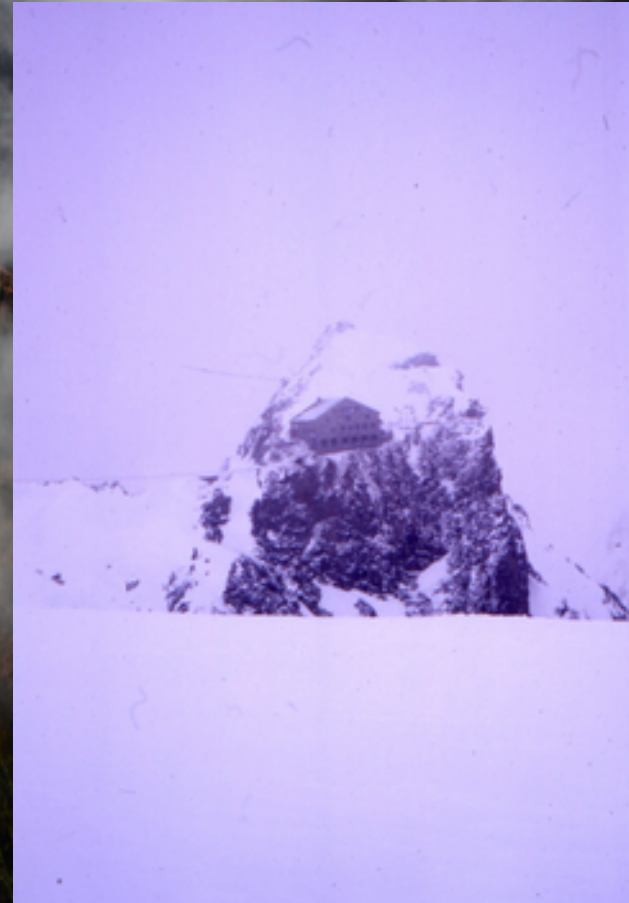


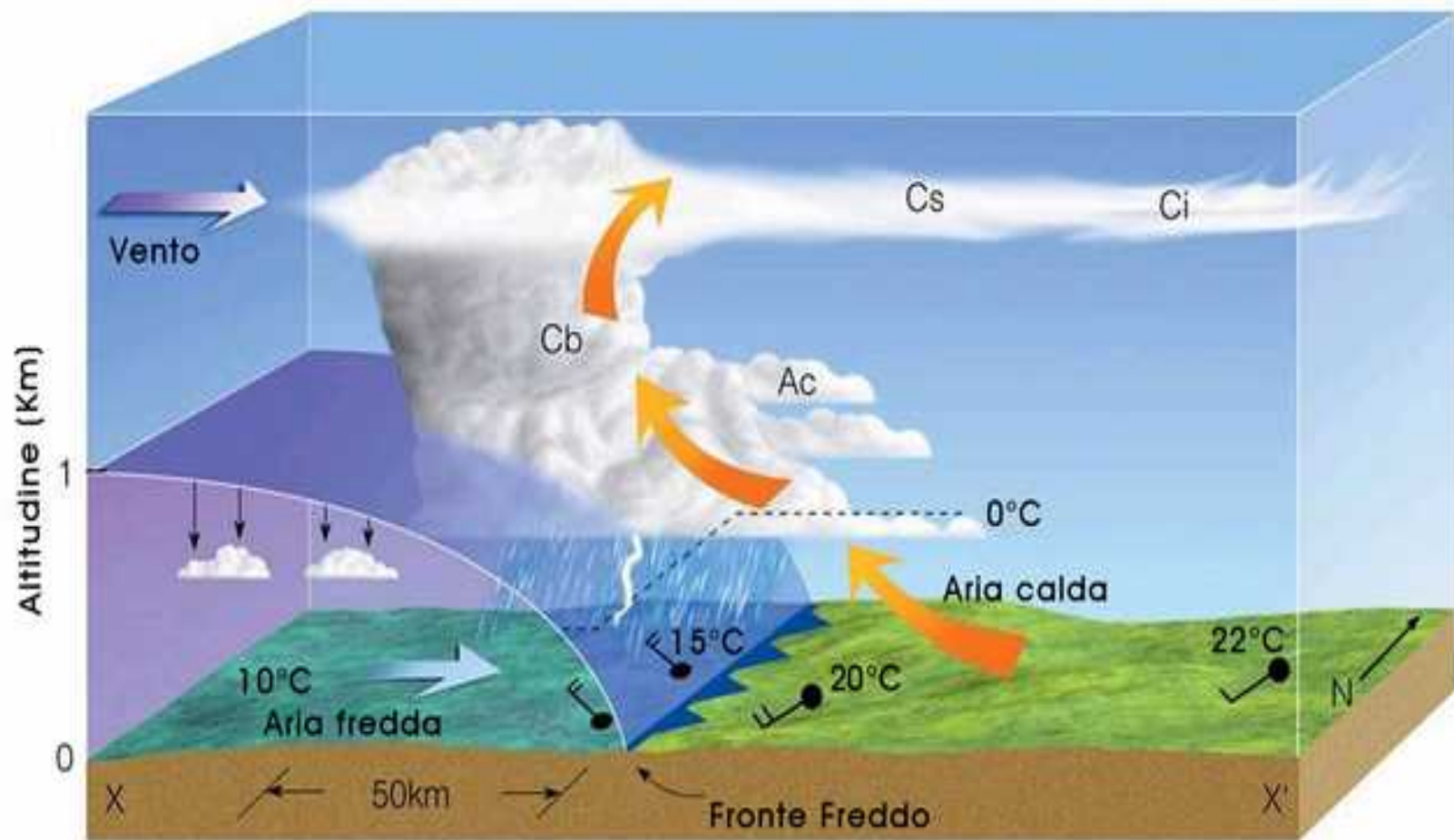
I nembostrati sono poco fotogenici





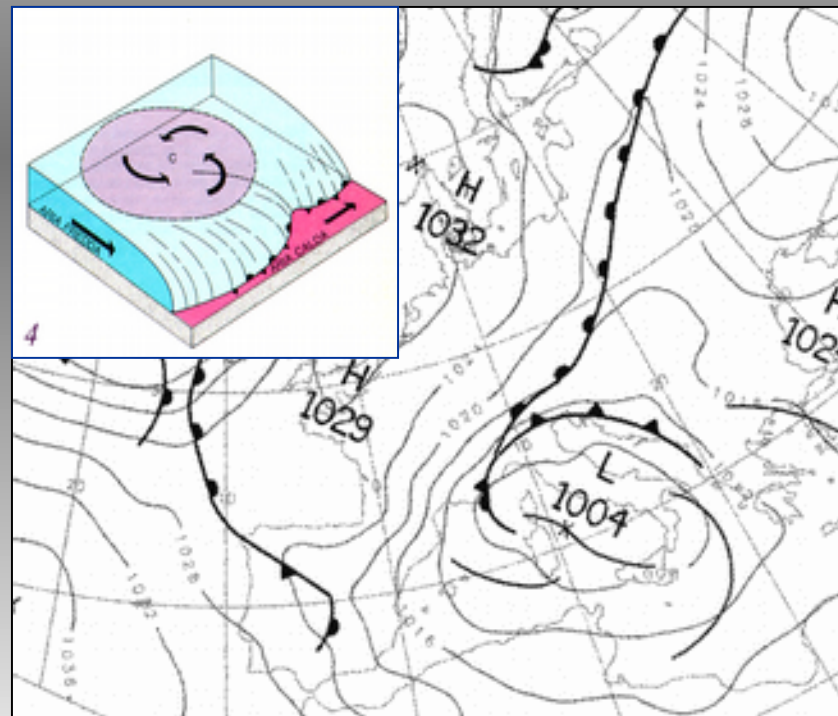
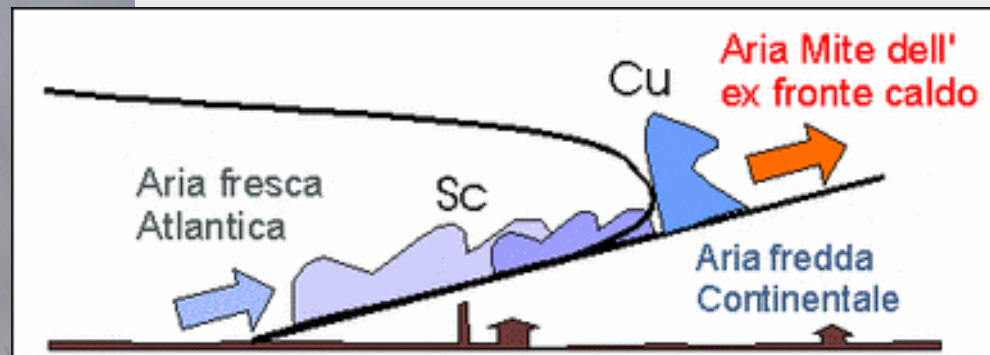
I nembostrati di una perturbazione autunnale avvolgono le montagne con pioggia ma anche pessima visibilità



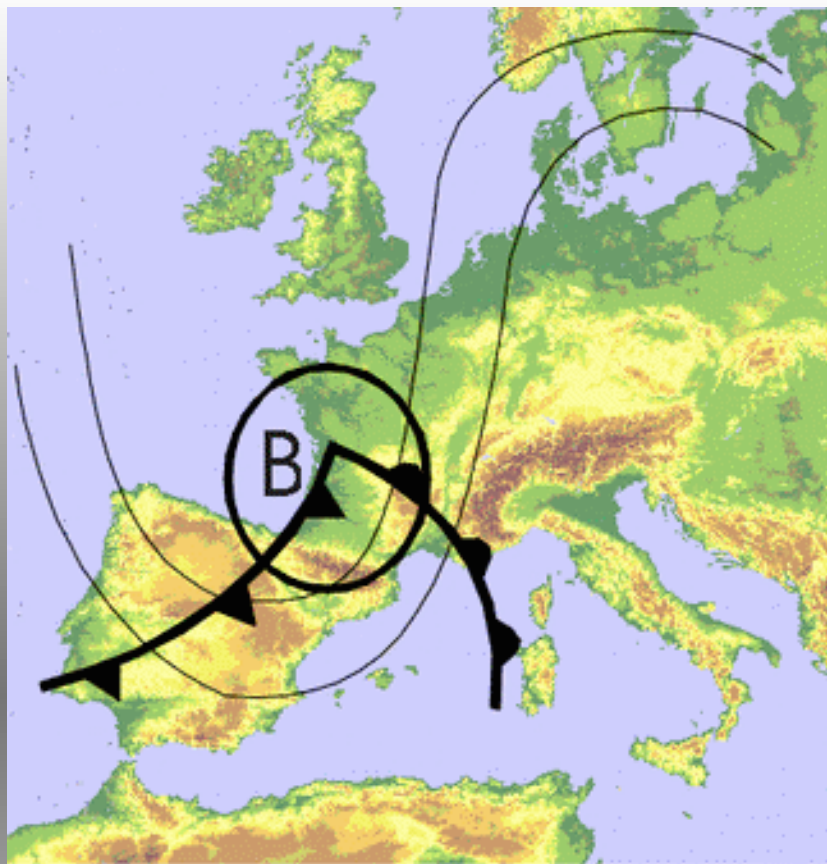


Fronte freddo estivo in allontanamento (Sardegna set 03)





Fronte occluso (31 Dicembre 2003) da Campo dei Fiori



Il Fronte caldo si avvicina

(aria stabile ma umida)

