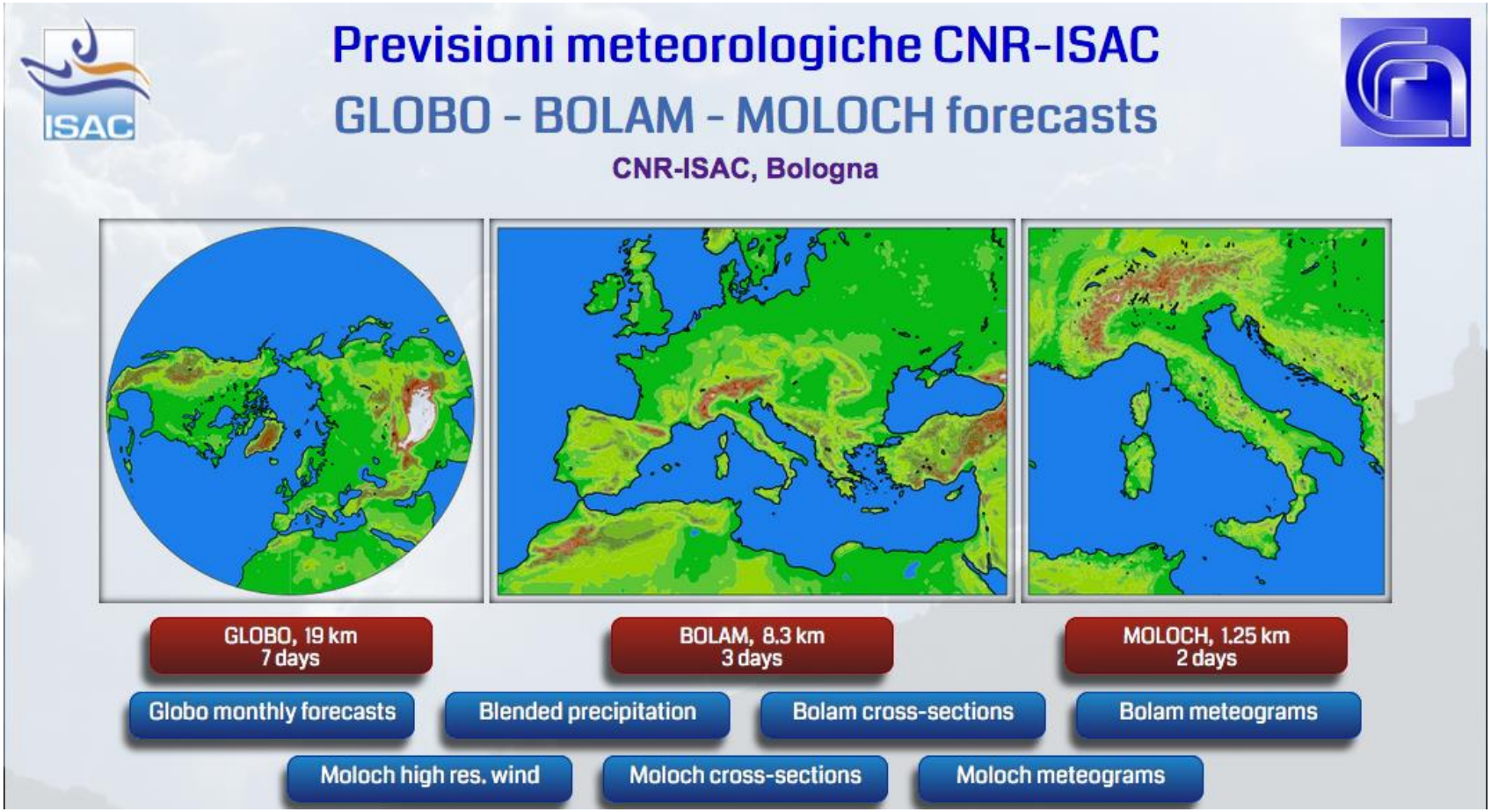
La modellistica previsionale del CNR

SILVIO DAVOLIO
CNR-ISAC (Bologna)

Piero Malguzzi, Oxana Drofa, Daniele Mastrangelo, Maurizio Fantini, Andrea Buzzi

MODELLI SVILUPPATI E IMPLEMENTATI PRESSO ISAC

http://www.isac.cnr.it/dinamica/projects/forecasts/



- Enti che **utilizzano** la modellistica ISAC:

ARPAL, LAMMA, ISPRA, MIPAF, ARPAS, METEOCAT, METEO-NOA

- Enti che **ricevono dati/prodotti** della modellistica ISAC:

Arpa Piemonte, CF Valle D'Aosta, OSMER Arpa FVG, Autorità Bacino Alto Adriatico, PoliMI, DPC

GLOBO

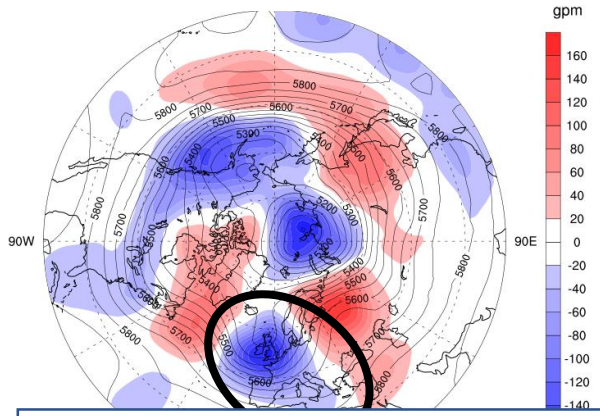
PREVISIONE MENSILE

dal 21.10.1994

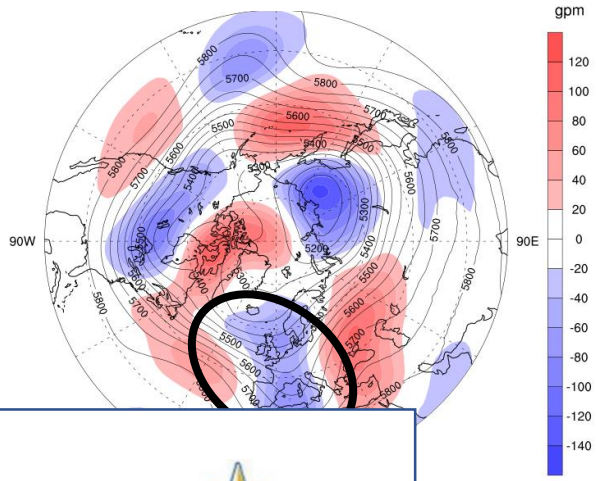
Z500 - media ensemble

Z500 – anomalia (colore)

