Modifications of LM parameterization schemes in the framework of the HYDROPTIMET project

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Outlook

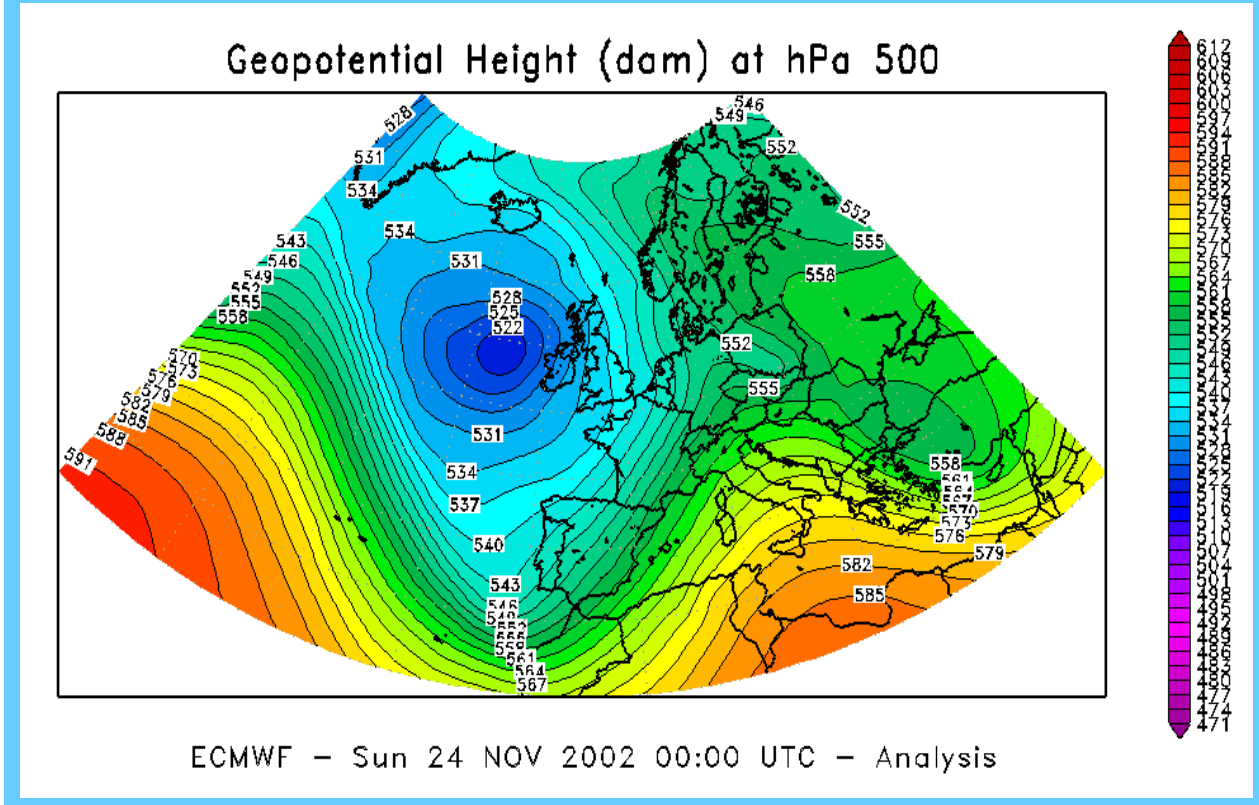
- Aim of the work
- Description of the event
- Performed runs
- I.C./B.C., domain and convection scheme dependence
- Introduction of cloud ice and prog. rain eq.
- Change in LM version
- Conclusions

Aim of the work

We want to investigate different configurations of LM, obtained varying the host model, numerical schemes and parameterisation schemes, in order to evaluate the influence of each one and to find an optimal configuration for the representation of QPF in the considered case studies.

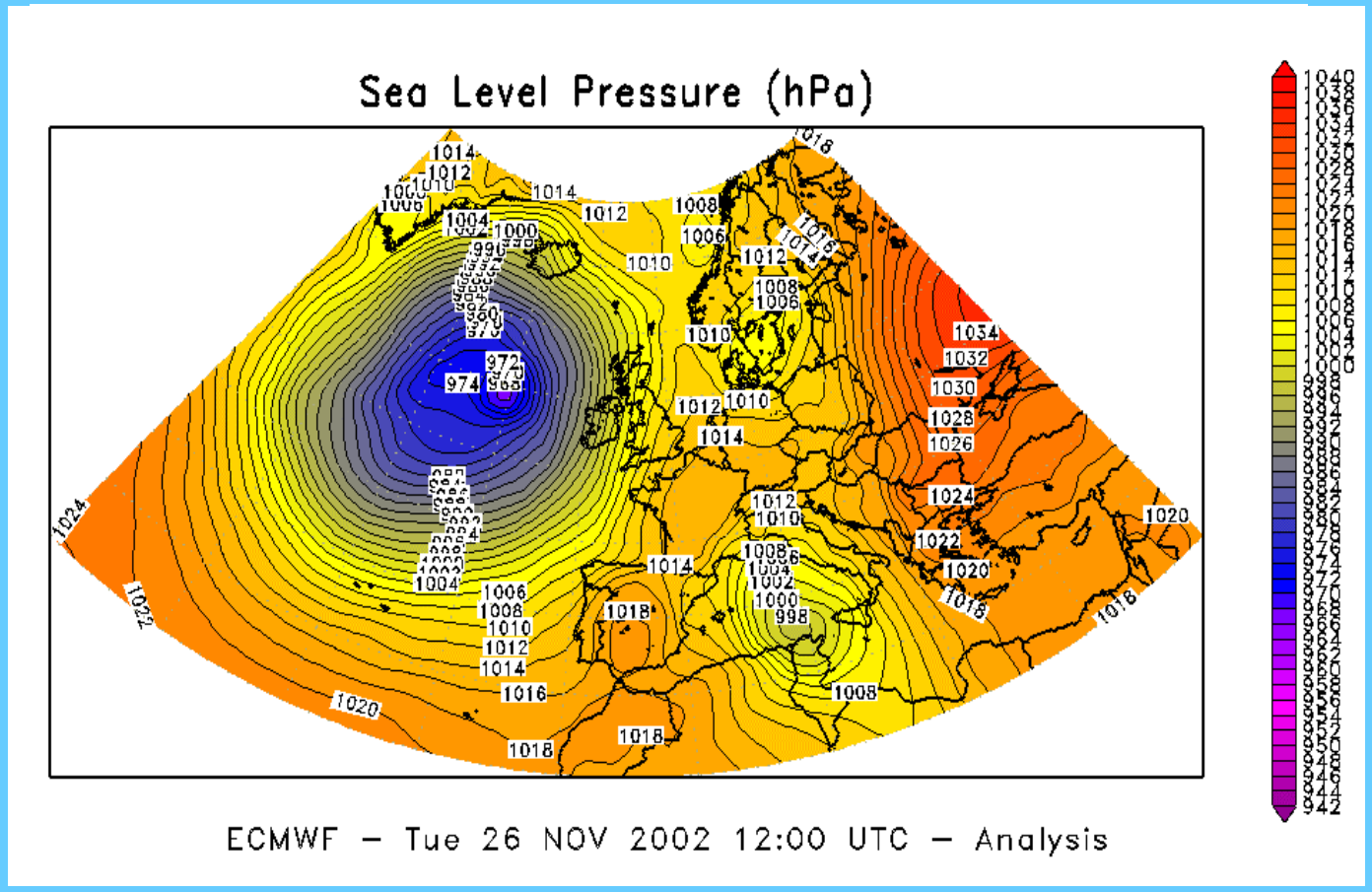
- Date of run performed: 20021125 00UTC (duration of 36 h)
- The output variables (hourly) of the simulations are the following:
  - ✓ surface level: U10m, V10m, T2m, TD2m, Total precipitation, Total cloud cover, Convective precipitation, PMSL, CAPE index
  - ✓ pressure levels: 1000hPa, 925hPa, 850hPa, 700hPa (T, RH, U, V, Geopotential)