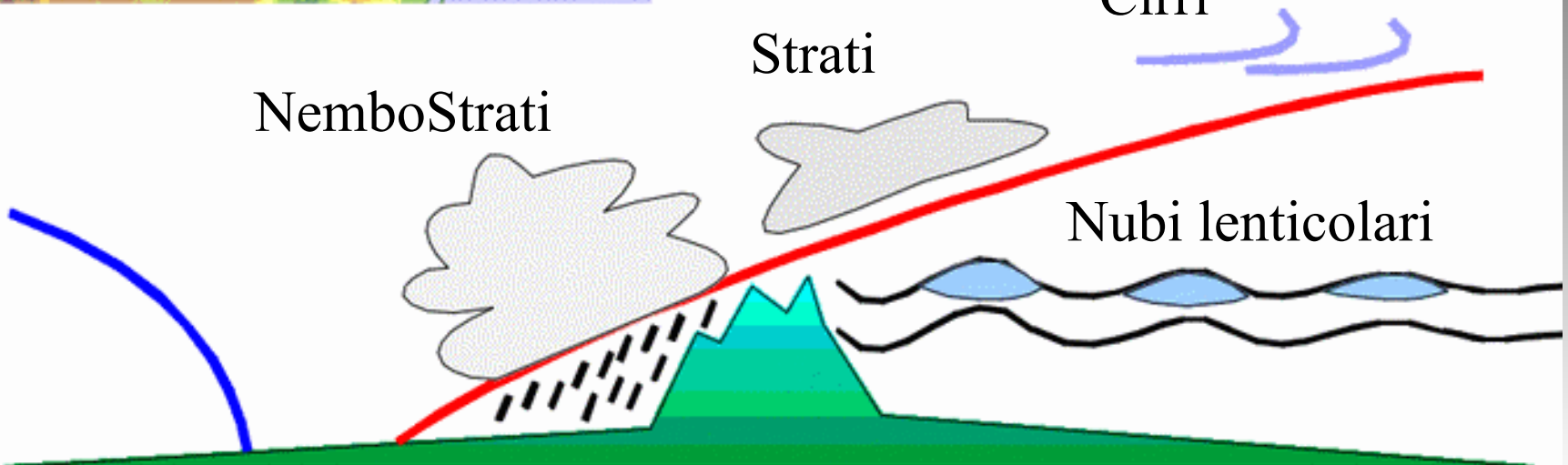


NemboStrati

Strati

Cirri

Nubi lenticolari

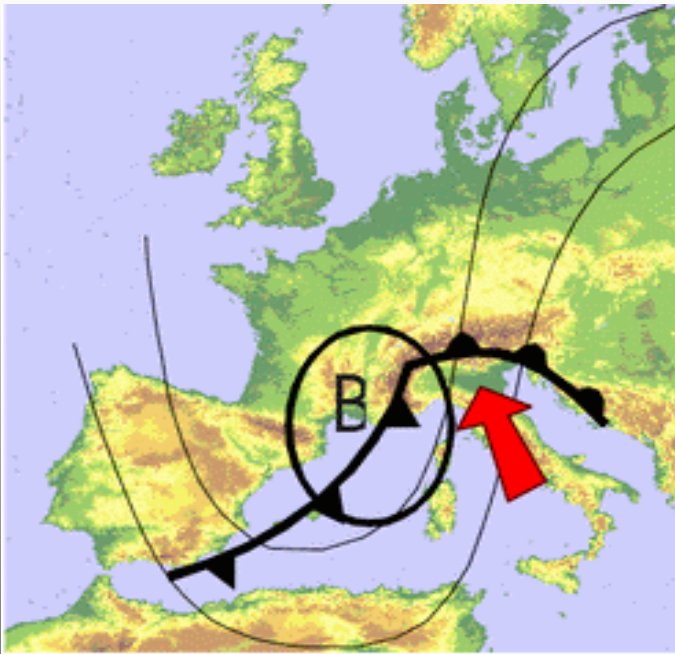




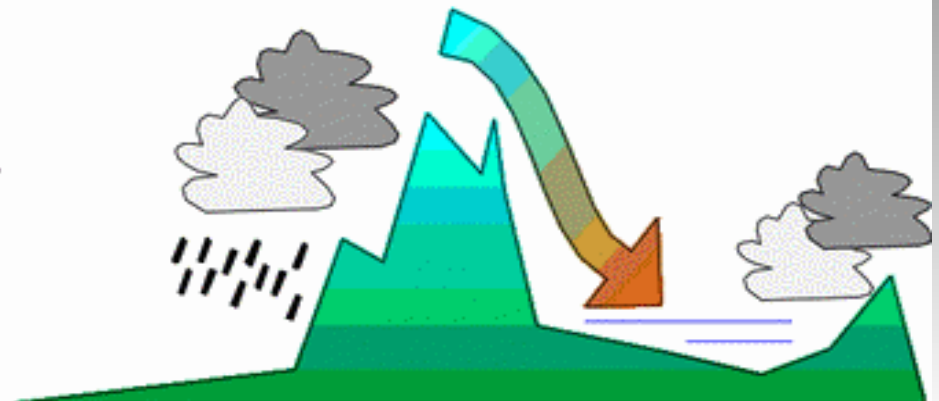
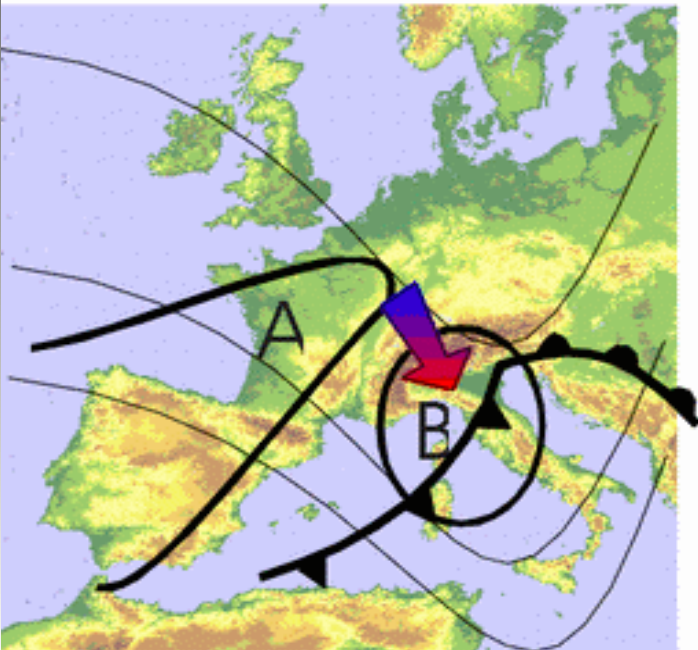
Nuvole o attacco alieno?



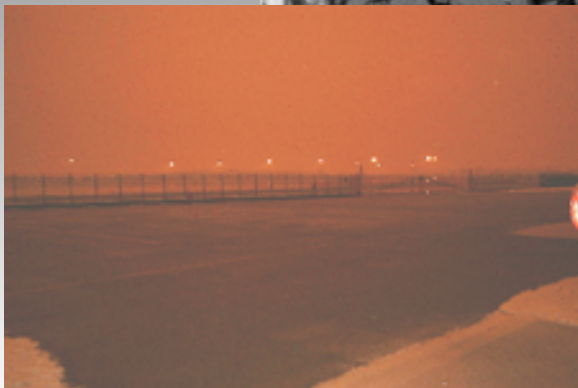
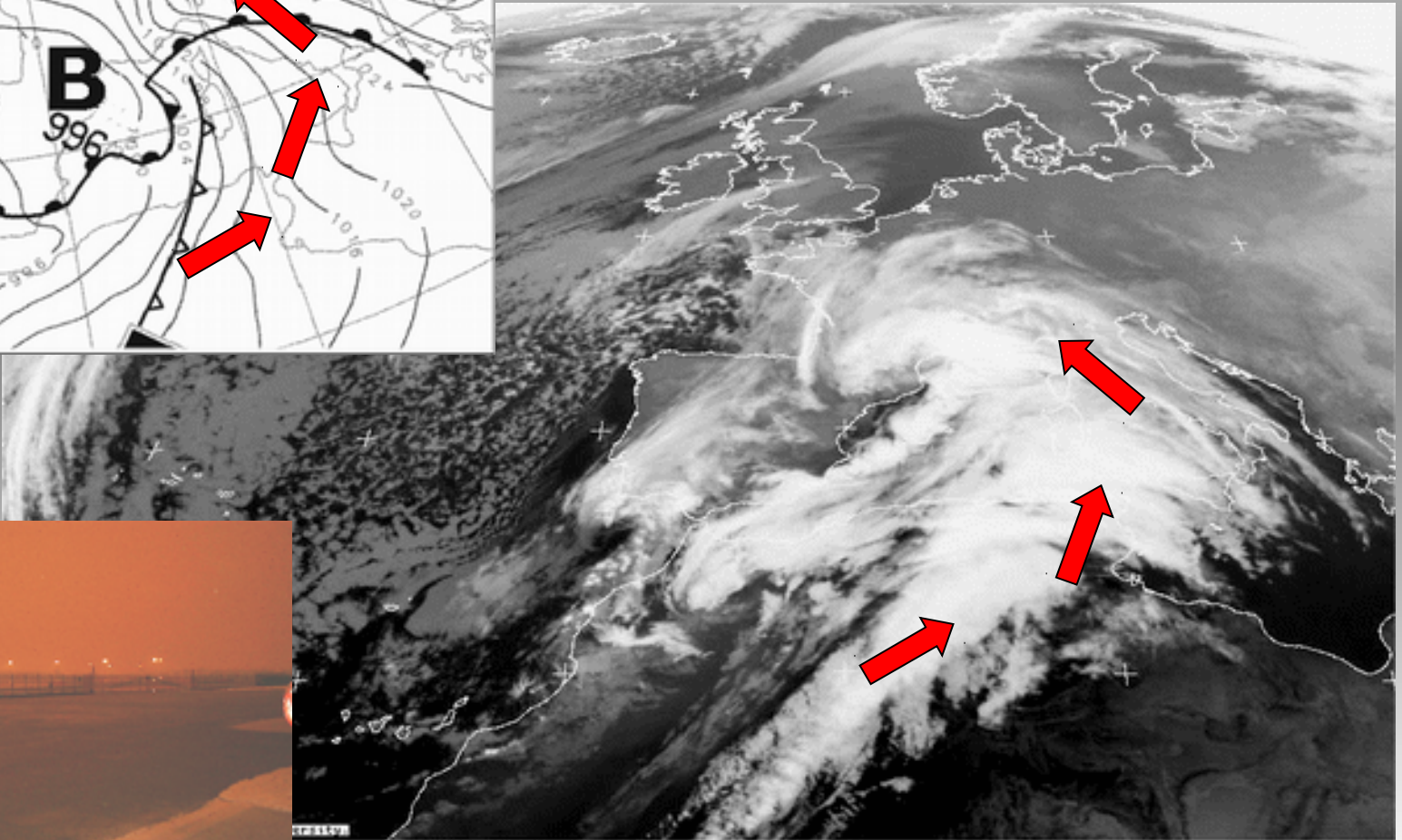
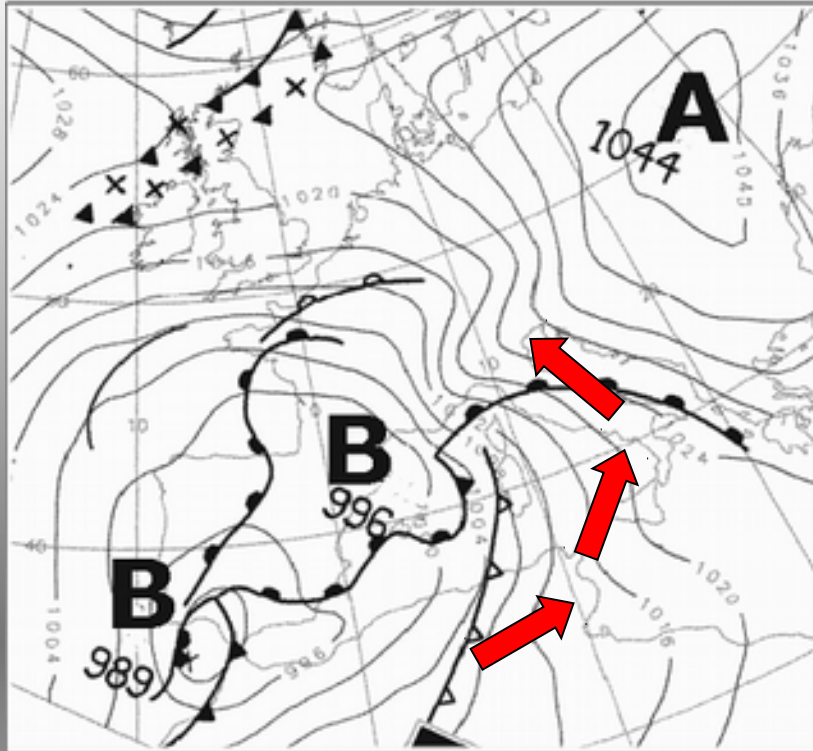
Sbarramento o Stau (invernale o equinoziale)