1A SETTIMANA 1994 - 27 Oct 1994



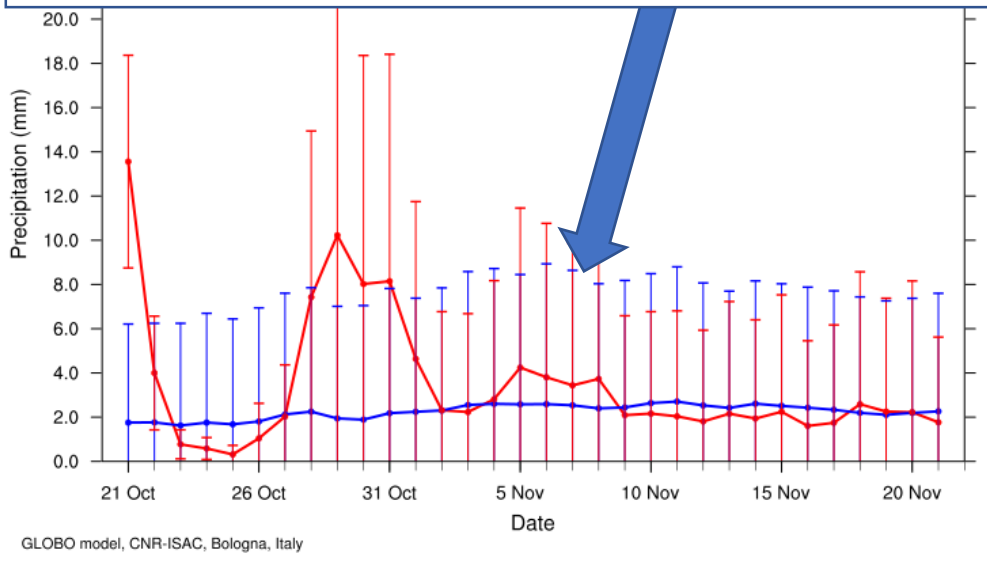
2A SETTIMANA 1994 - 3 Nov 1994

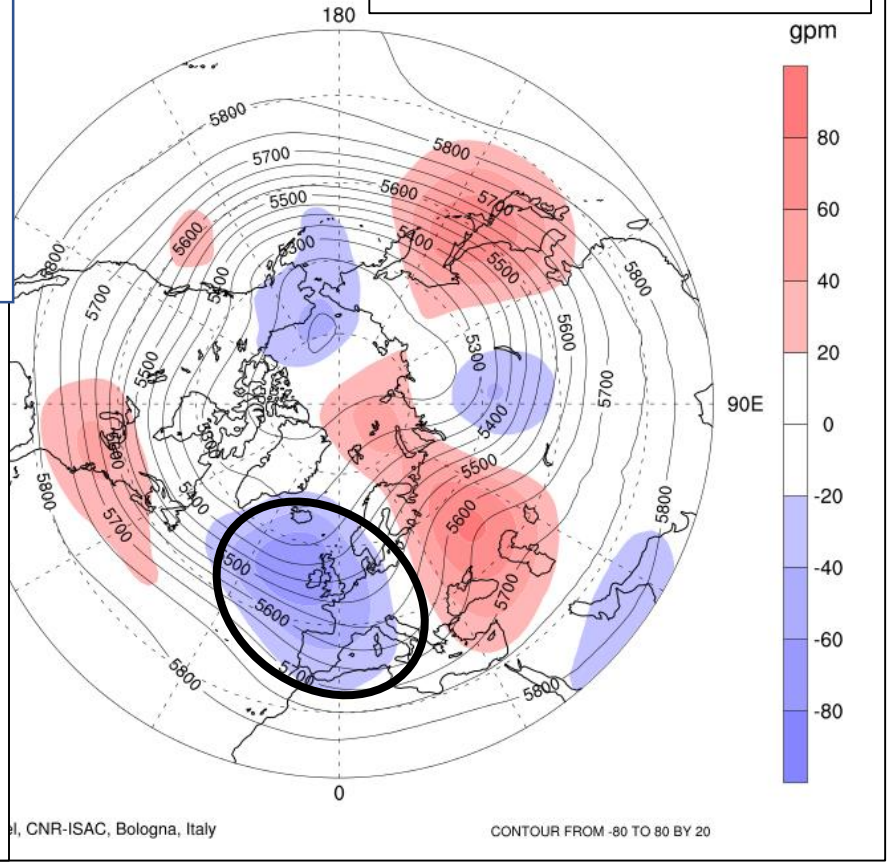


3A SETTIMANA
4-10 NOVEMBRE '94

Subseasonal-to-Seasonal S2S Prediction Project

WMO





SIMULAZIONI

ERA5
i.c. 04/11/1994
00 UTC

BOLAM
(8 km)

MOLOCH
(1.25 km)

ERA5
i.c. 04/11/1994
12 UTC

BOLAM
(8 km)

MOLOCH
(1.25 km)

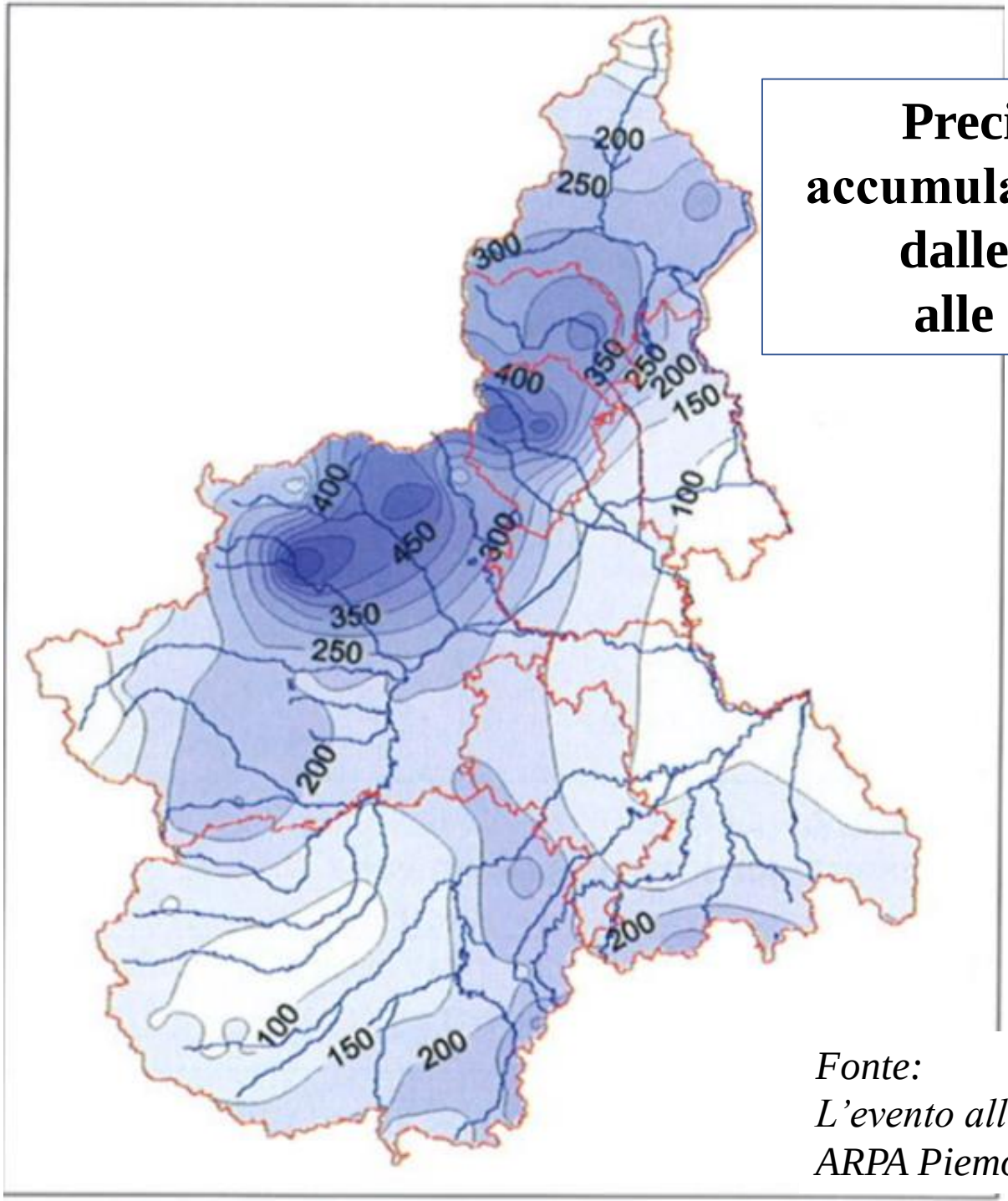
IFS exp: h6bg
i.c. 04/11/1994
00 UTC

MOLOCH
(1.25 km)

ERA5
i.c. 04/11/1994
00 UTC

BOLAM
"vintage"

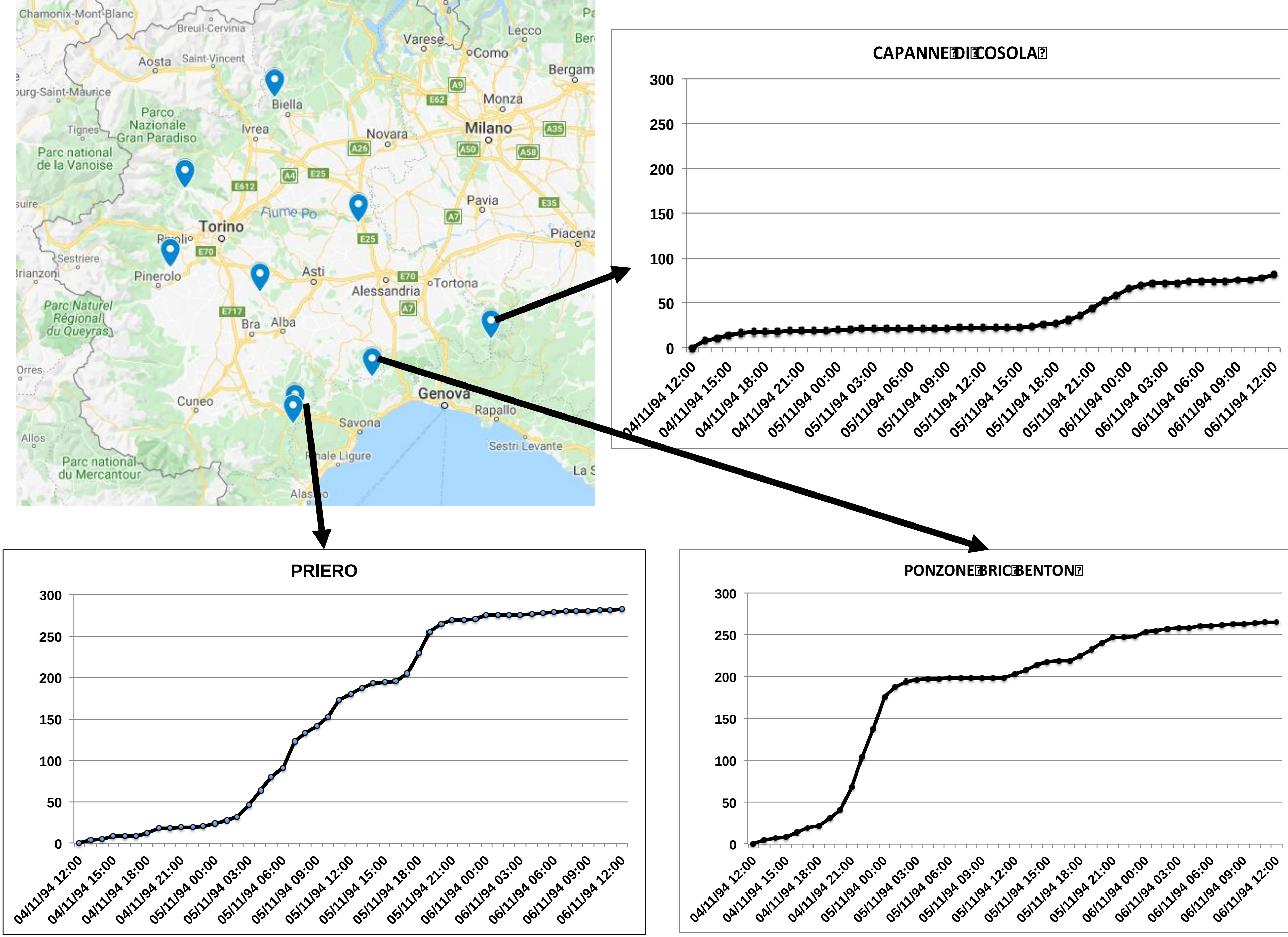
Risoluzione:
20 km
30 livelli verticali



Precipitazione osservate accumulate nel corso dell'evento dalle 00 UTC 04.11.1994 alle 00 UTC 07.11.1994