Description of the event (1)



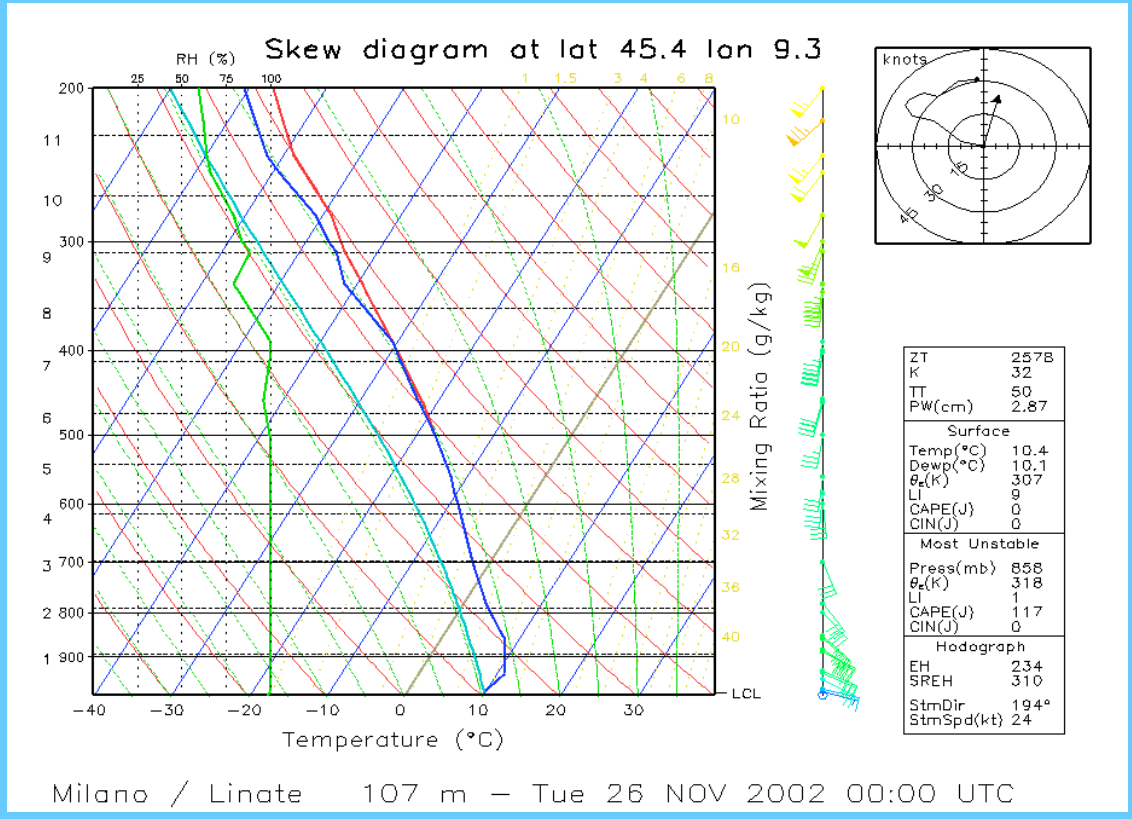
A deep low off the Irish coastline favoured the entrance of several perturbations over North western Europe. Then, beginning from Saturday the 23rd, the depression began to expand southward reaching the North-African coastline and directing moist air towards Northern Italy

Description of the event (2)