Favonio o Fohn (invernale o equinoziale)



Situazione di “sbarramento” (21 Feb 2004)



E' tanto, è poco?

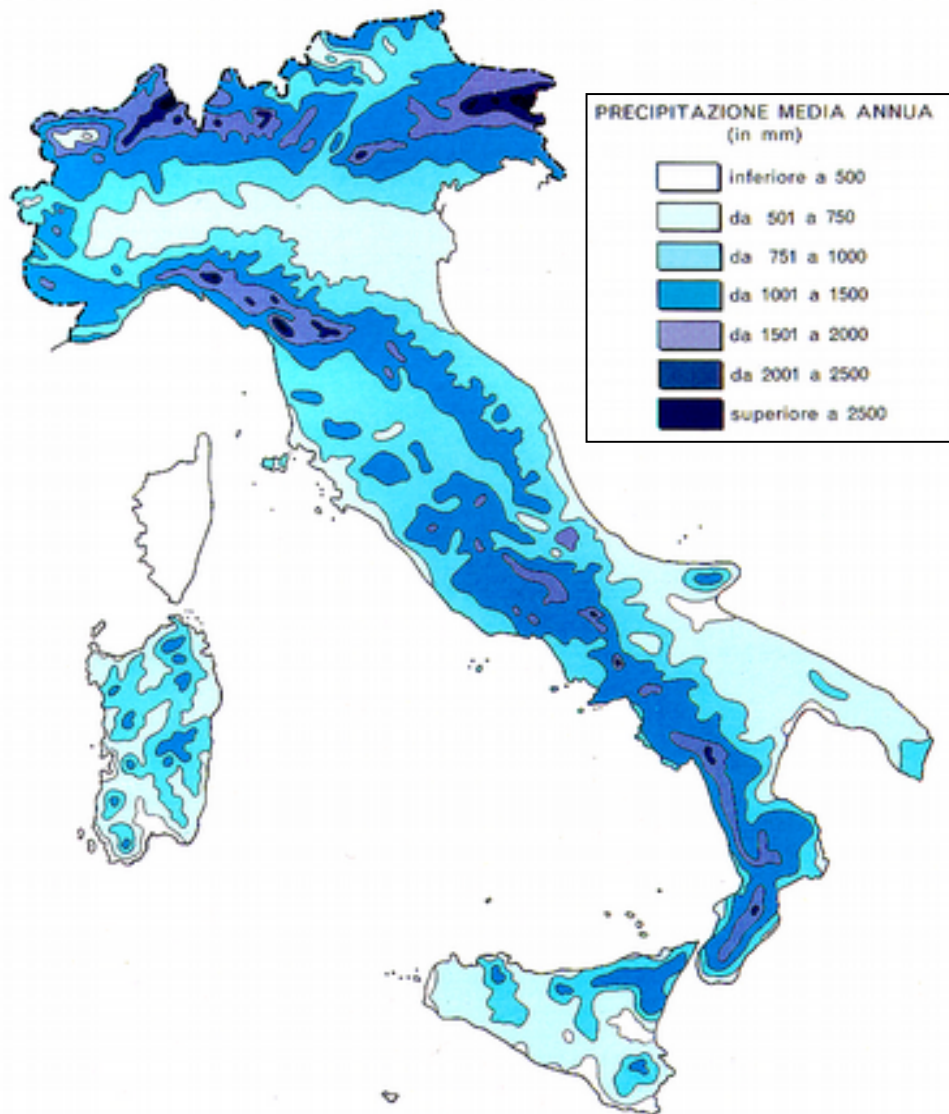
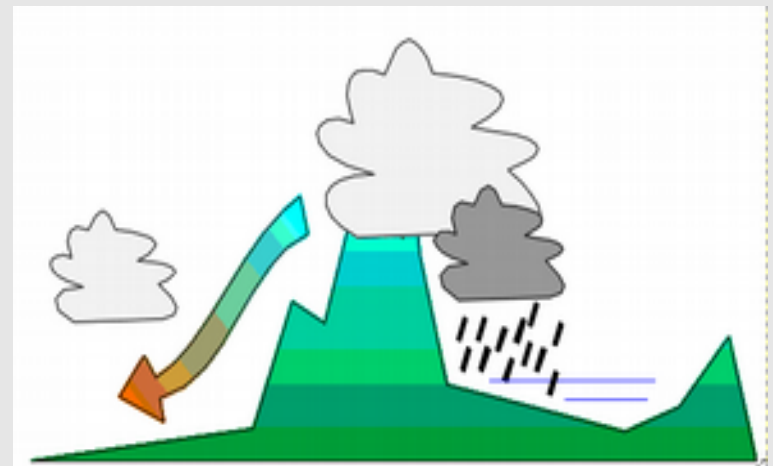
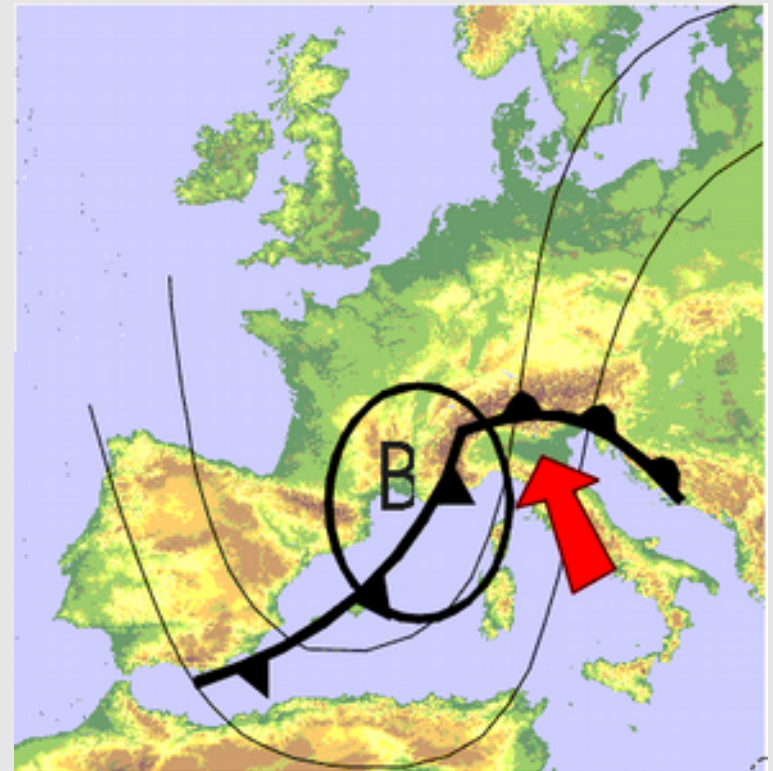


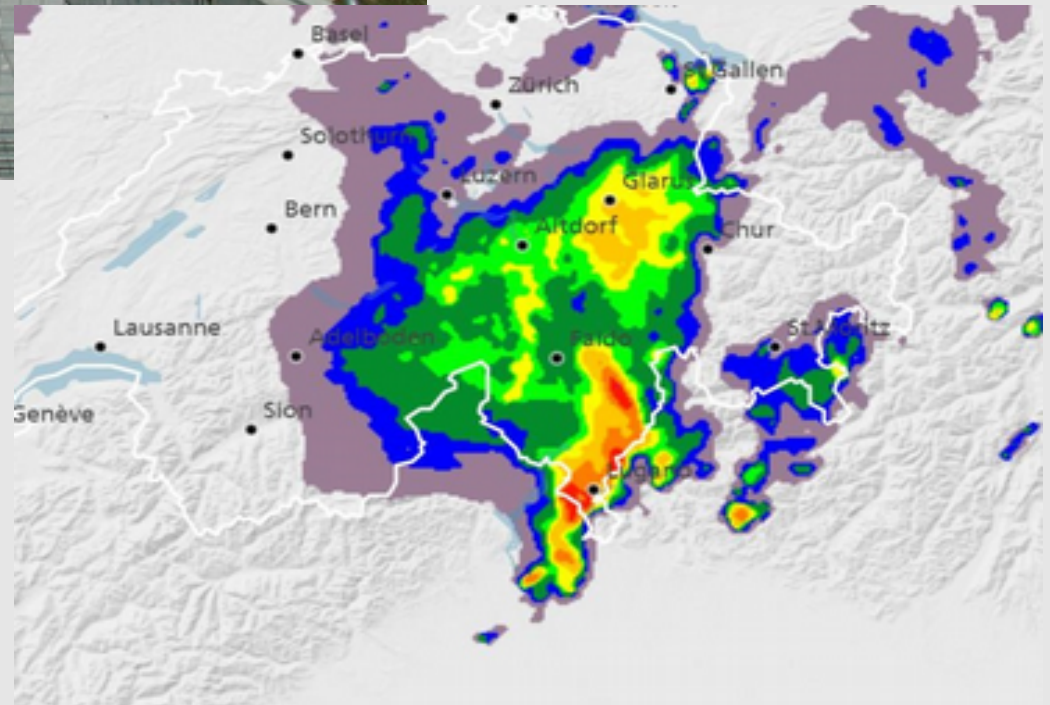
Fig. 13.15. Le precipitazioni medie in Italia. (Da una carta del Servizio Idrografico Italiano, semplificata).