Focus sulle 36 ore
12 UTC, 04.11.1994
00 UTC, 06.11.1994

Fonte:
L'evento alluvionale del 2-6 Novembre 1994
ARPA Piemonte



Chamonix-Mont-Blanc
Breuil-Cervinia
Aosta
Saint-Vincent
Biella
Varese
Como
Lecco
Bergamo
Monza
Milano
Novara
Ivrea
Parco Nazionale Gran Paradiso
Tignes
Parc national de la Vanoise
Torino
Fiume Po
Pavia
Piacenza
Sestriere
Pinerolo
Asti
Alessandria
Tortona
Parc Naturel Régional du Queyras
Bra
Alba
Cuneo
Genova
Rapallo
Savona
Sestri Levante
Finale Ligure
Allos
Parc national du Mercantour
Alassio
CAPANNE DI COSOLA
PRIERO
PONZONE BRIC BENTON
300
250
200
150
100
50
0
04/11/94 12:00
04/11/94 15:00
04/11/94 18:00
04/11/94 21:00
05/11/94 00:00
05/11/94 03:00
05/11/94 06:00
05/11/94 09:00
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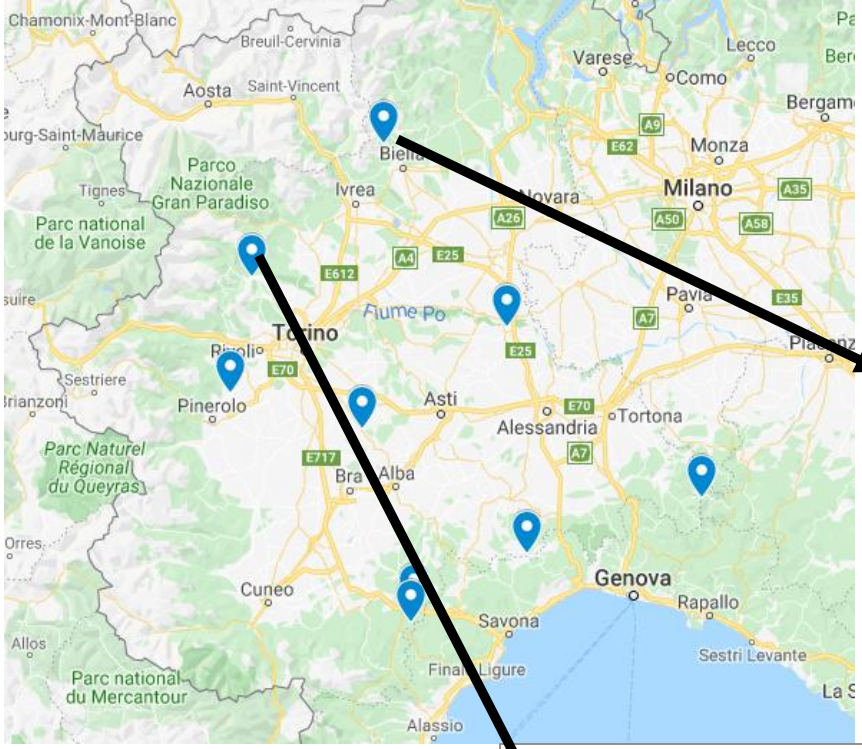
06/11/94 09:00
06/11/94 12:00


Chamonix-Mont-Blanc
Breuil-Cervinia
Aosta
Saint-Vincent
Varese
Como
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Milano
Bergamo
Parco Nazionale Gran Paradiso
Tignes
Ivrea
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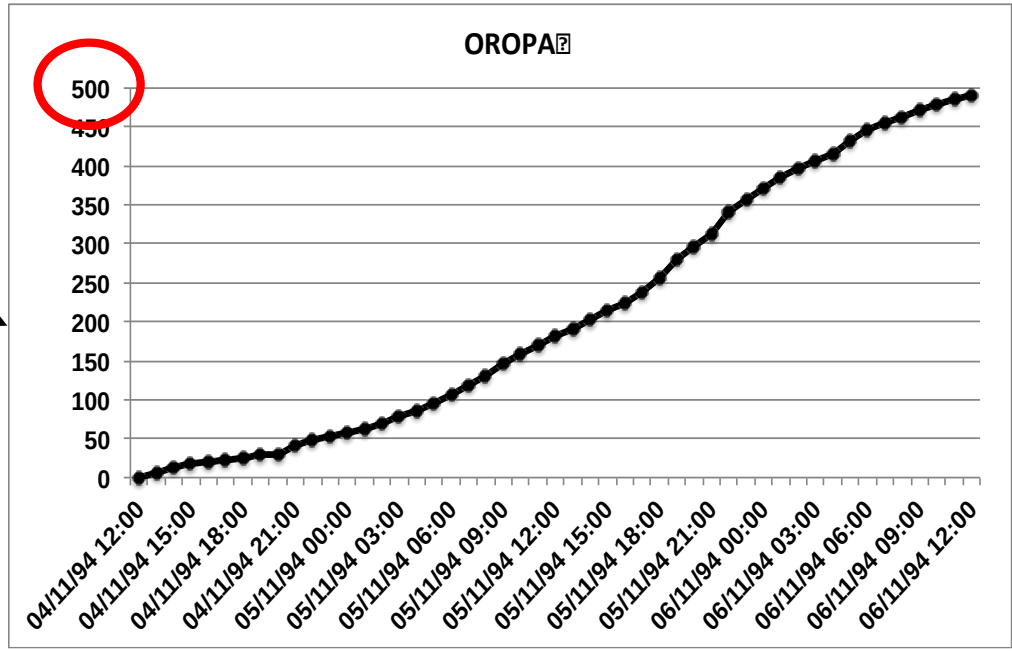
Alessandria
Tortona
Parc Naturel Régional du Queyras
Bra
Alba
Cuneo
Genova
Rapallo
Savona
Sestri Levante
Allos
Parc national du Mercantour
Alassio
A4
A5
A7
A26
A50
A58
A35
E25
E35
E62
E70
E612
E717


OROPA
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04/11/94 12:00
04/11/94 15:00
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05/11/94 00:00
05/11/94 03:00
05/11/94 06:00
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05/11/94 18:00
05/11/94 21:00
06/11/94 00:00
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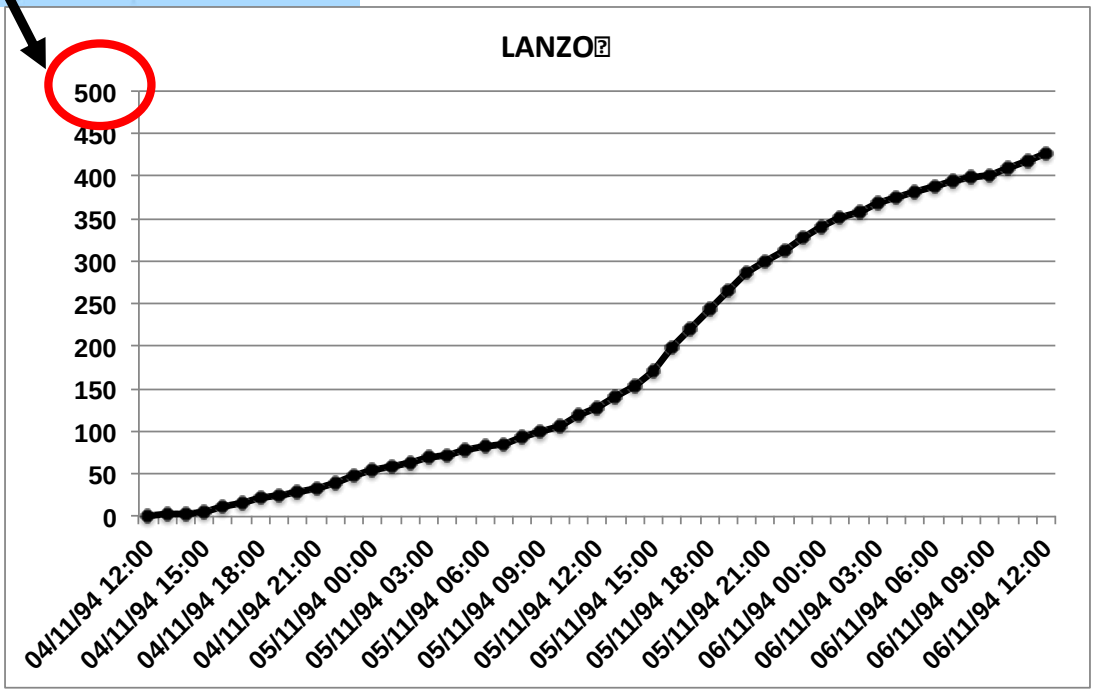
06/11/94 06:00
06/11/94 09:00
06/11/94 12:00