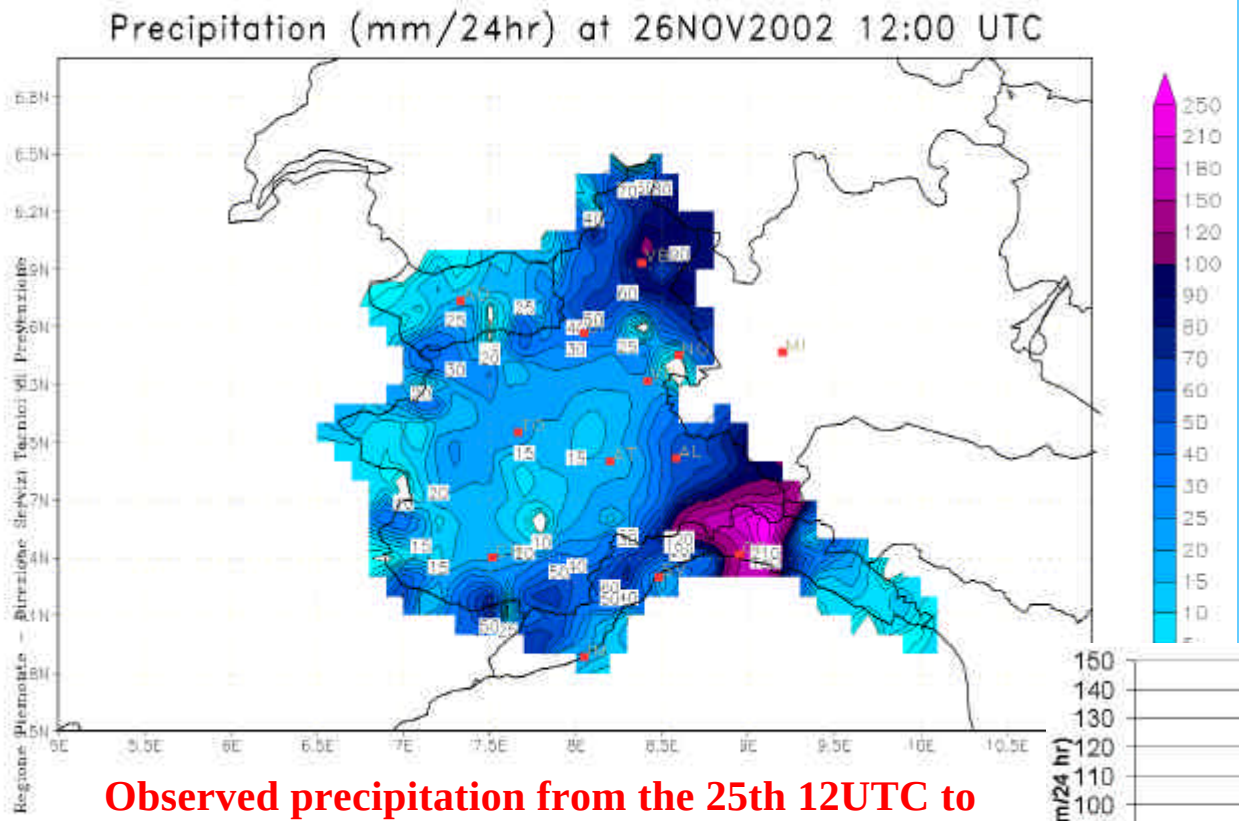
The evening of the 25th a deep minimum at all levels isolated over the Sardinia Channel causing a very moist and wet south-easterly flow from the Tyrrhenian Sea towards Piedmont. This minimum was stationary for about 24 hours, due to the blocking effect caused by a ridge over Greece.

Description of the event (3)

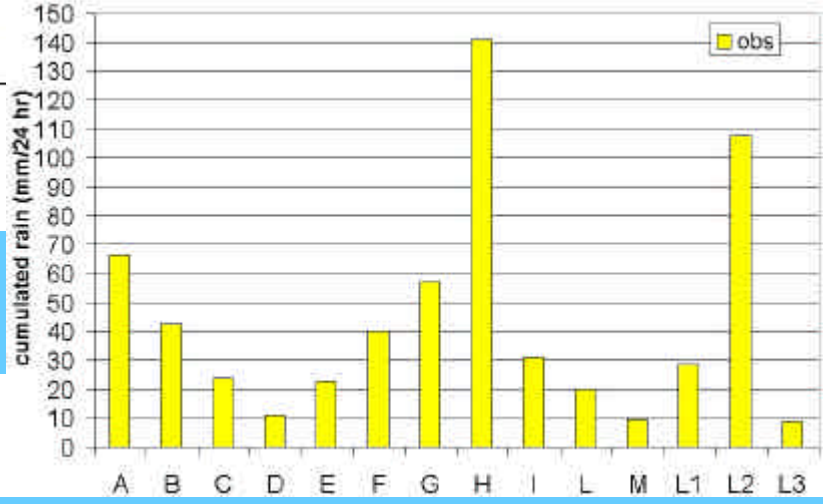


Due to the long duration of the southerly flow, the height of the freezing level was constantly increasing from Saturday the 23rd, when the mean value over North-Western Italy was around 1900 metres, to Tuesday the 26th, with a mean value around 2600 metres and a further increase up to 2900 metres the day after. Moreover, it is noticeable how the relative humidity recorded was always very high, close to 100% up to 5000 metres.

Description of the event (4)



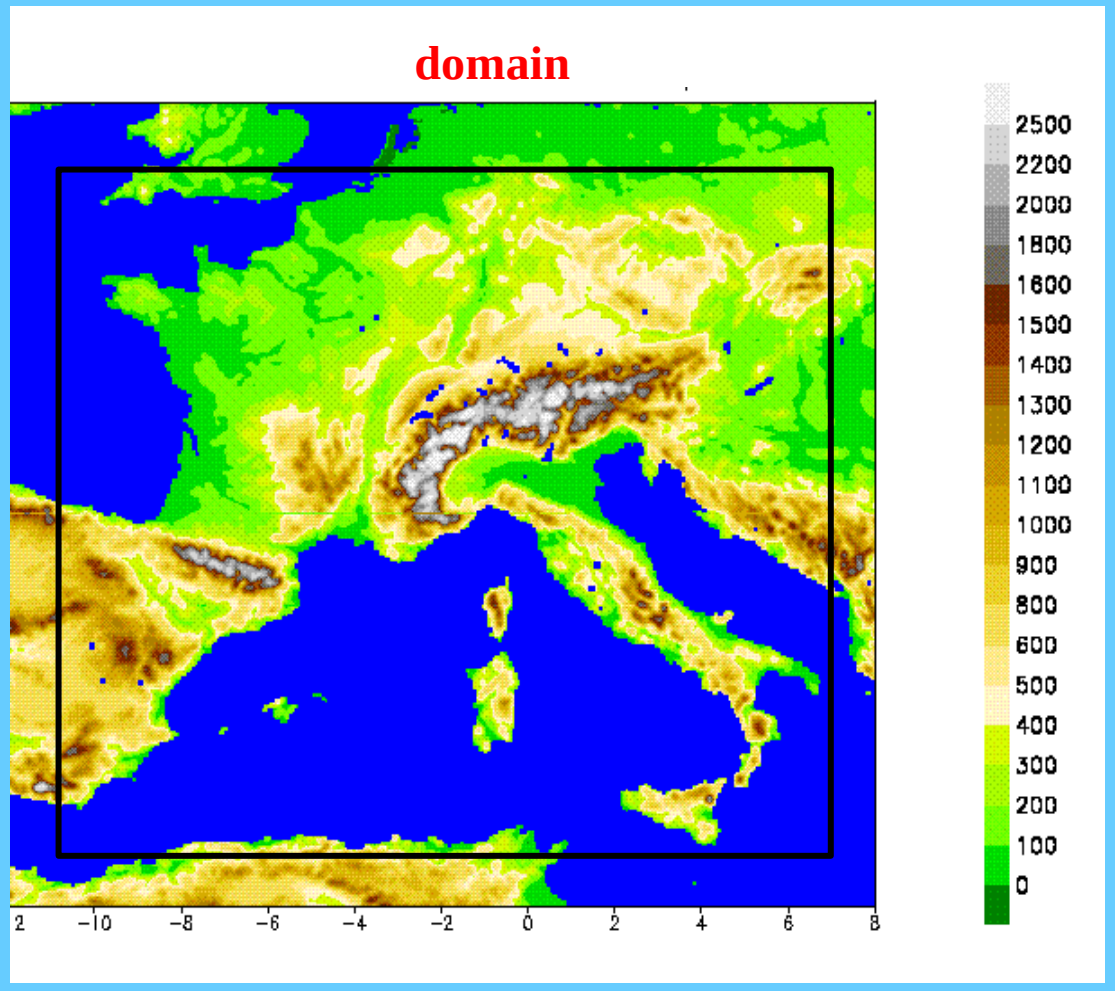
Observed precipitation from the 25th 12UTC to the 26th 12UTC