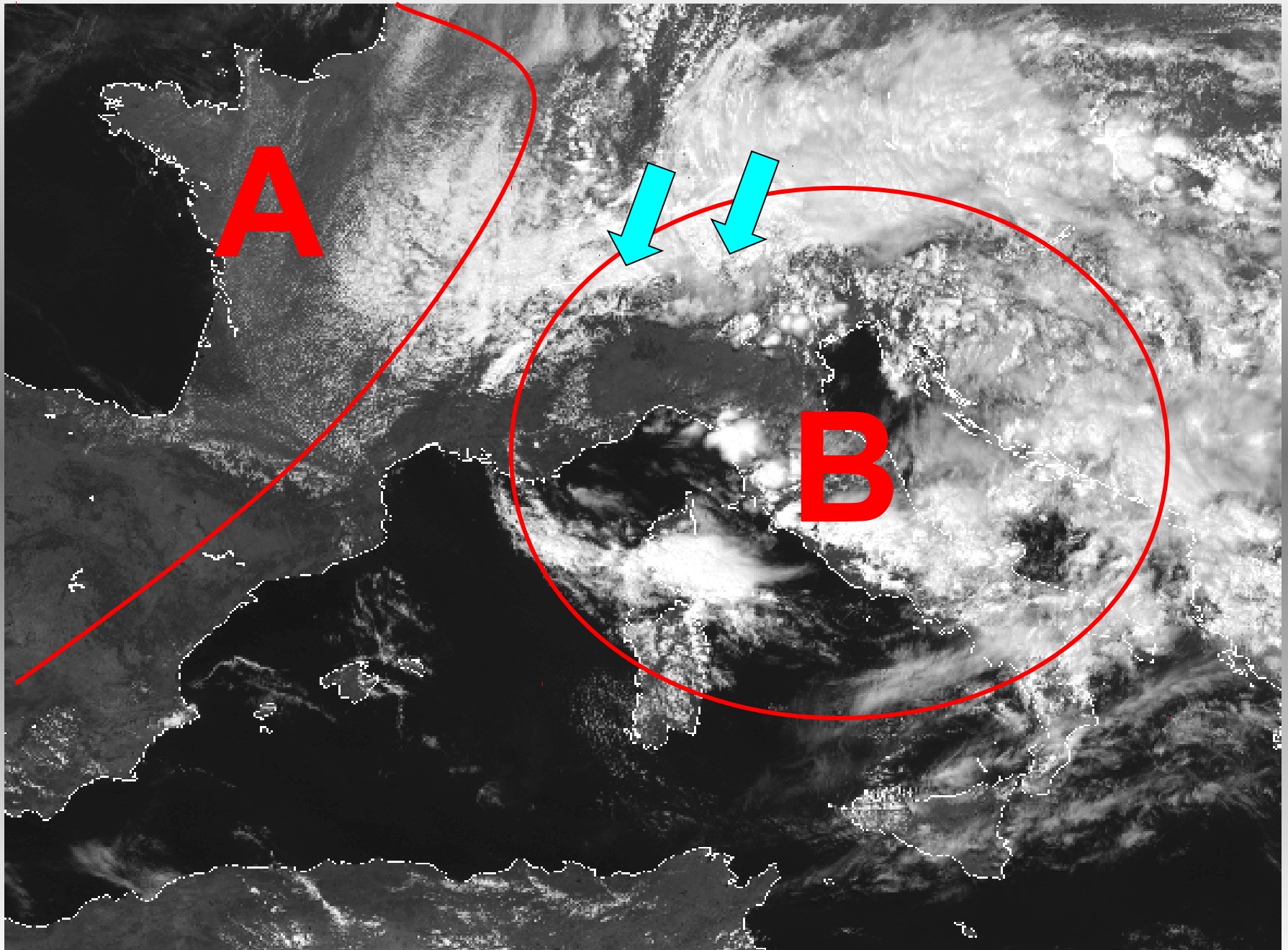


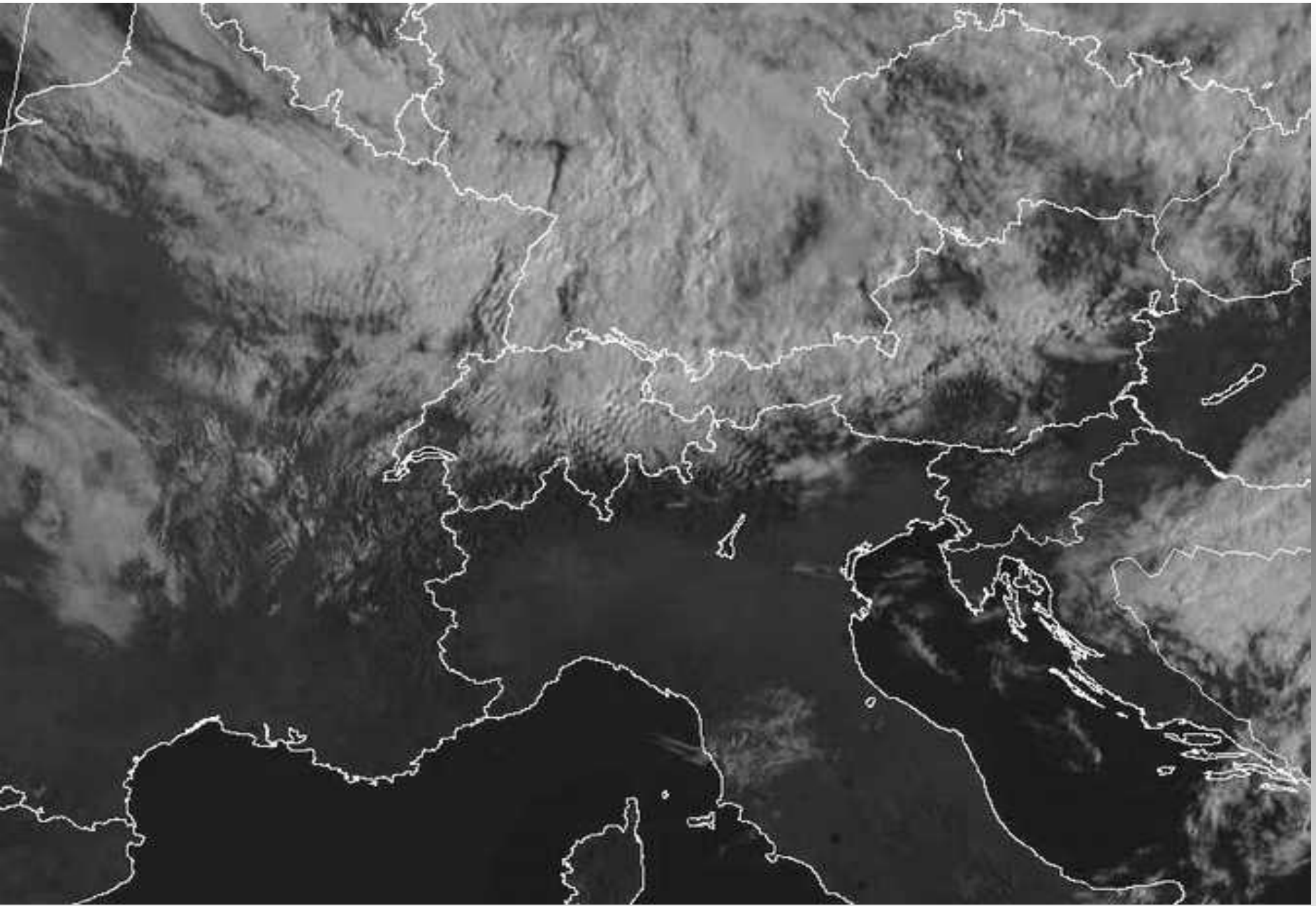
Il Radar (Meteosvizzera) del Monte Lema è quello più vicino a noi.

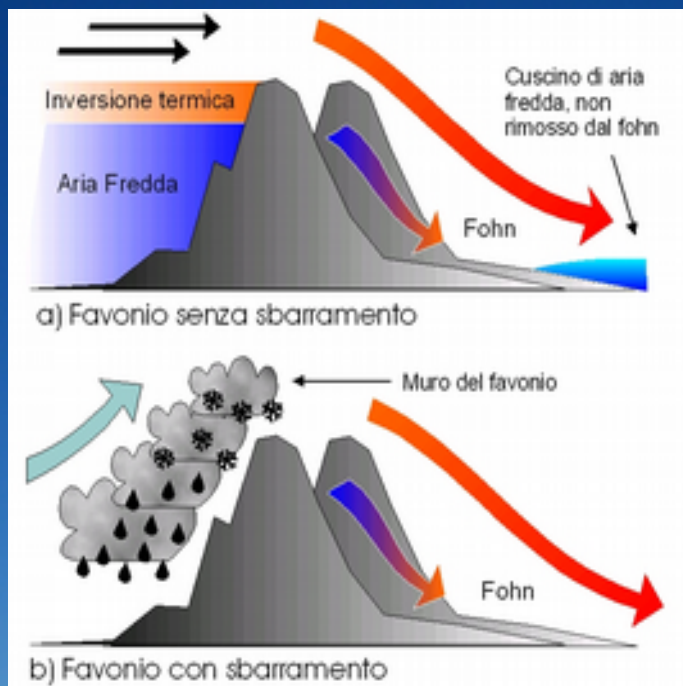
Anche in Italia esiste una rete di 22 radar meteo che fa capo alla Protezione Civile



Favonio giorno 3 giugno 2004





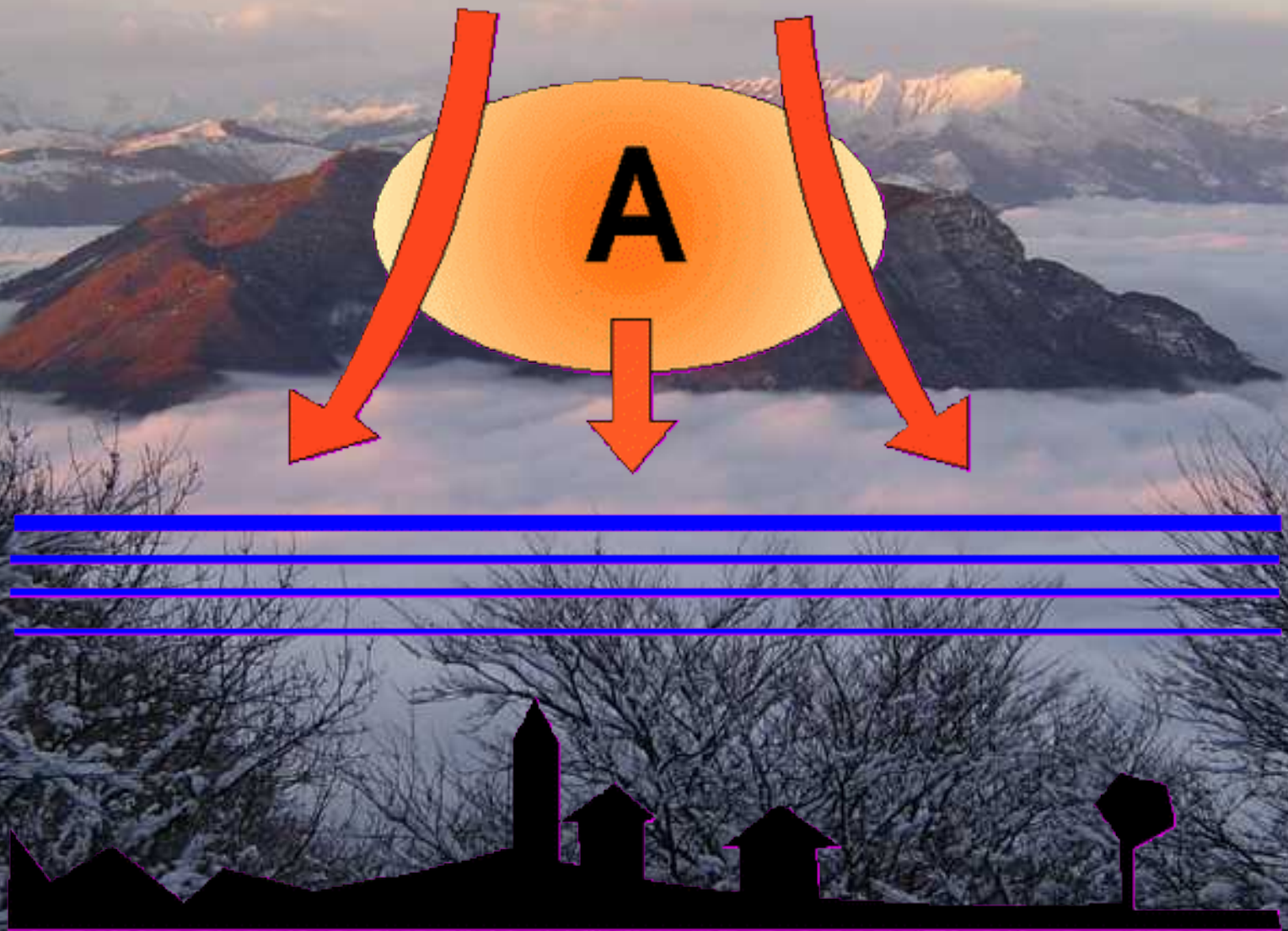


Situazioni di favonio

Muro del Favonio visto da vicino.