LANZO
500
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300
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200
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100
50
0
04/11/94 12:00
04/11/94 15:00
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04/11/94 21:00
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05/11/94 12:00
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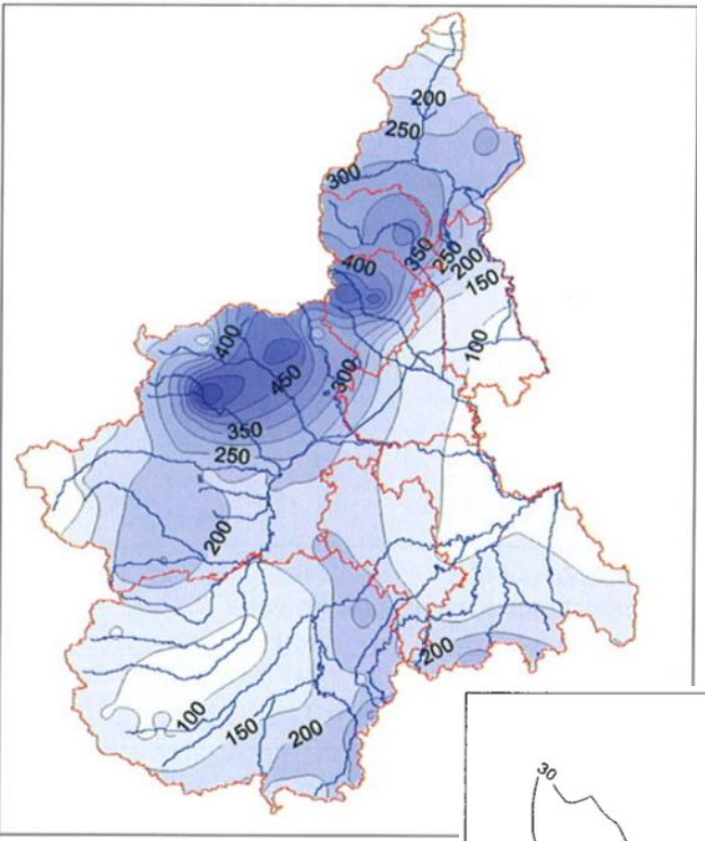
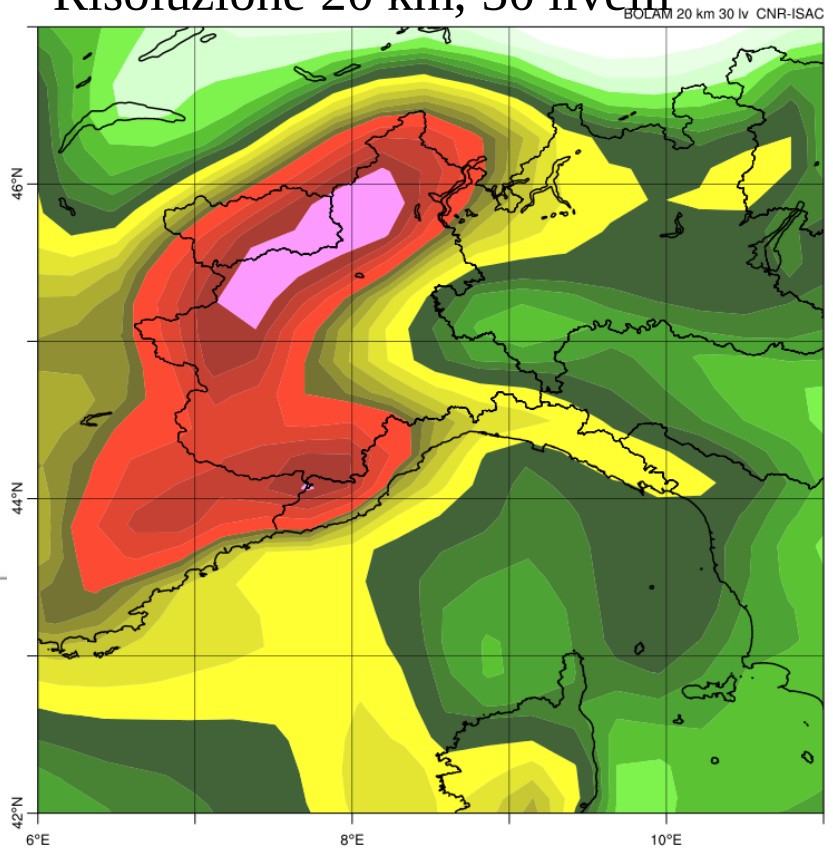
05/11/94 21:00
06/11/94 00:00
06/11/94 03:00
06/11/94 06:00
06/11/94 09:00
06/11/94 12:00

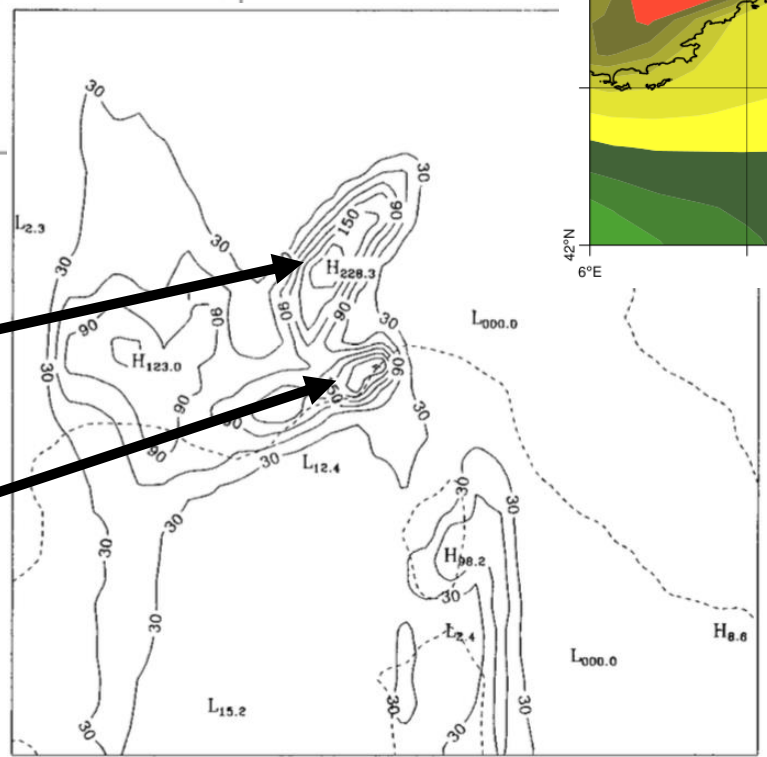
SIMULAZIONE BOLAM “*vintage*”
Risoluzione 20 km, 30 livelli





Max: 230 mm

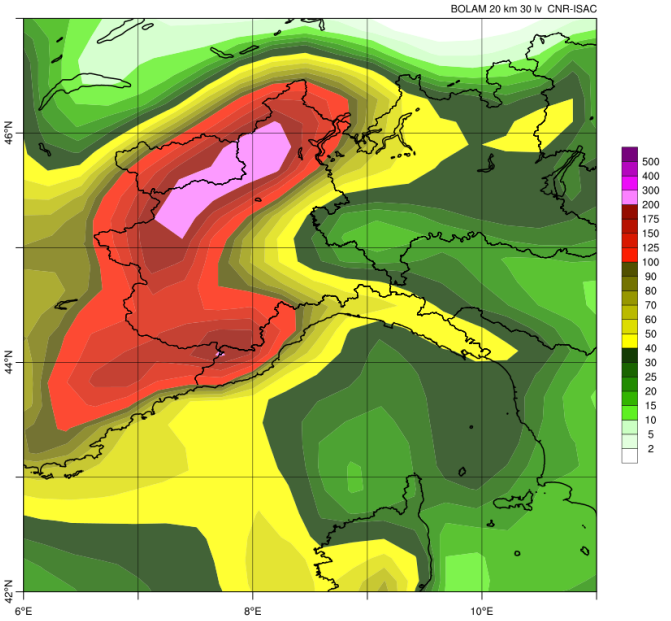
Max: 180 mm

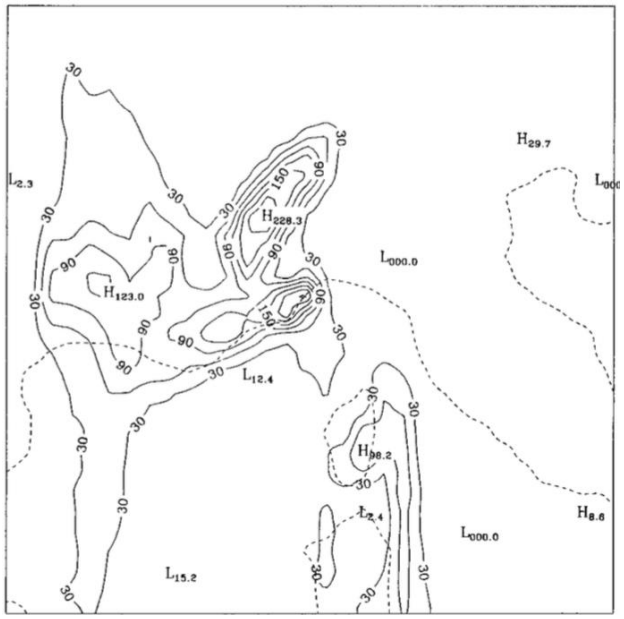


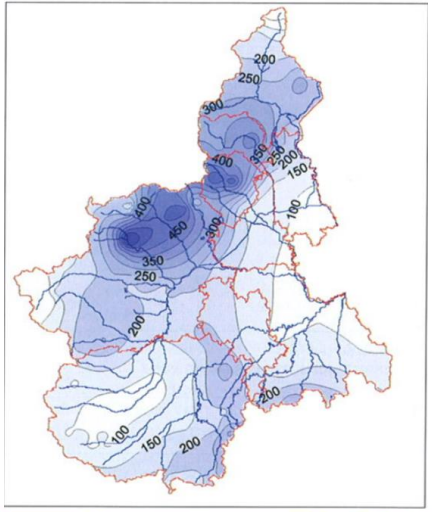
SIMULAZIONE BOLAM 1994
Mon. Wea. Rev., 1998