Mean cumulated precipitation over the areas

Performed runs

S4	Base run with I.C. and B.C. from ECMWF, v. 3.5, Tiedtke, orog. filter, 35 v.l.
S7	S4 + cloud ice scheme
S8	S4 + prog. rain eq.
SB	S4 + 45 v.l. and no orog. filter
SC	S8 + 45 v.l. and no orog. filter
SD	S7 + 45 v.l. and no orog. filter
SE	SC with v. 3.9
SM	SE with orog. filter



I.C./B.C., domain and convection scheme dependence

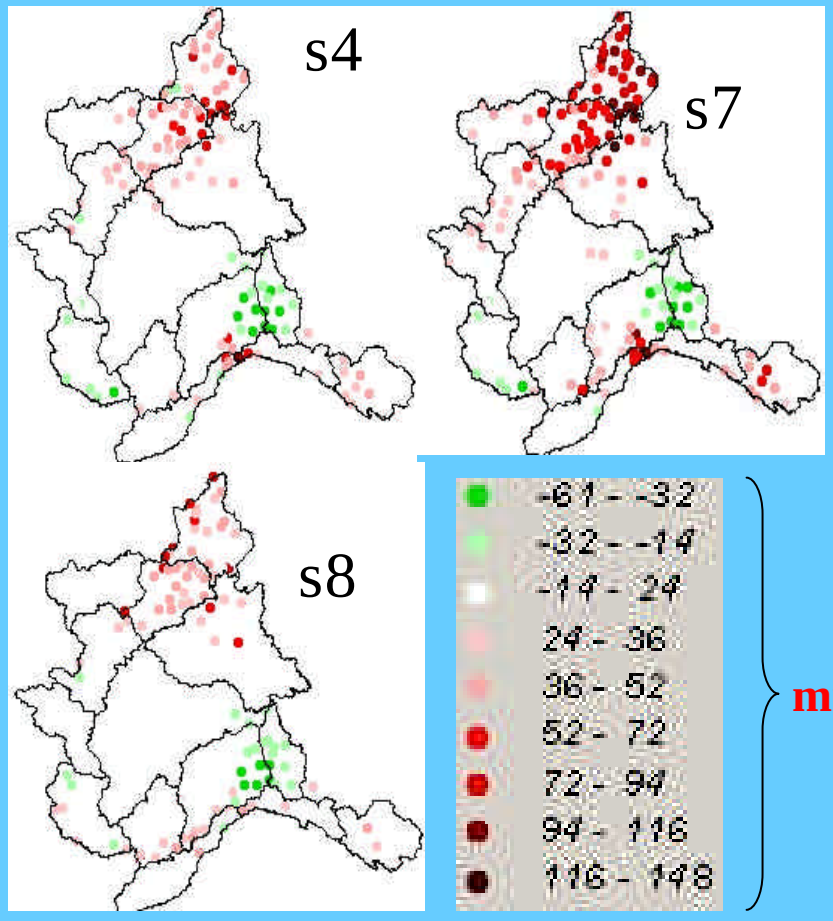
These results are not shown here, but they can be summarized in the following way:

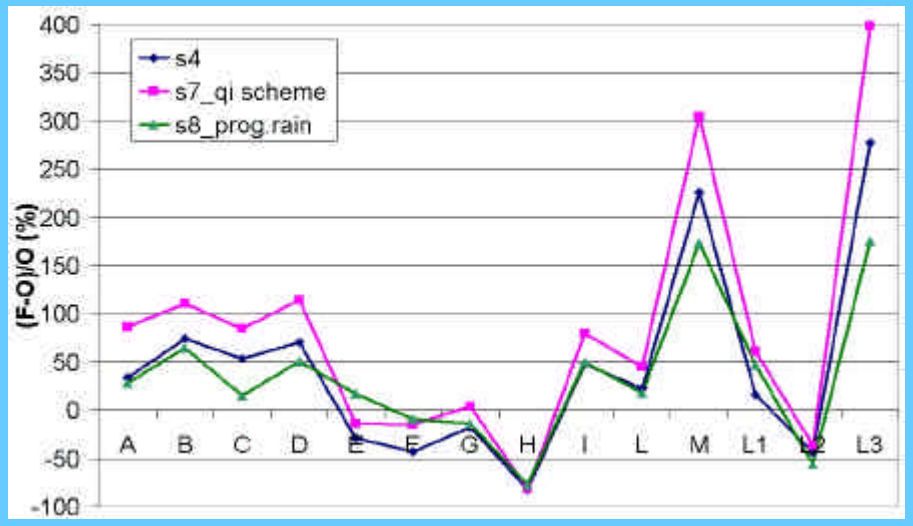
• There is no appreciable difference using the operative domain of LAMI or a larger one (shown before)