La stabilità dell'inversione termica crea il mare di nubi d'inverno







(time-lapse F. Bellini Oss. Astr. Schiaparelli)





Brina

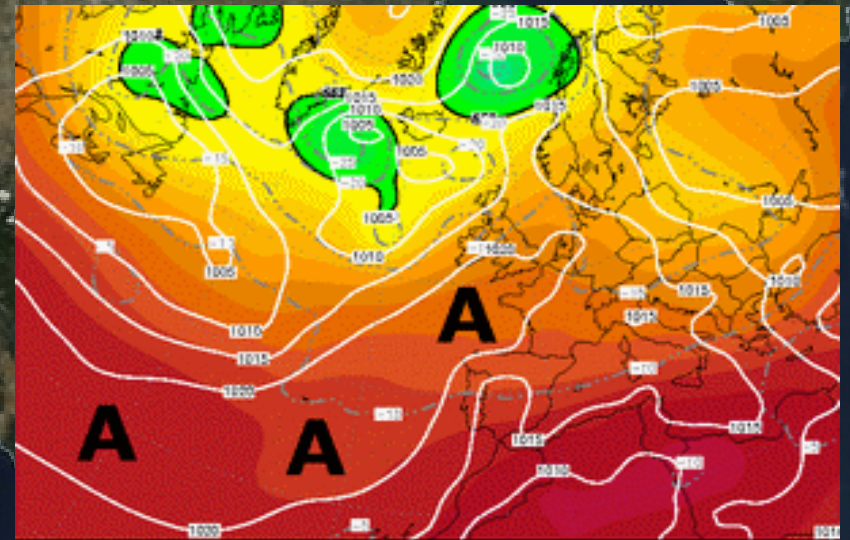


Galaverna



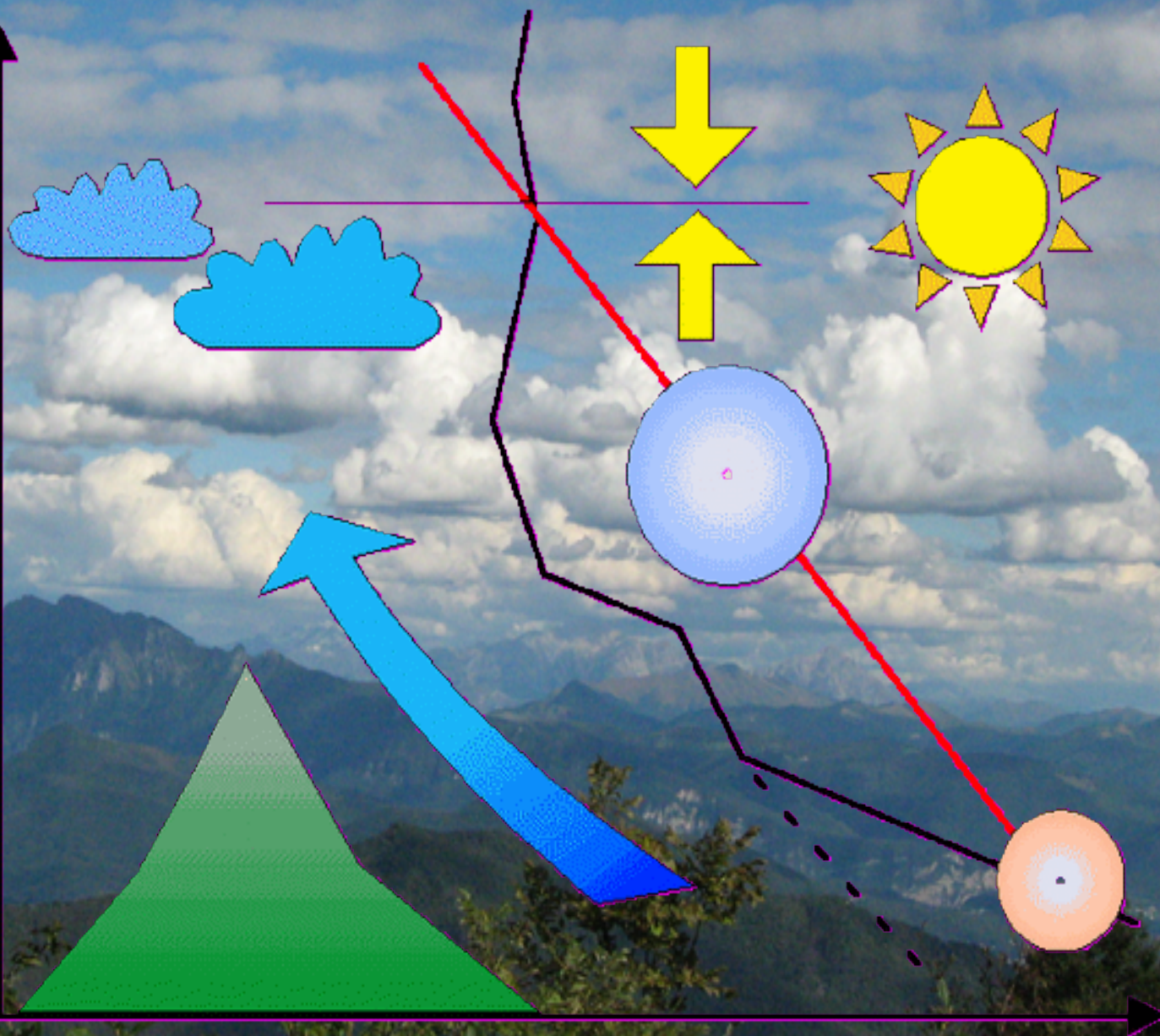
Calabrosa

Bel tempo estivo stabile: anticiclone delle Azzorre

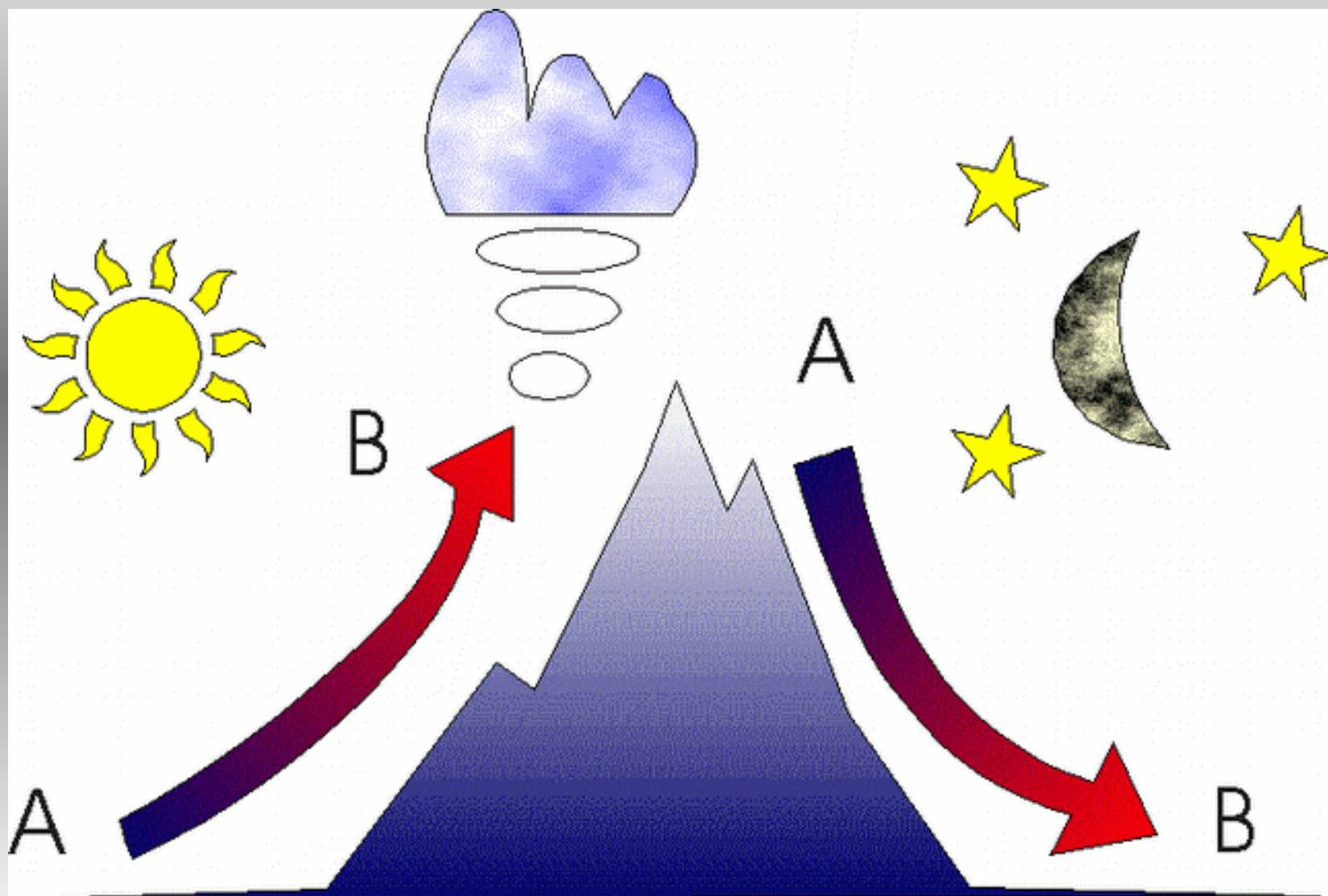


Altezza

Temperatura

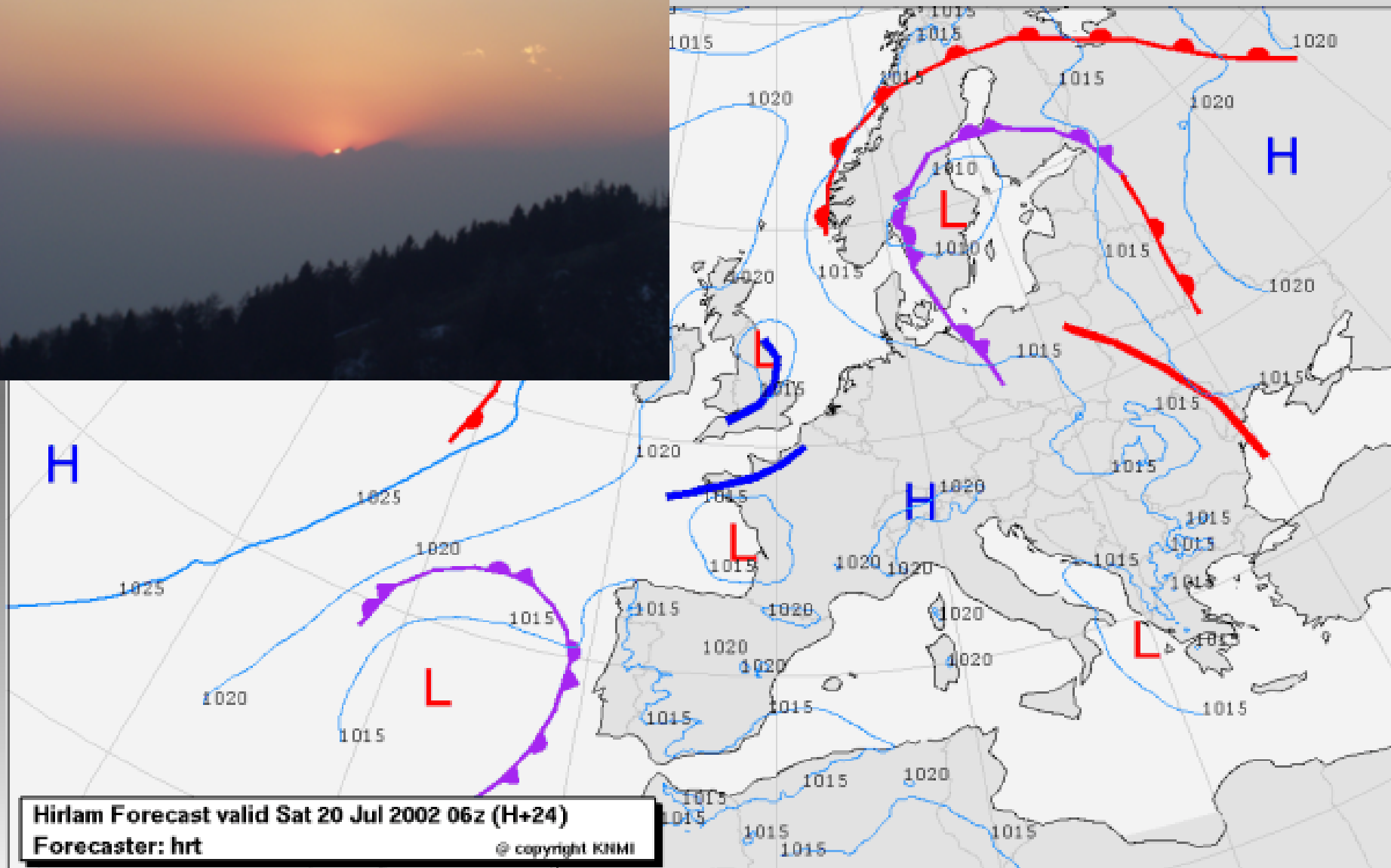