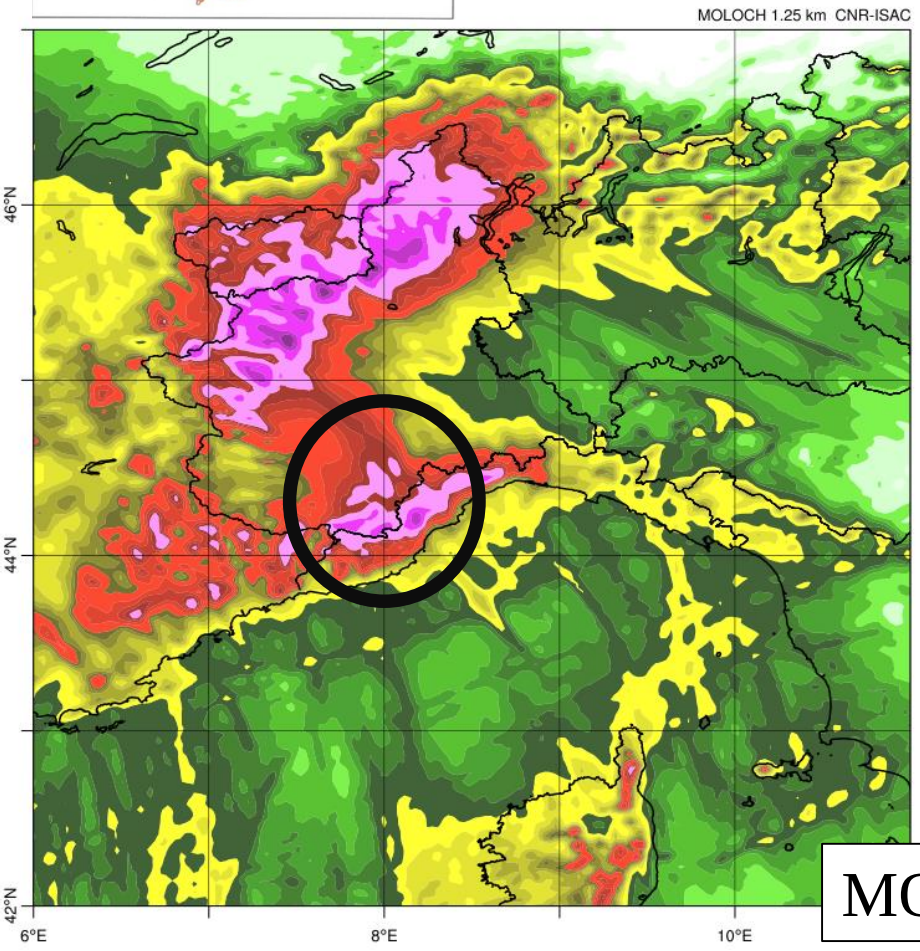
silvio — ssh -X -Y silvio@goldrake.bo.isac.cnr.it

```
ottovolante/home/silvio/Piemonte1994/bolam->./bolam.run
OpenMPI parallel run using 128 cpu's
lancio BOLAM
```

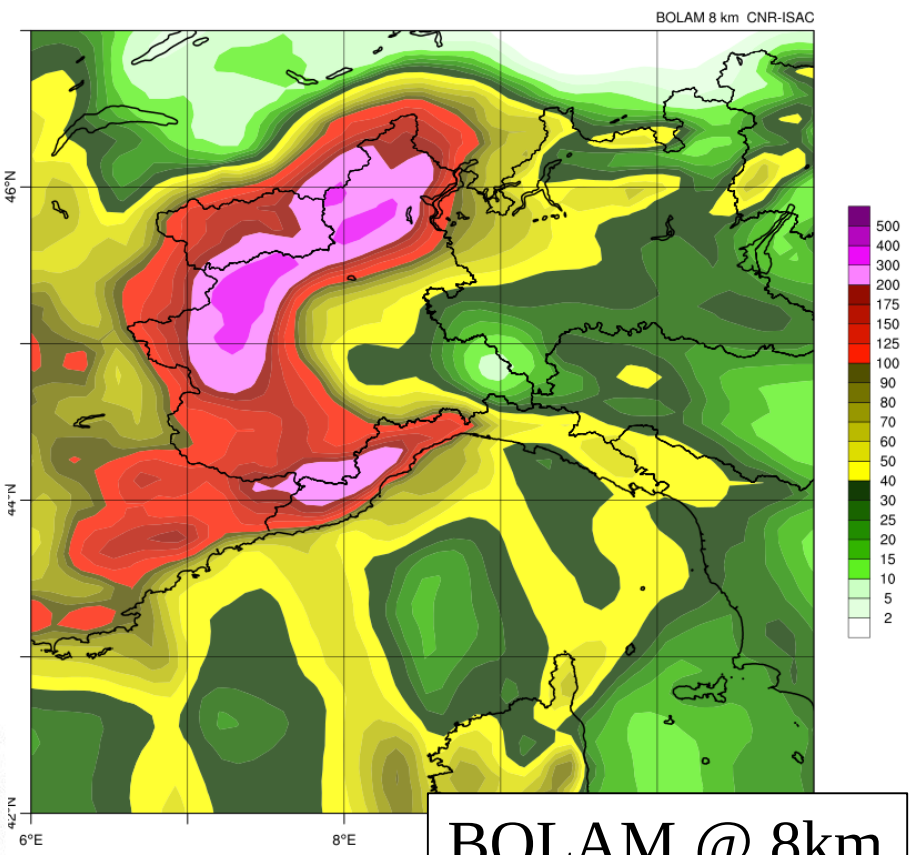






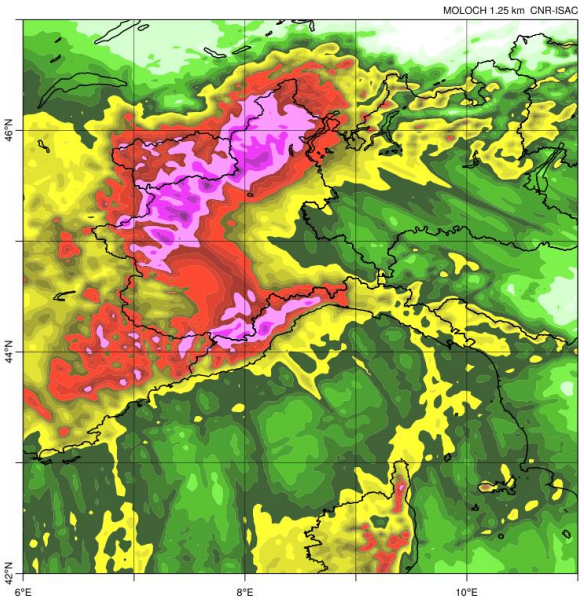


MOLOCH @ 1.25km

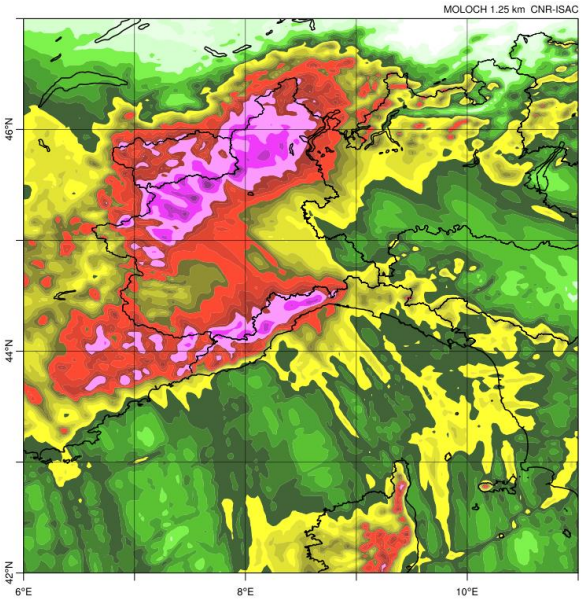


BOLAM @ 8km

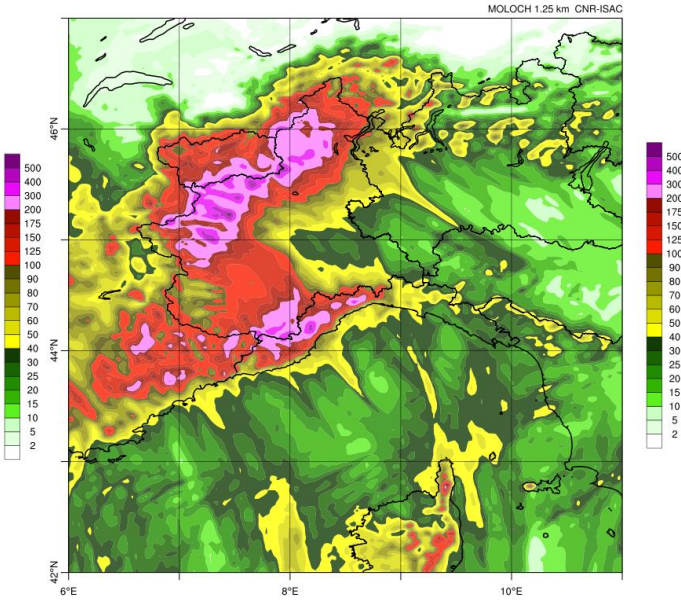
SIMULAZIONI MOLOCH: PRECIPITAZIONE CUMULATA