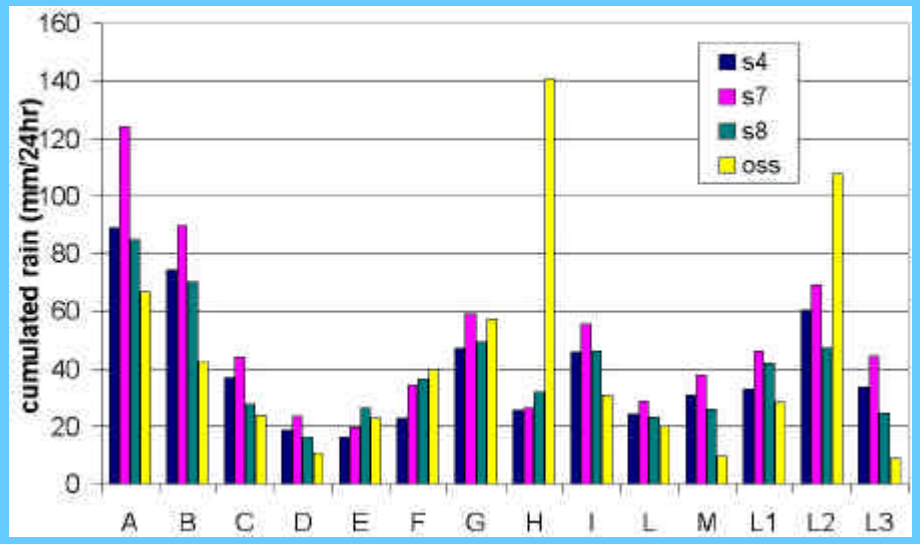
• Different I.C. and B.C. can produce different results, especially when there is the formation of a SLP low moving in the Mediterranean Sea: in this case, the run with IFS appears to perform better

• As far as the convection schemes are concerned, Kain-Fritsch produces in general a worsening of the QPF with respect to the default Tiedtke scheme

Introduction of q_i and prog. rain eq. (1)