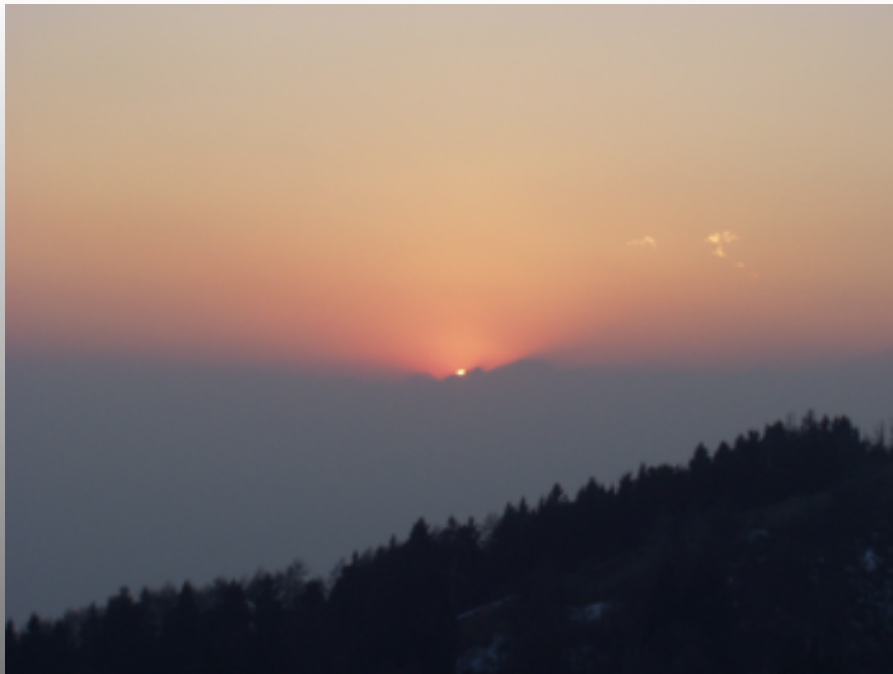


Le brezze





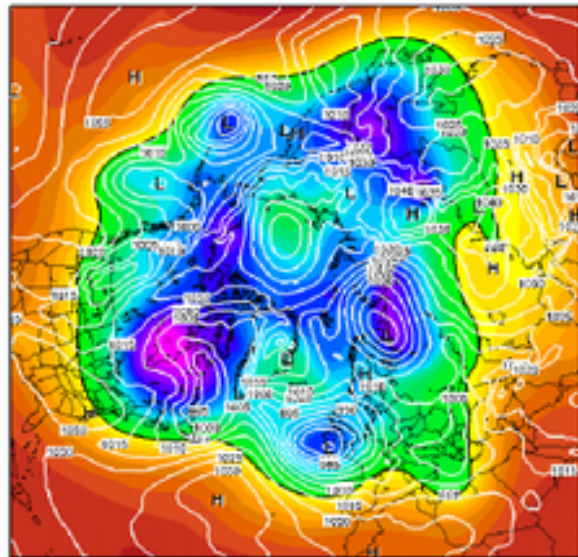
Pressione Livellata sull'Europa



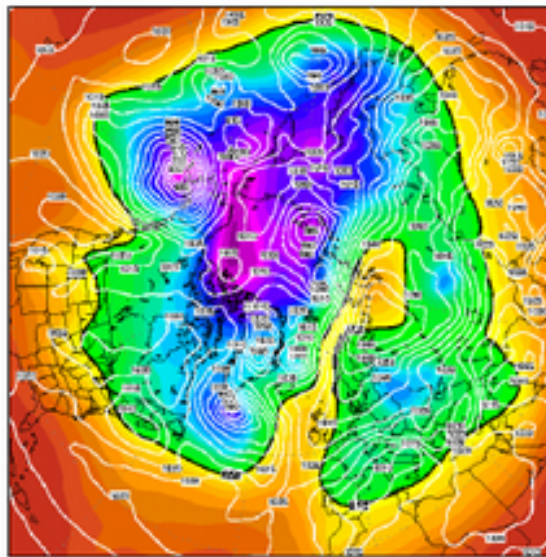


27 Settembre 2010 – Federico Bellini

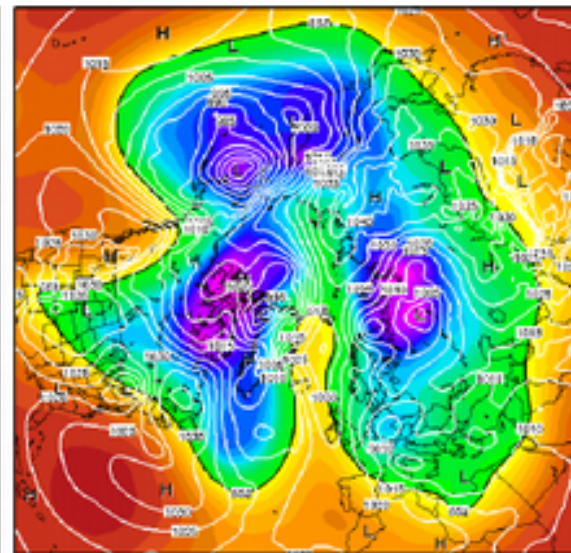
Vortice polare protagonista dell'inverno alpino



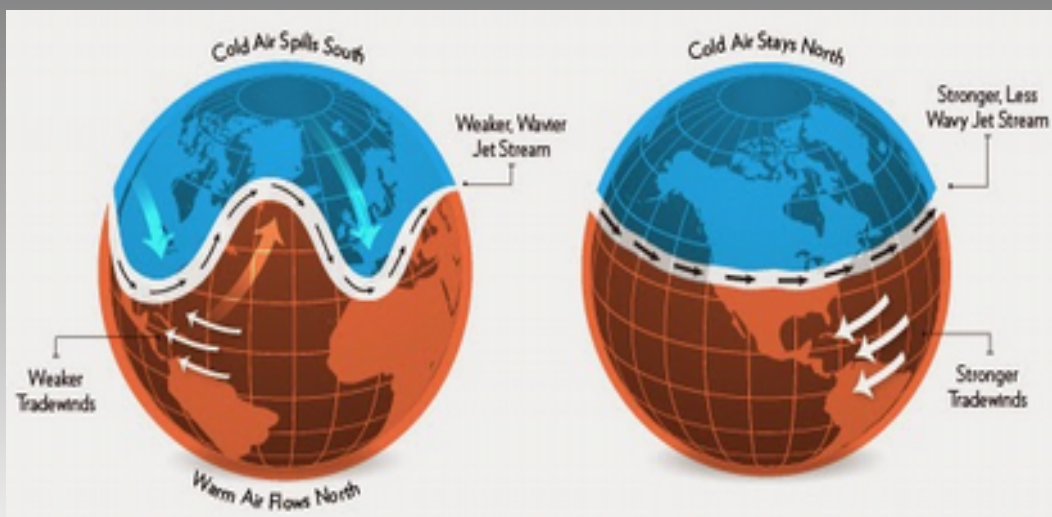
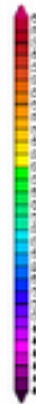
Vortice polare normale