ERA5-BOL-MOL
I.C. 00 UTC

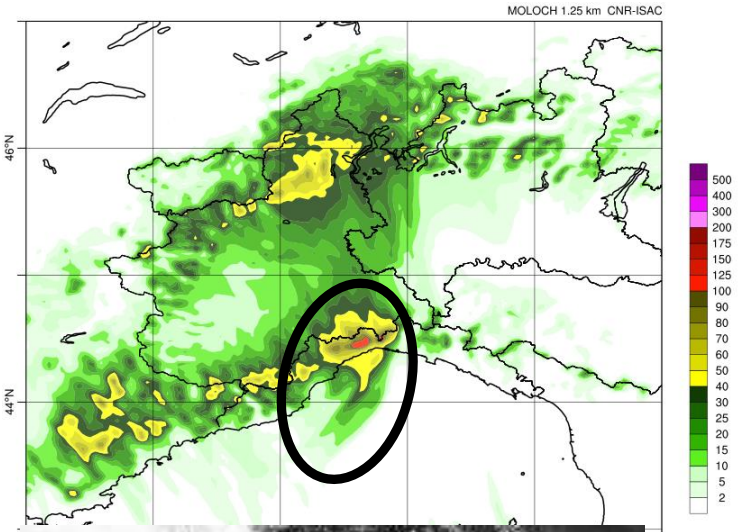


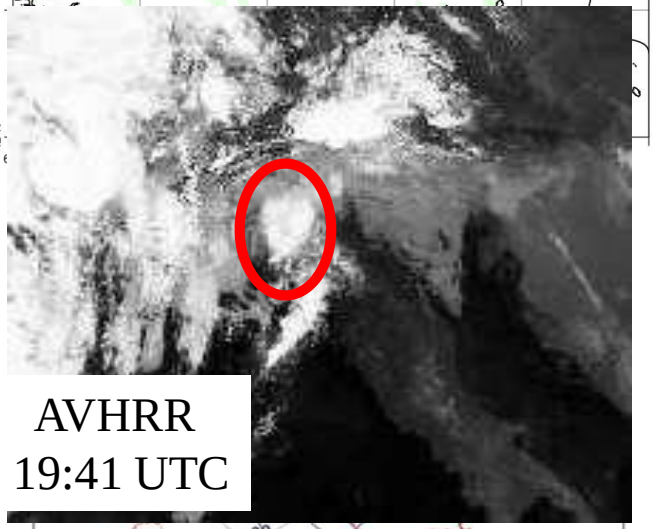
ERA5-BOL-MOL
I.C. 12 UTC

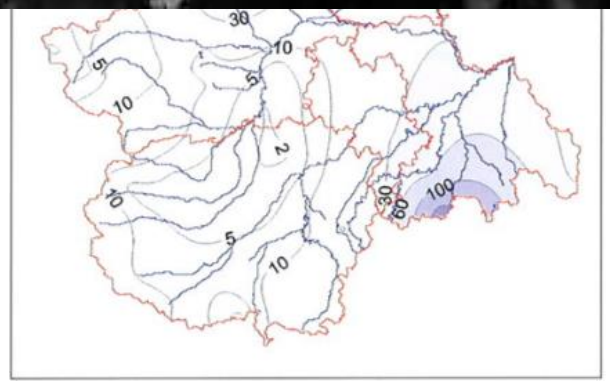


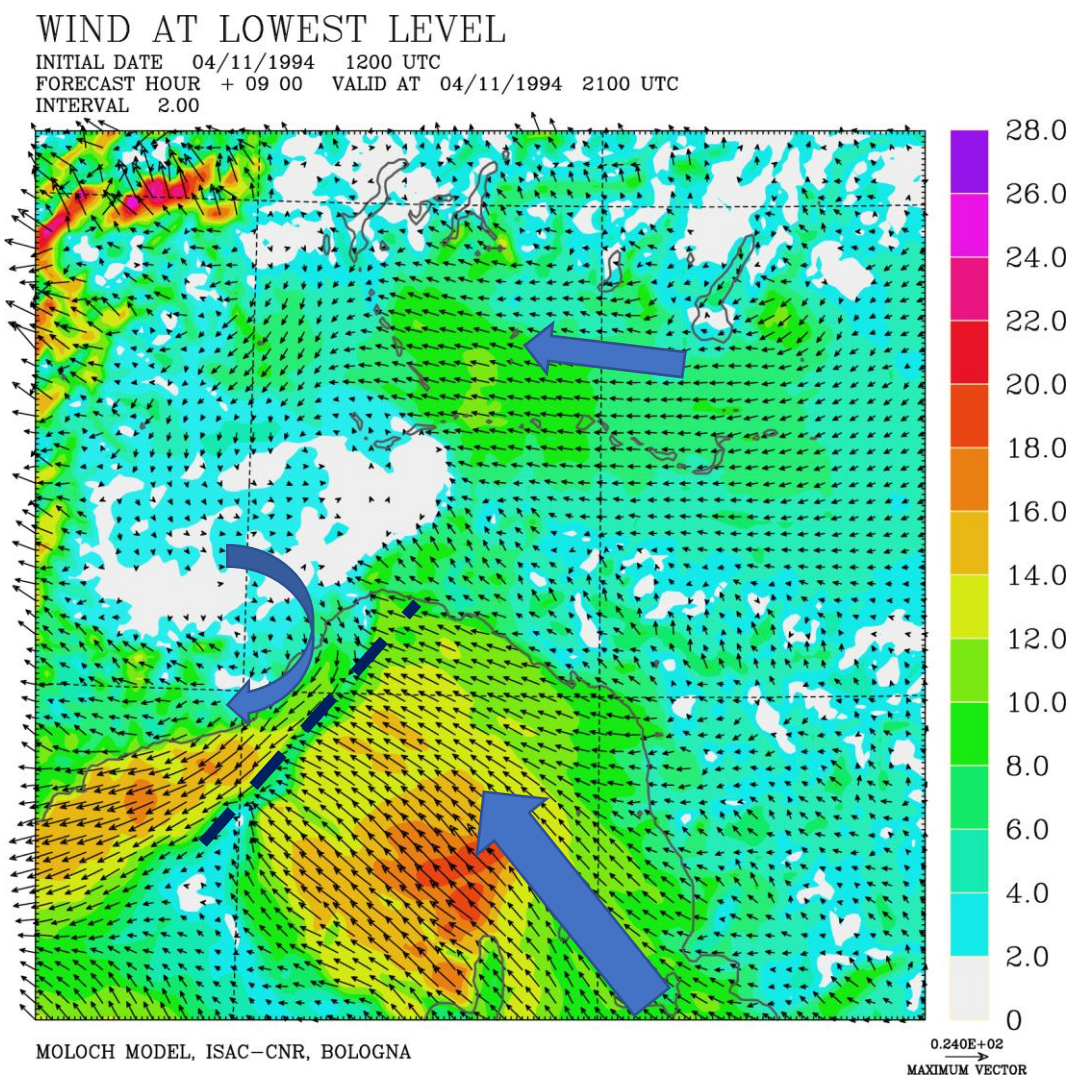
IFS-MOL
I.C. 00 UTC

PRECIPITAZIONE CUMULATA IN 12 ORE
12 UTC 04.11.1994 – 00 UTC 05.11.1994





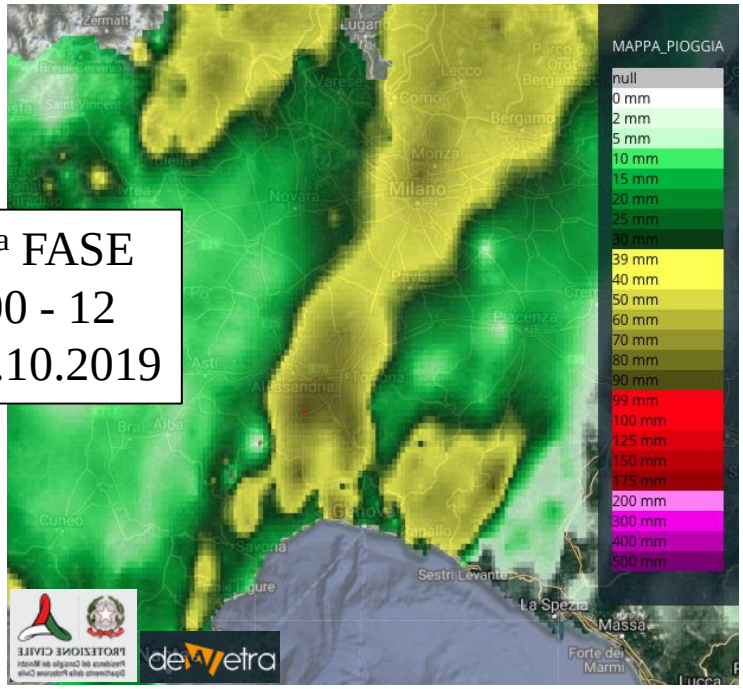




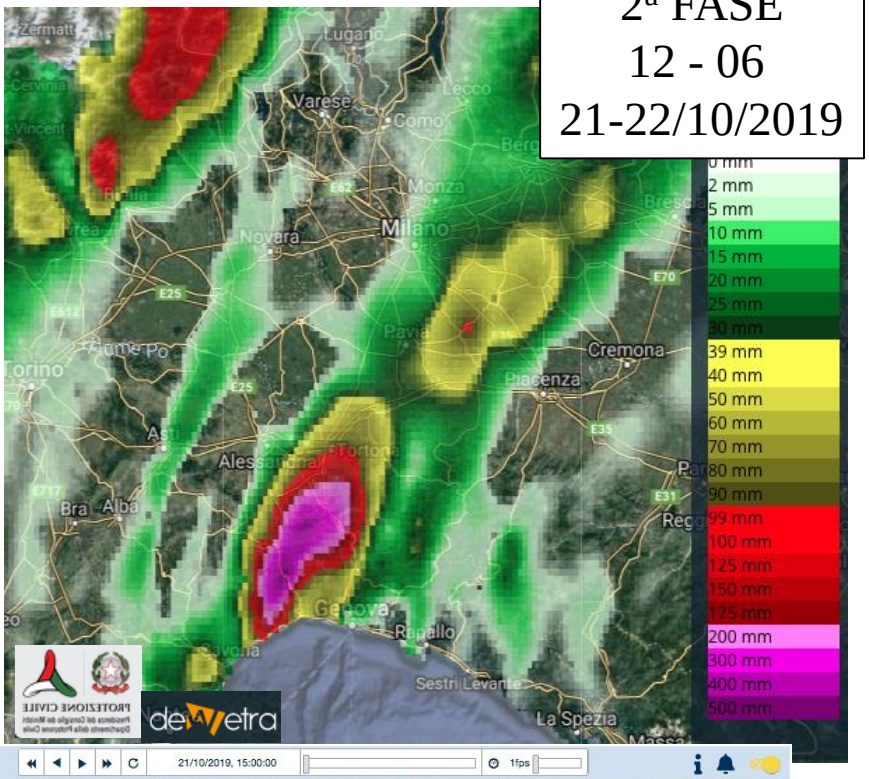
MODELLI AD ALTA RISOLUZIONE