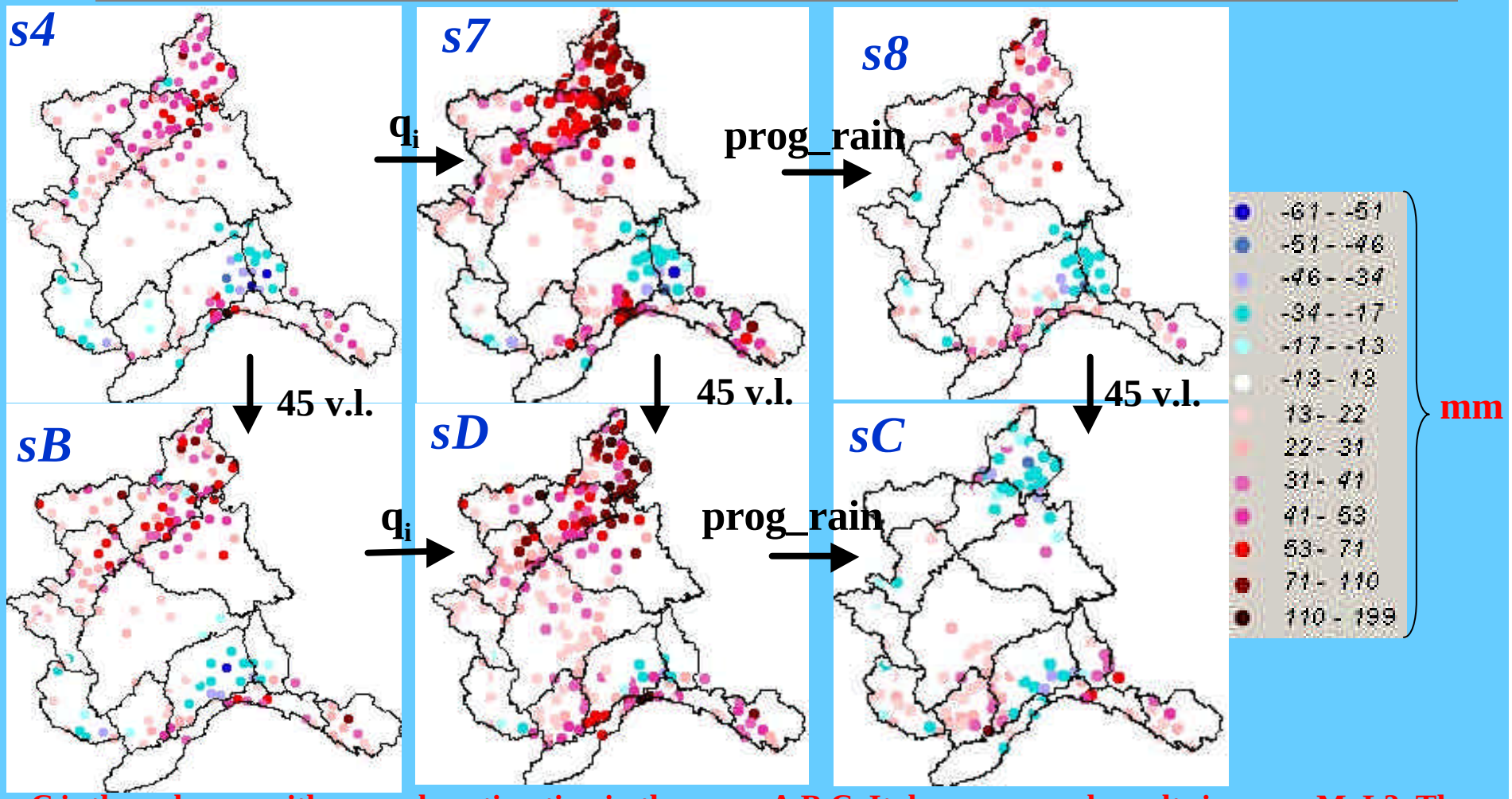






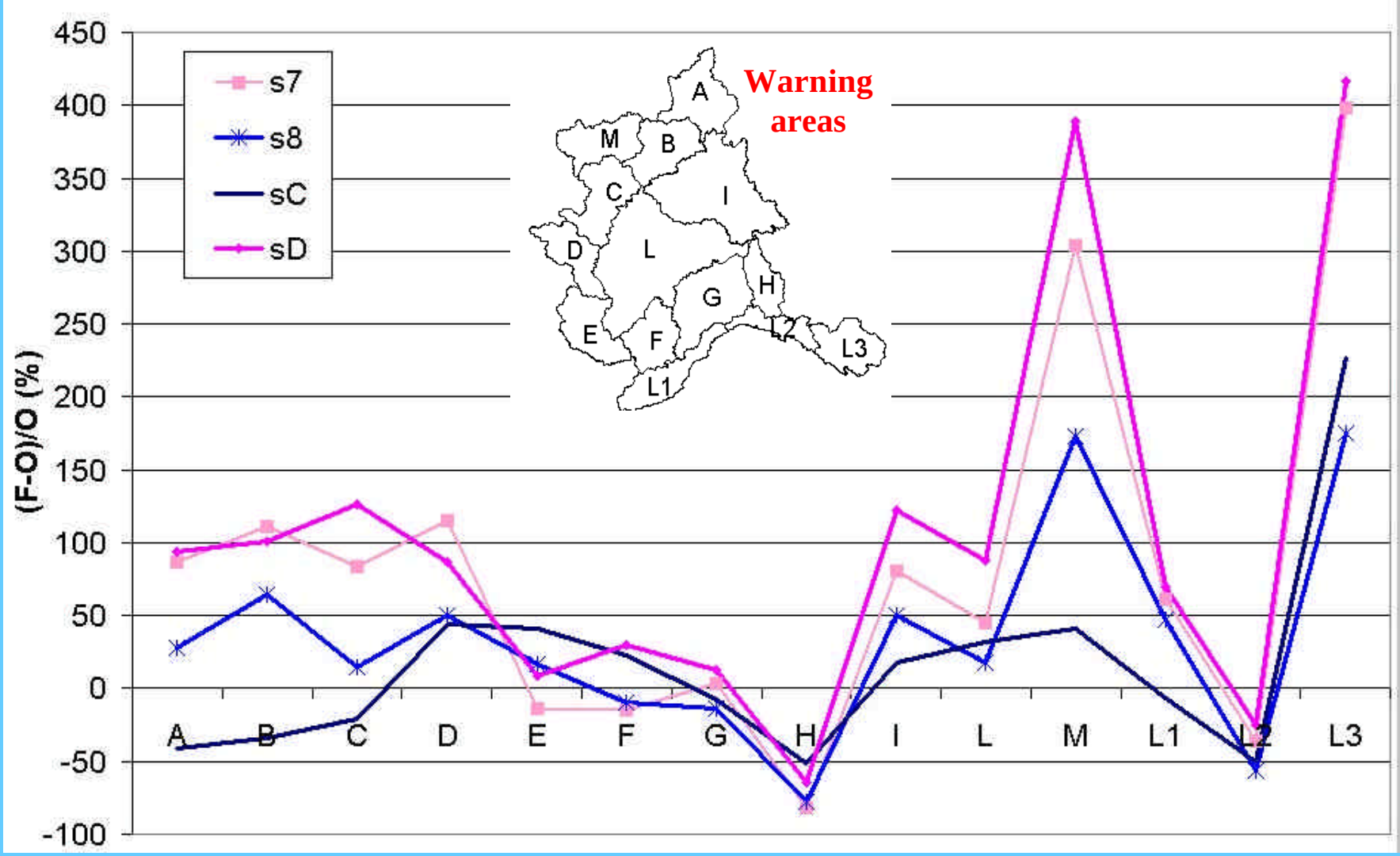
s8 gives better results in most of the areas. It has to be remarked that the introduction of q_i, in this case, gives worse forecasts over the Alps.

Introduction of q_i and prog. rain eq. (2)



sC is the only run with an underestimation in the areas A,B,C. It has very good results in areas M, L3. The model has a great sensitivity to v.l. and in particular s7 and s8 have smaller differences than sC and sD.