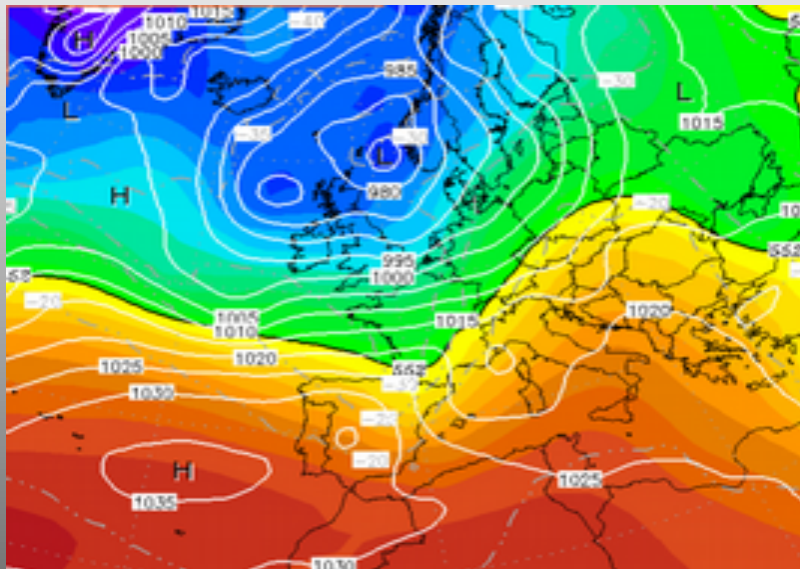
Ondata gelo feb 2012



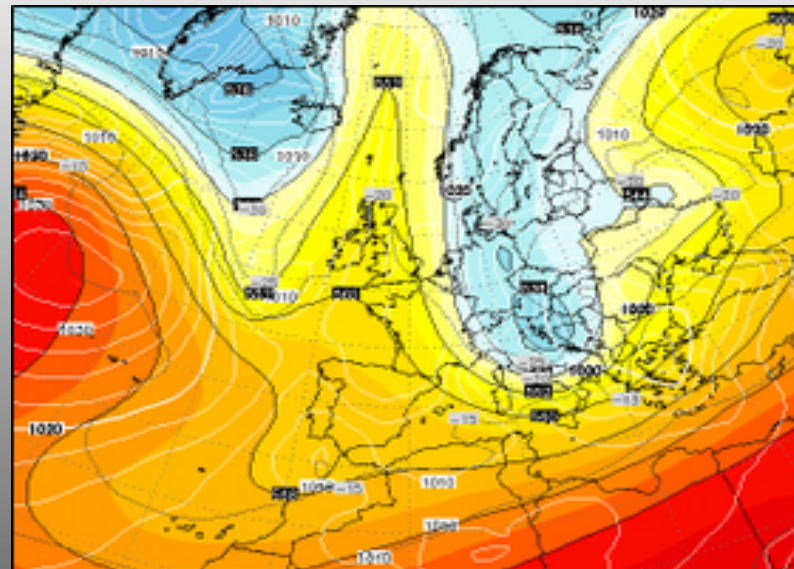
Ondata gelo gen 1985



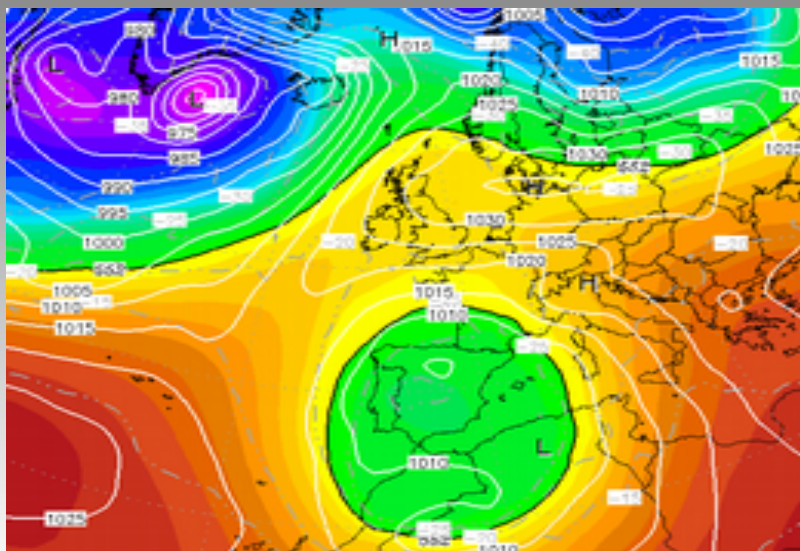
Perturbazioni atlantiche



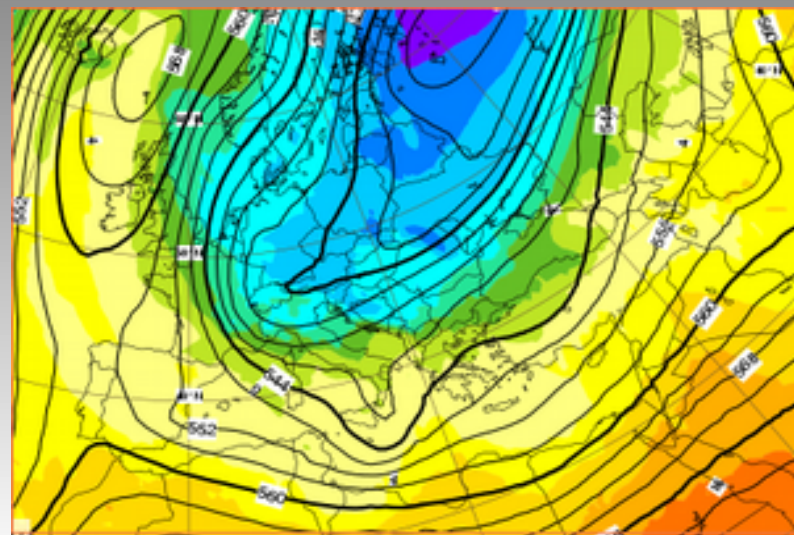
Discesa BP polare



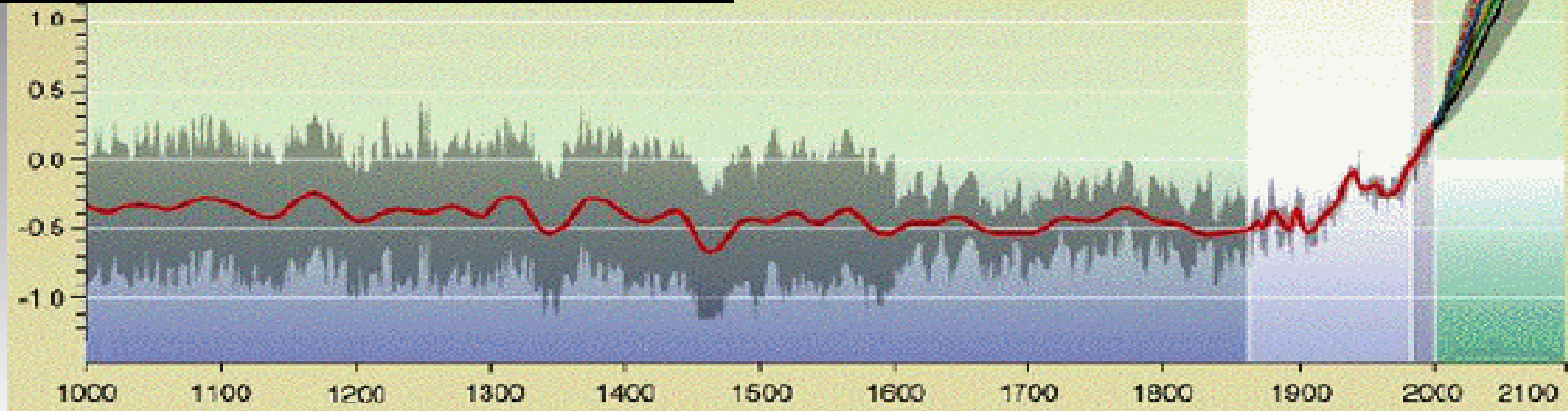
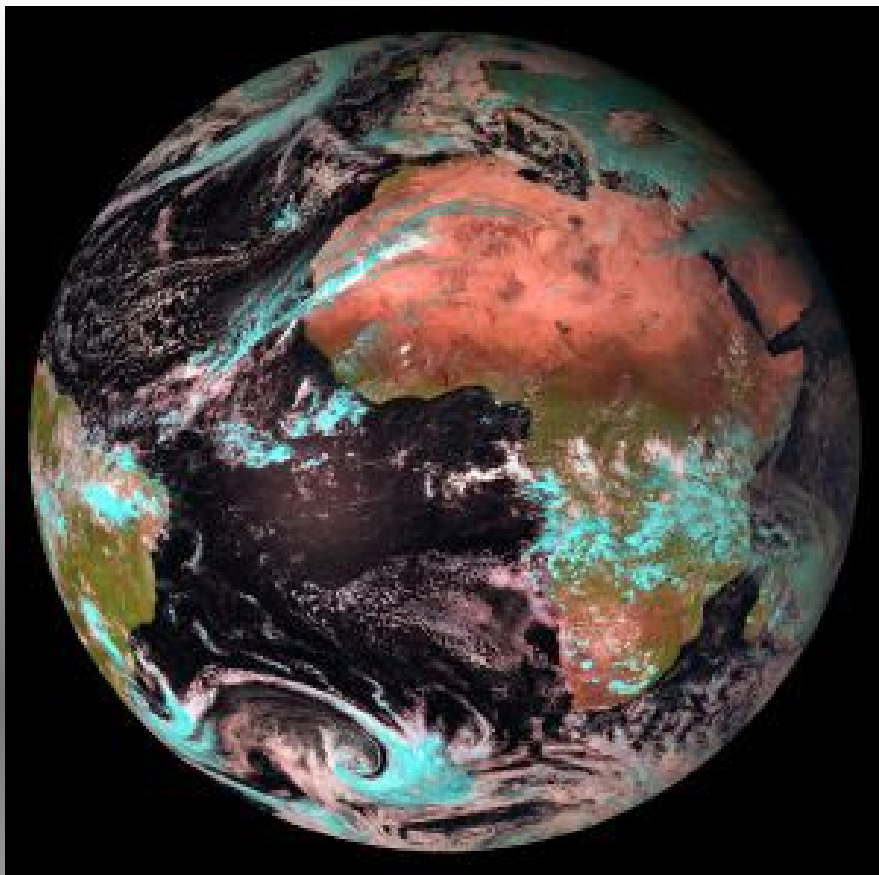
Bassa pressione Mediterranea



Gelo Russo Siberiano



Come cambierà il clima?



La glaciazione Wurmiana (60'000-10'000)