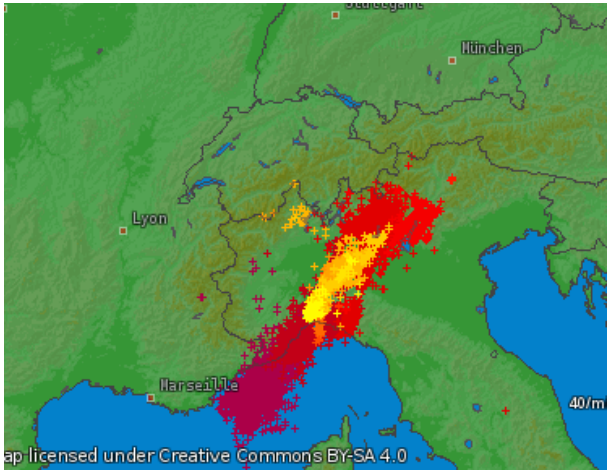
EVENTO DEL 21 OTTOBRE 2019

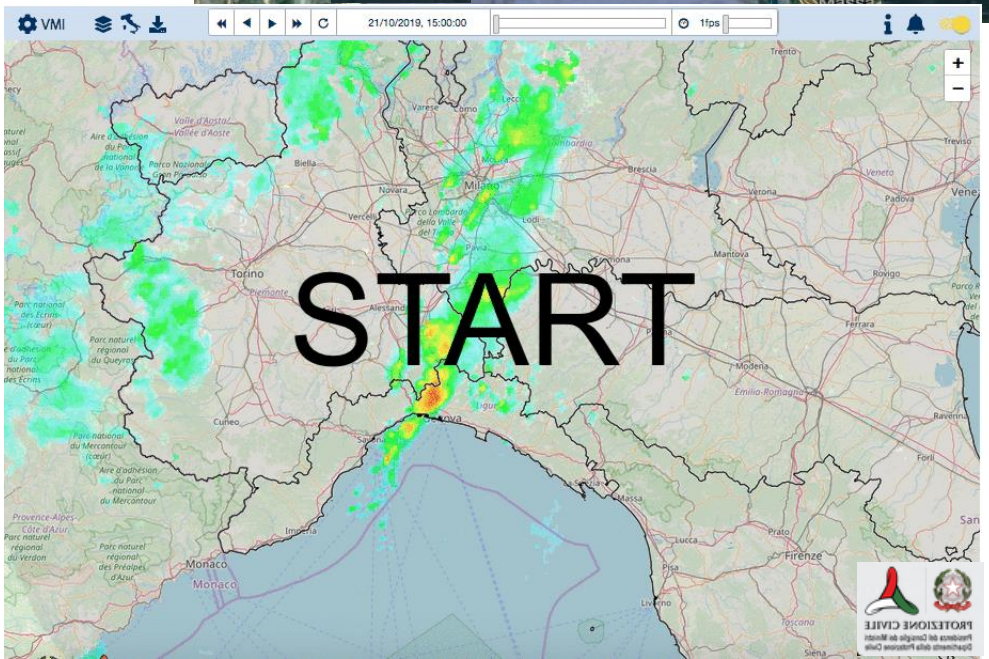
1ª FASE
00 - 12
21.10.2019

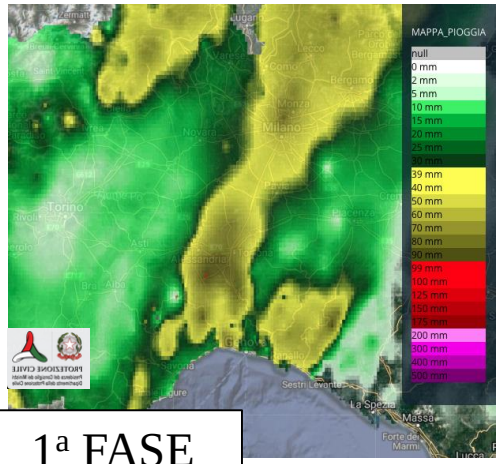


2ª FASE
12 - 06
21-22/10/2019



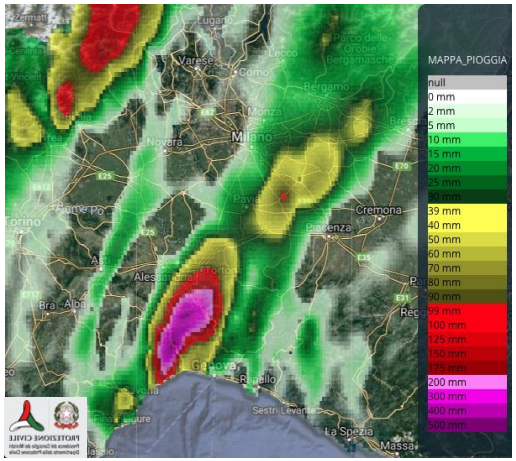






EVENTO DIVERSO DAL 1994:

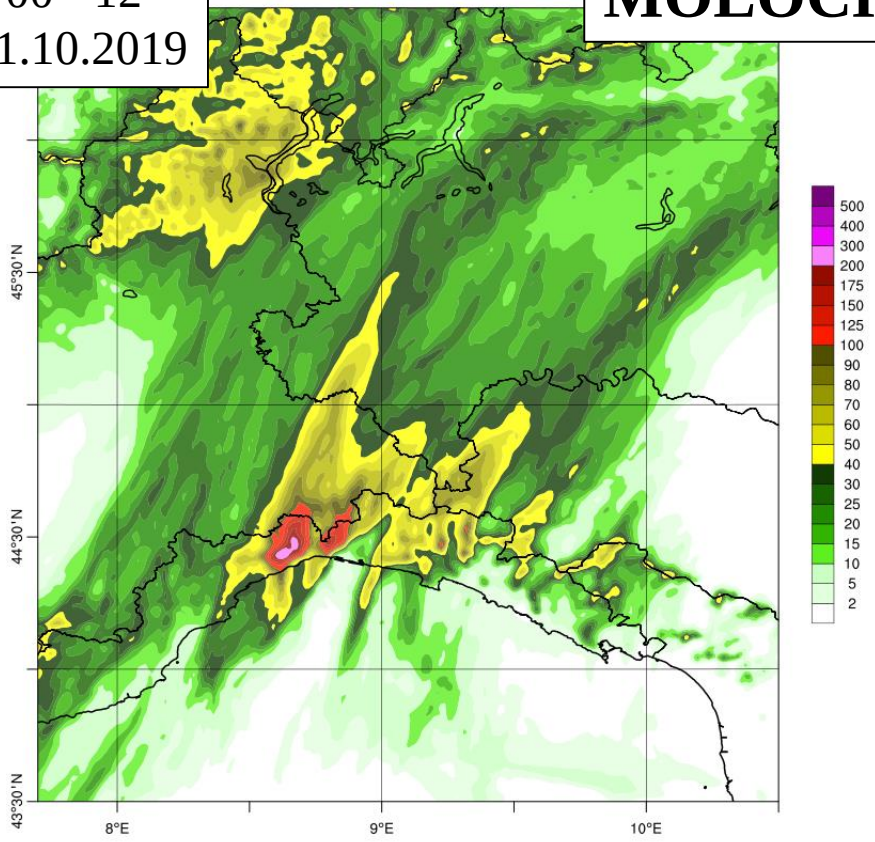
- sinottica
- aree interessate
- fenomenologia e scala spazio/temporale
- “triggering”