Introduction of q_i and prog. rain eq. (3)

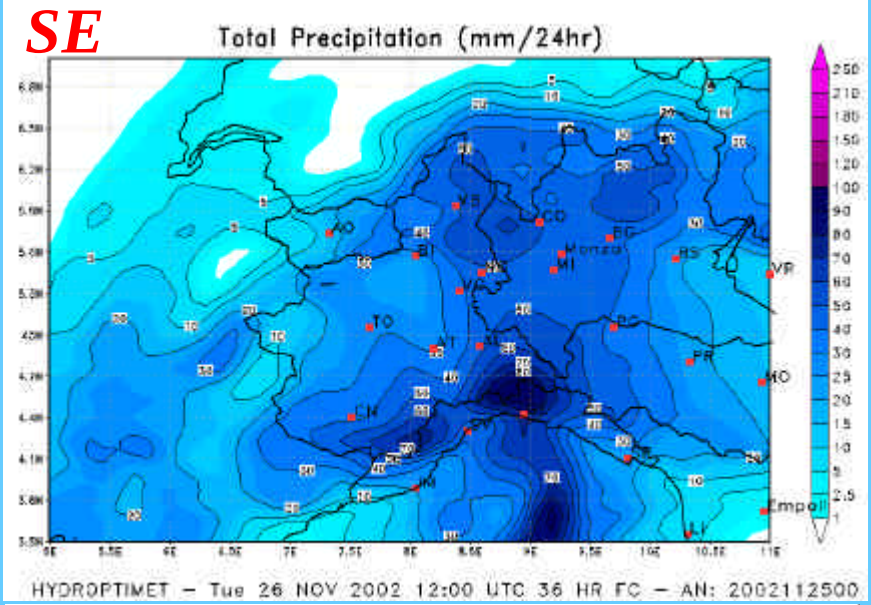


Change in LM version (1)

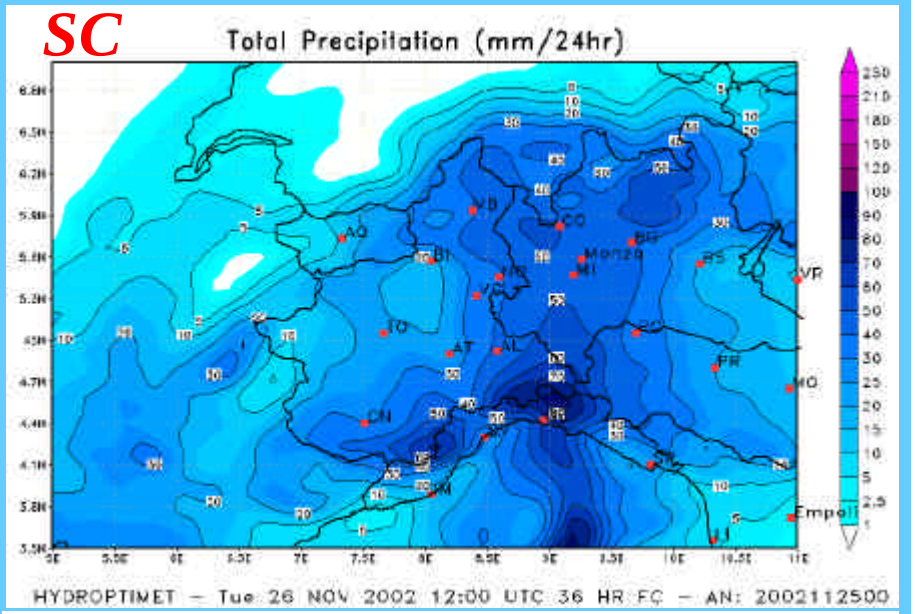
	SC	SE	SM
LM version	3.5	3.9	3.9
INPUT_DYN	l2tls=true	l2tls=true	l2tls=true
INPUT_PHY	lgsp=true itype_gscp=5	lgsp=true itype_gscp=3 lprogprec=true	lgsp=true itype_gscp=3 lprogprec=.true
INPUT_int2lm	lfilter=true eps_filter=0.0	lfilter=true eps_filter=0.0	lfilter=true eps_filter=0.1