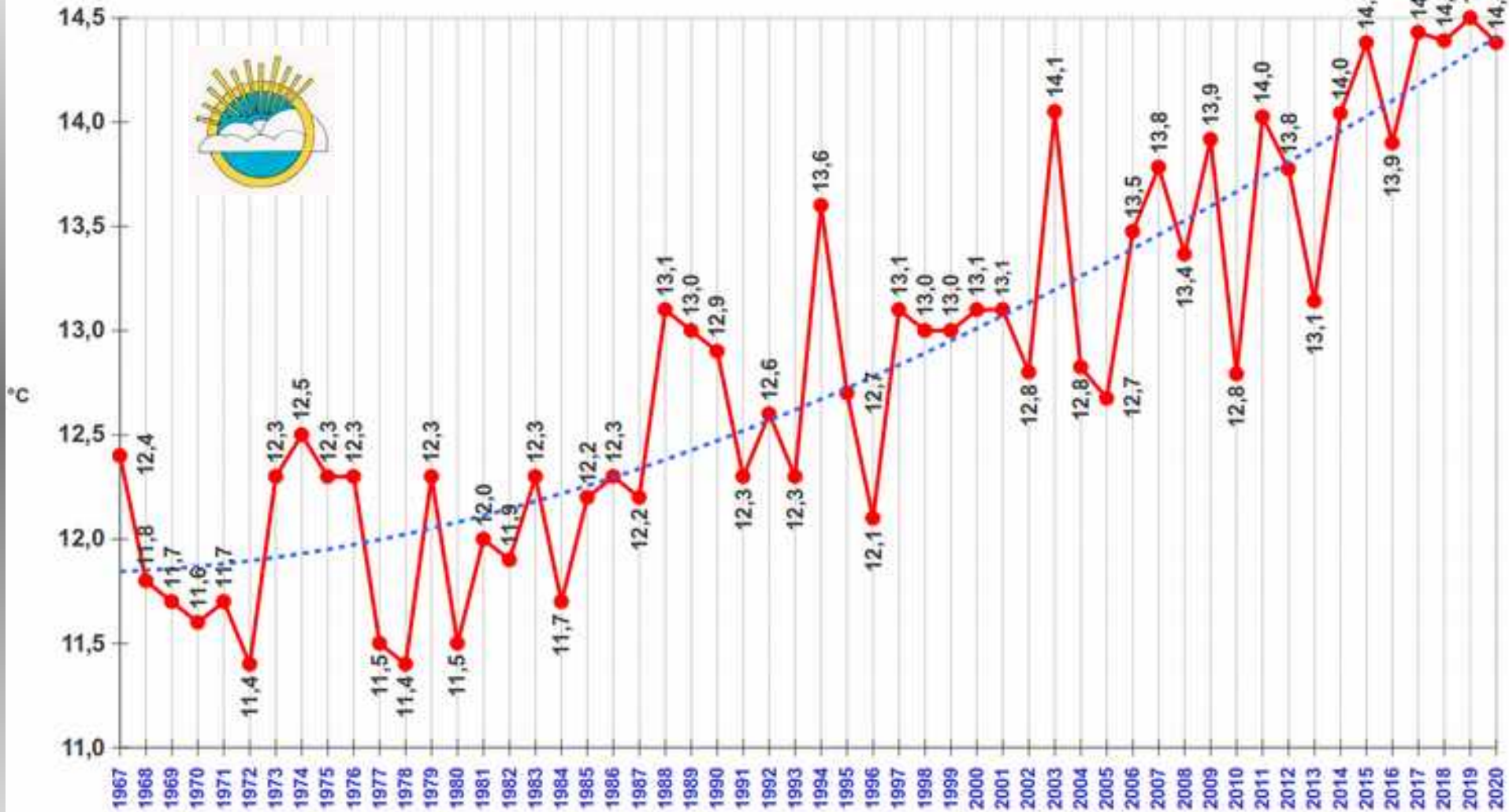




Morene 1920

Morene 1850

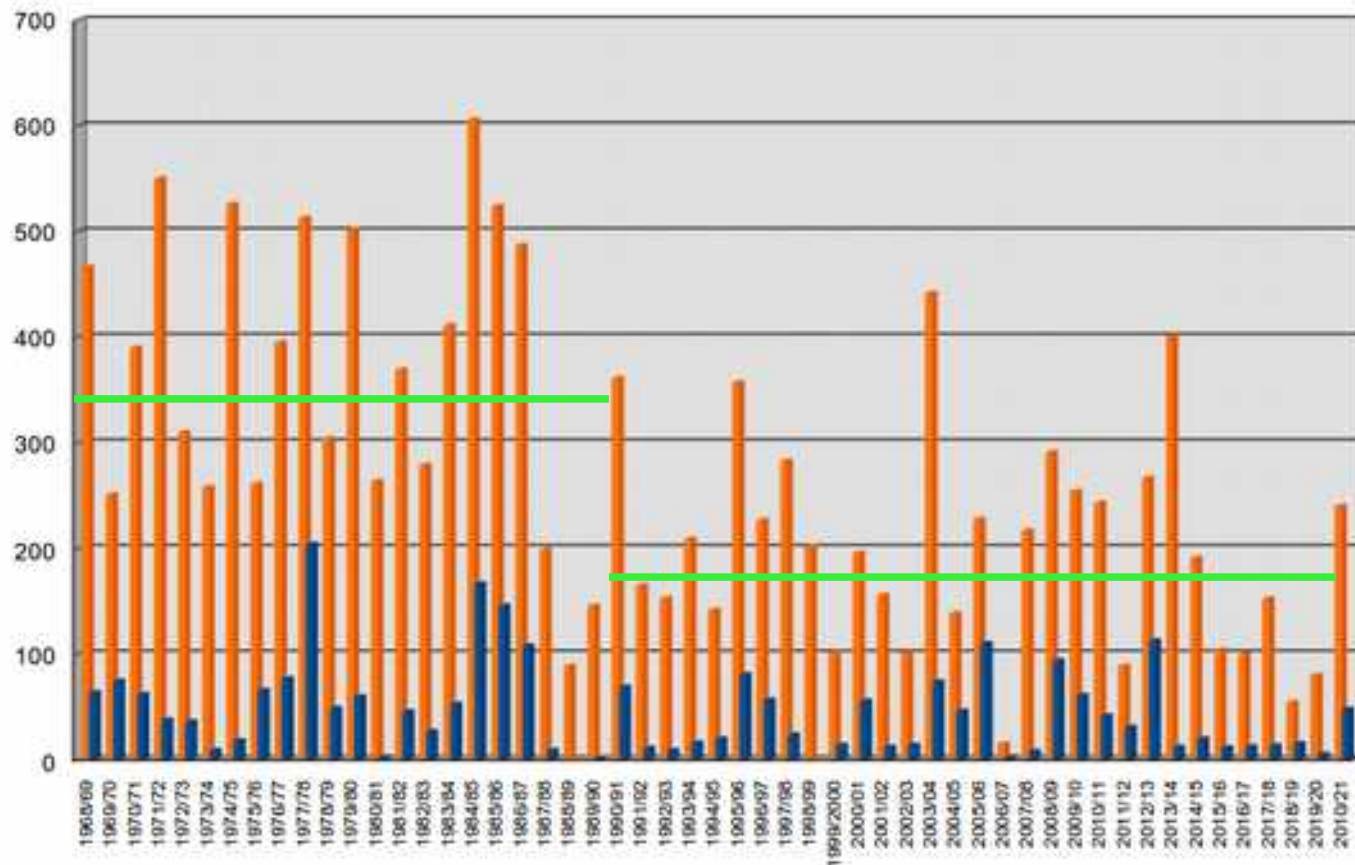
Provincia di Varese - Centro Geofisico Prealpino
 STAZIONE DI VARESE m 410 s.l.m.
 TEMPERATURA MEDIA ANNO METEOROLOGICO PERIODO 1967-2020 E LINEA DI TENDENZA



Aumento delle temperature risulta $0.43^{\circ}/10y \pm 0.06^{\circ}$

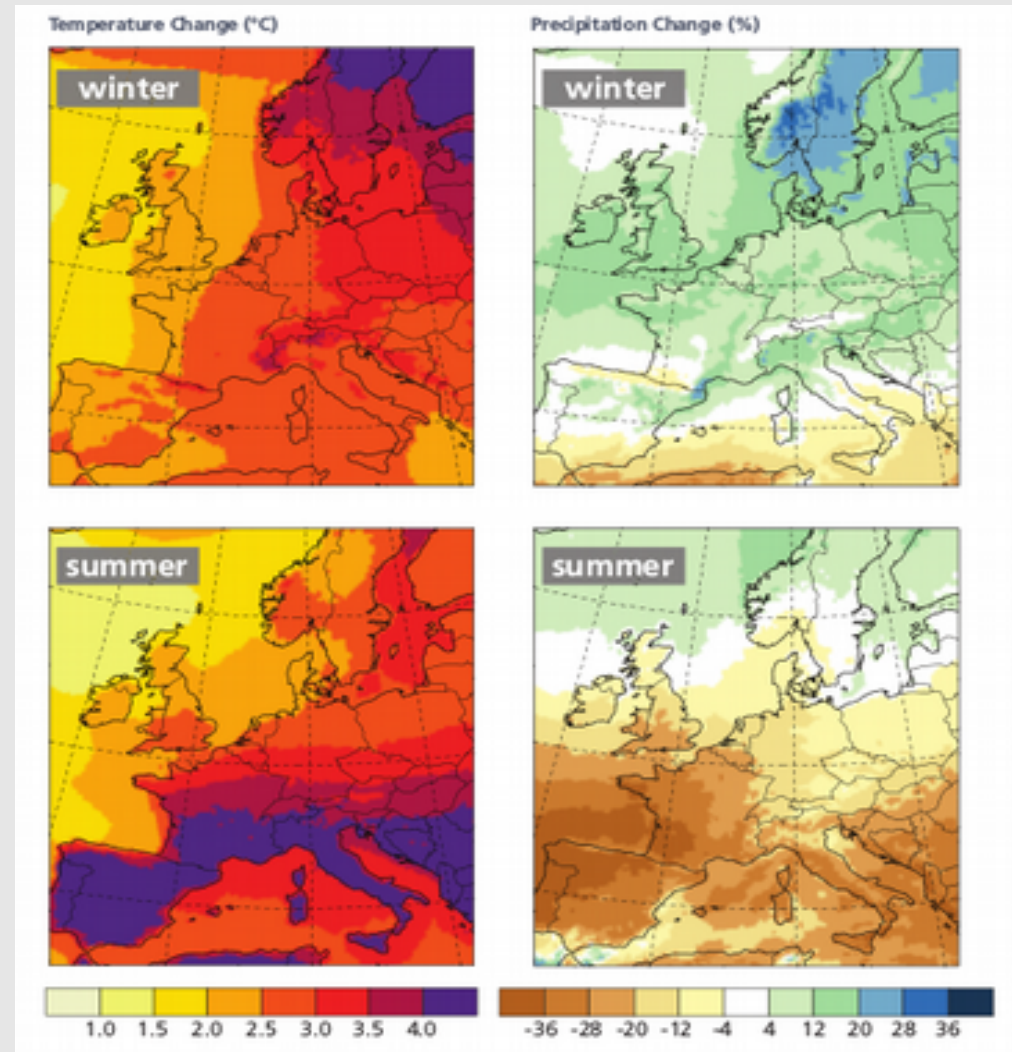
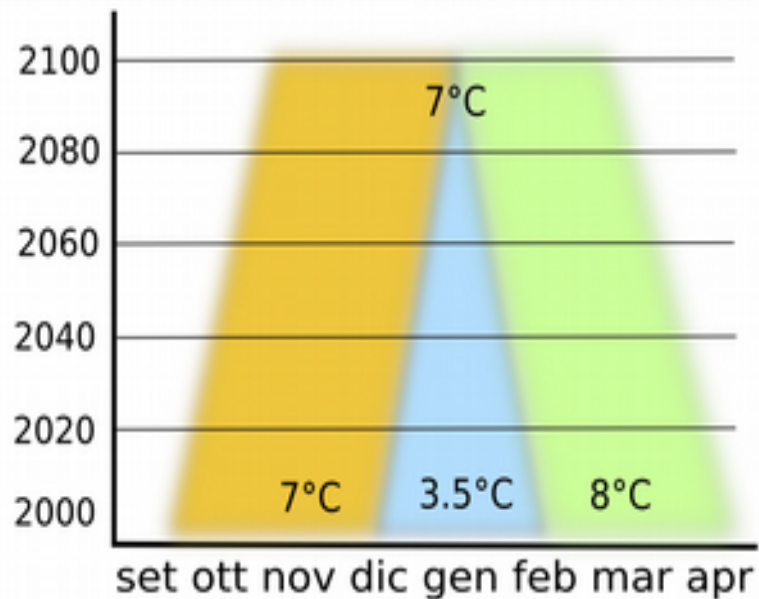
**I quantitativi di neve sono
diminuiti in particolare
dal 1986**

**Centro Geofisico Prealpino - Precipitazioni Nevose in cm
Stazioni di Varese e Campo dei Fiori a confronto**



Effetto del global Warming

Le proiezioni al 2100 prevedono un forte **aumento delle temperature estive** maggiore di quello delle **temperature invernali** (trend che è già osservato) e una **diminuzione delle piogge estive** (-20%) con un recupero di quelle invernali (+15%), a causa di uno spostamento di autunno e primavera, fenomeno però non ancora evidente.



Buone gite!