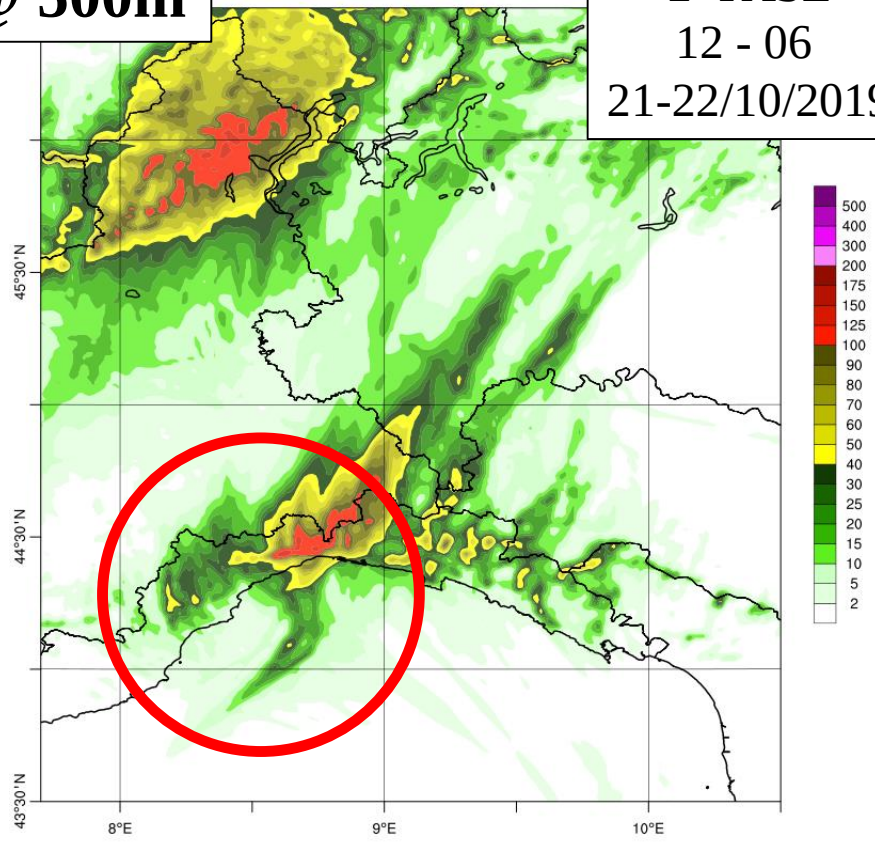


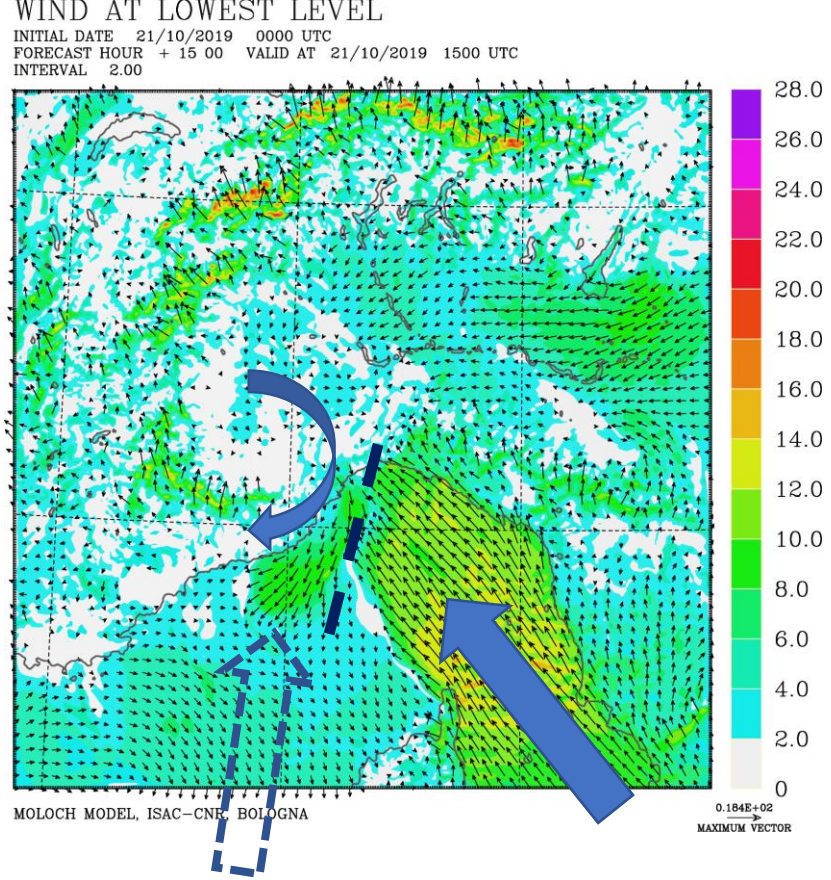
1ª FASE
00 - 12
21.10.2019

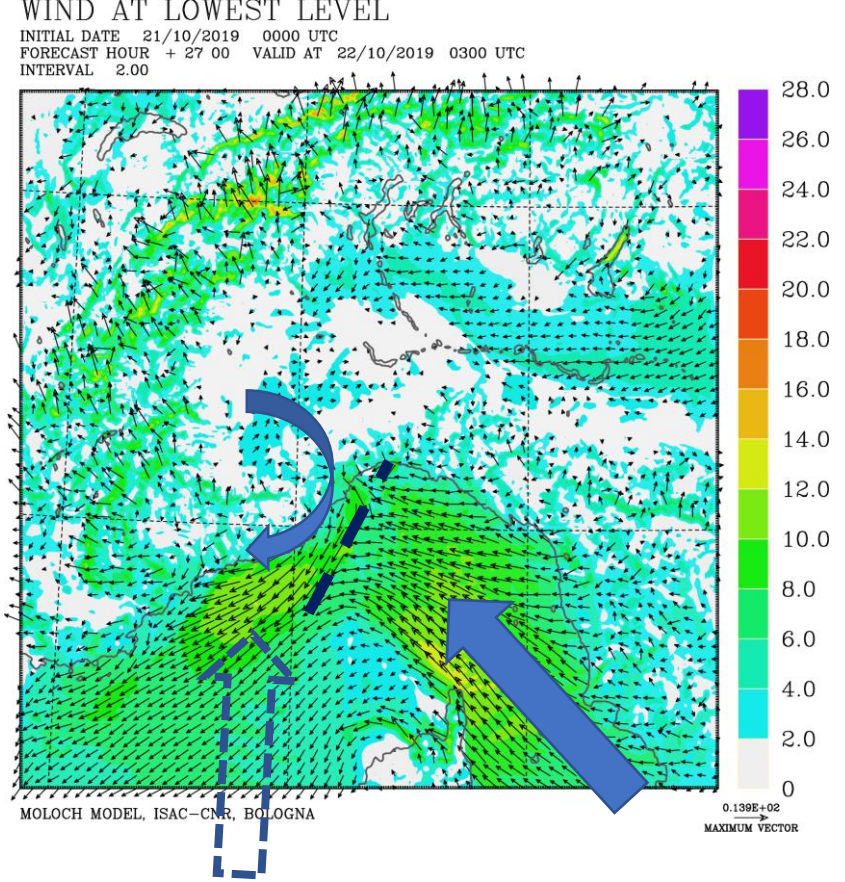
MOLOCH @ 500m

2ª FASE
12 - 06
21-22/10/2019









- Profilo verticale della massa d'aria incidente
- Interazione con orografia (flow over, blocked flow, convezione)
- Caratteristiche della corrente di densità
- Descrizione della complessa orografia
- Convezione

Delicato equilibrio tra diverse forzanti a scala locale!

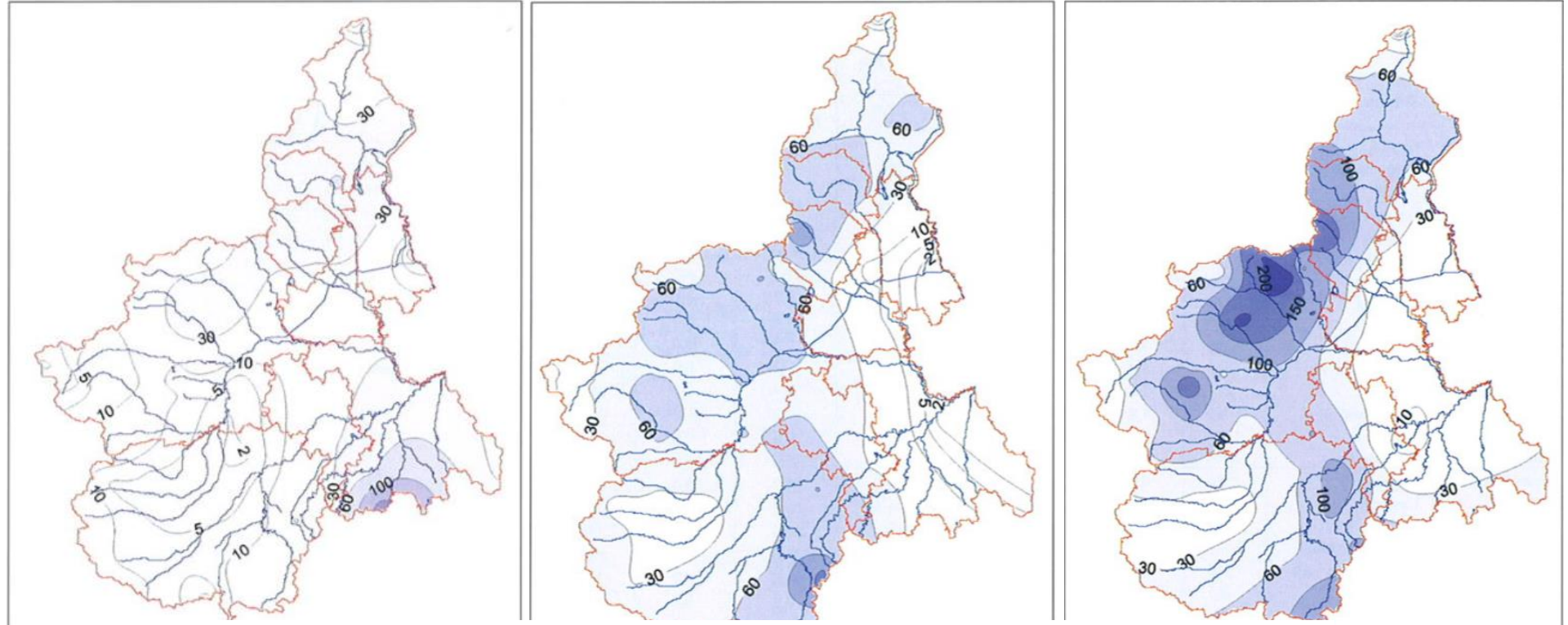
CONCLUSIONI

Piemonte 1994; Gavi 2014 & 2019: due tipologie di evento diverse

Sistemi convettivi (rigeneranti) rappresentano una delle sfide della modellistica meteorologica ad alta risoluzione.

Prospettive:
- **ECMWF** ensemble globale a 5 km entro il 2025
- Mettere assieme competenze a livello **nazionale** (ricerca e centri operativi) per affrontare la sfida:
    - -sviluppo modelli
    - -assimilazione dati → migliorare condizione iniziale
    - -previsione di ensemble

CNR **ISAC**: MOLOCH come modello (non esclusivo!) su cui collaborare



Fonte: L'evento alluvionale del 2-6 Novembre 1994; ARPA Piemonte

GRAZIE PER L'ATTENZIONE