Change in LM version (2)

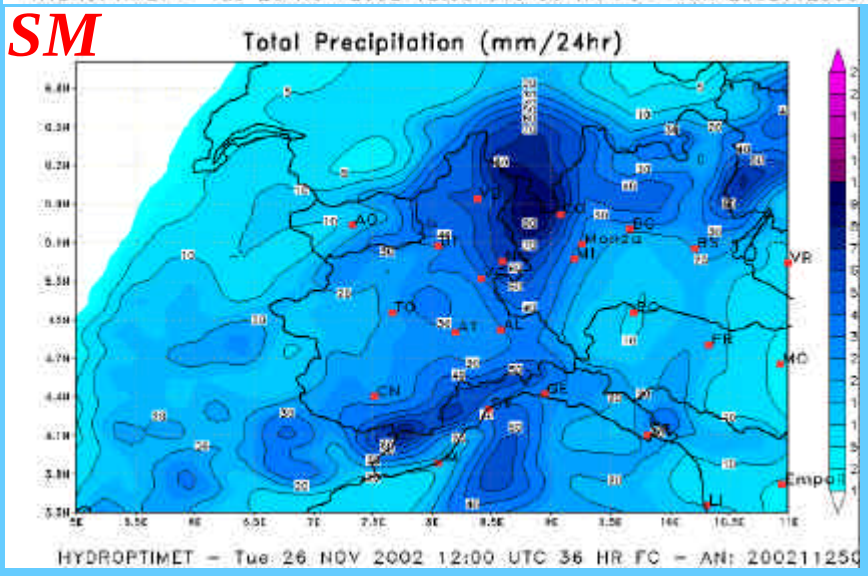
SE

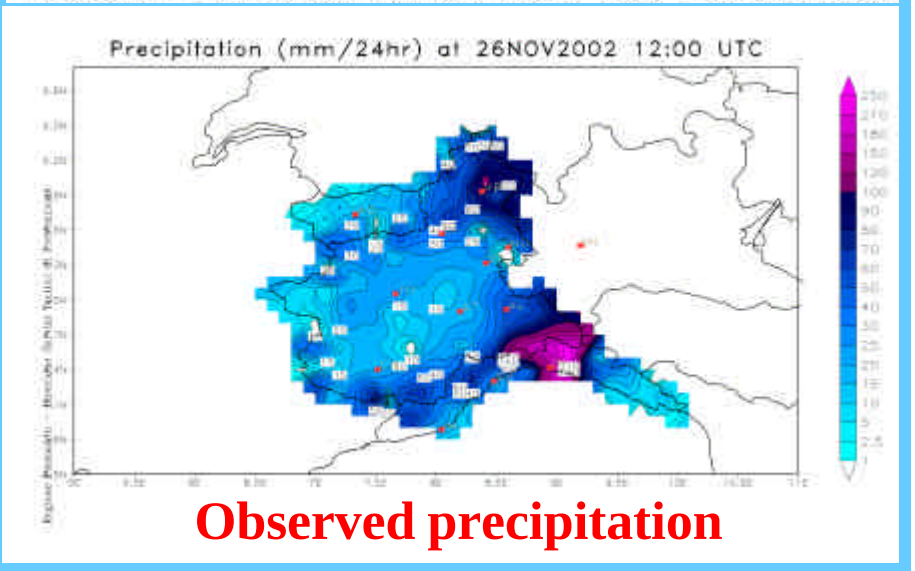


SC



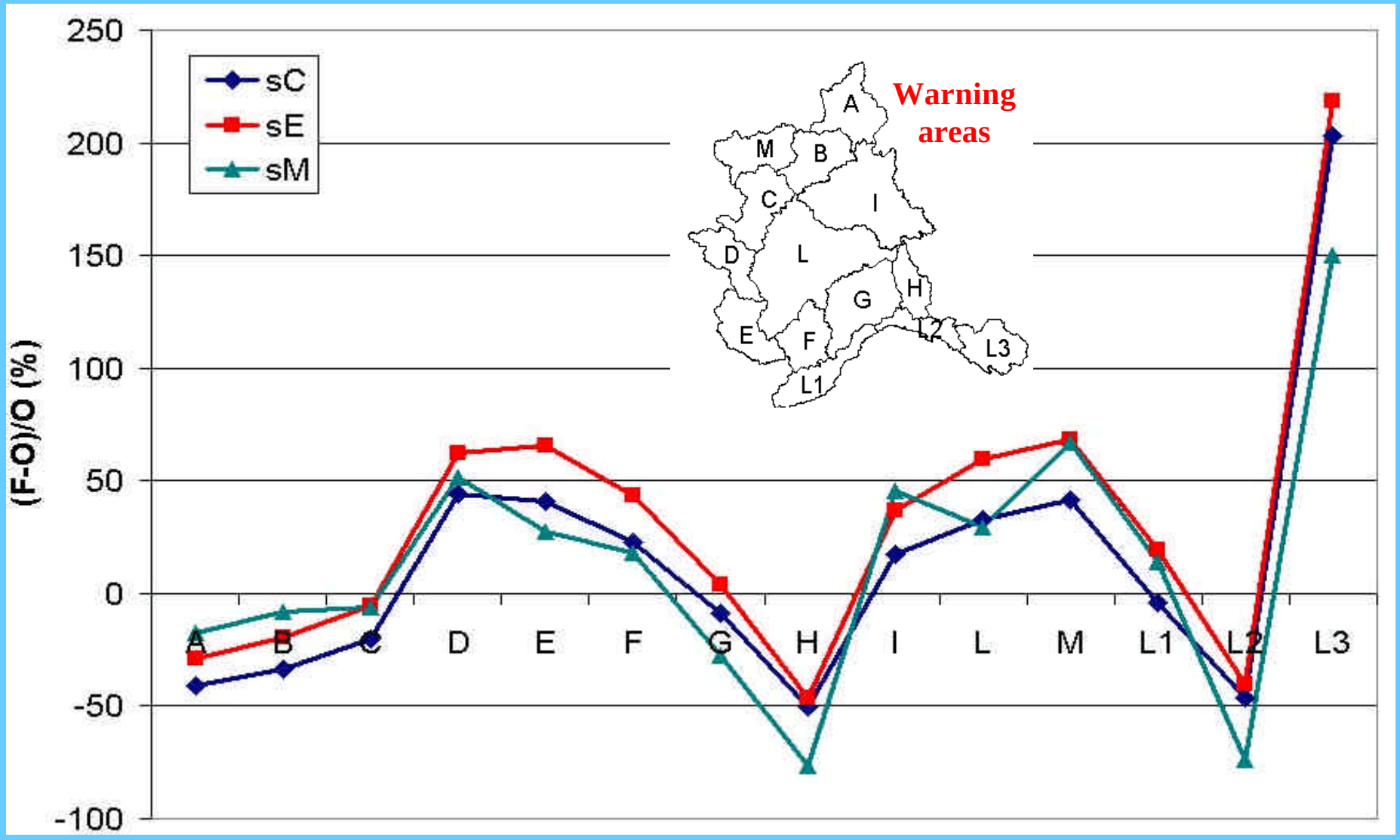
SM



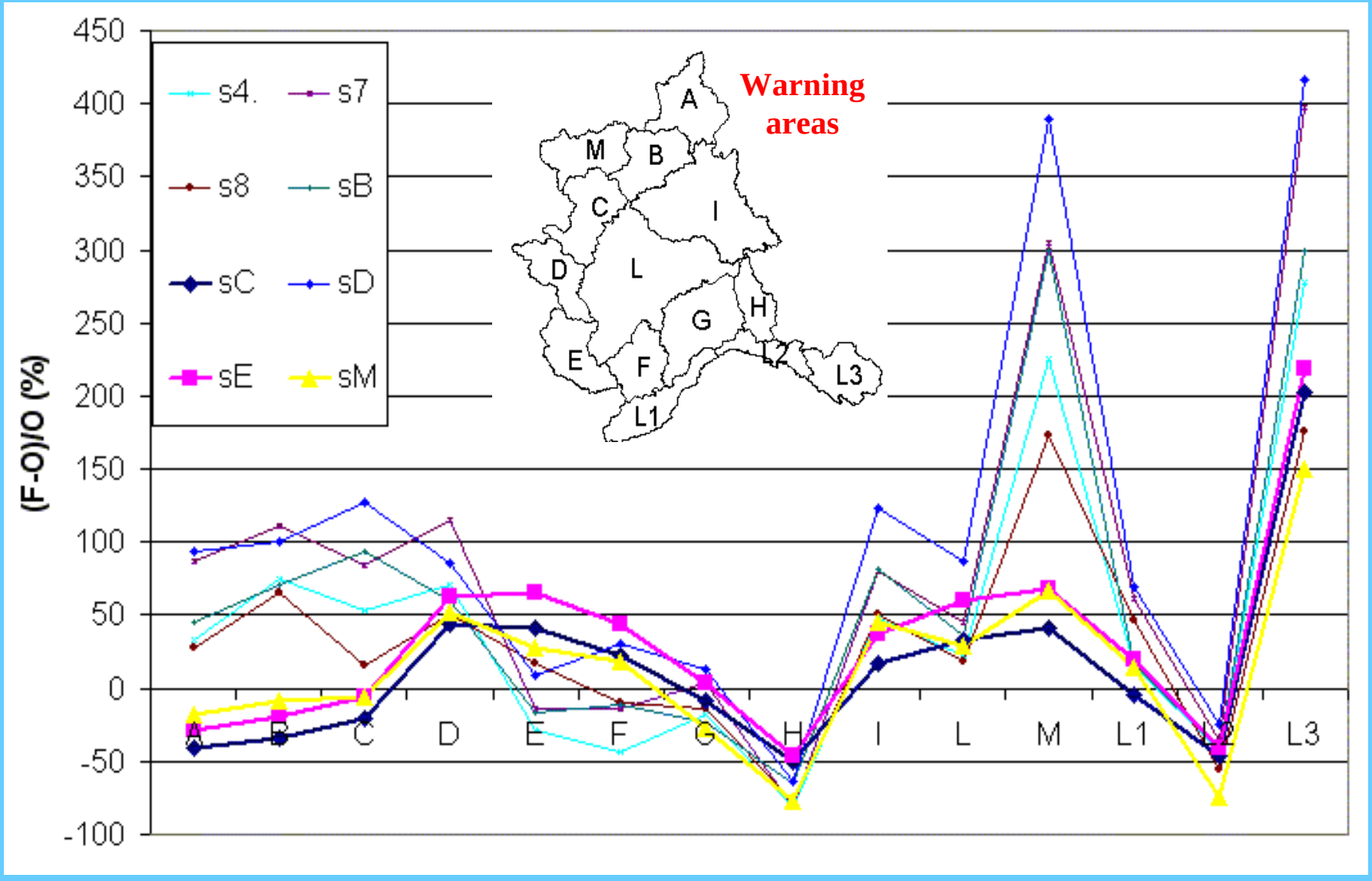


Observed precipitation

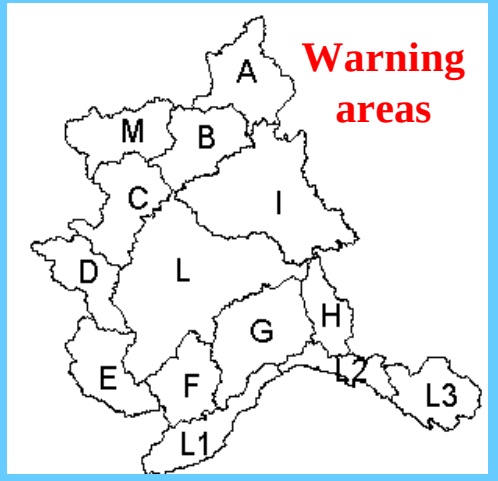
Change in LM version (3)



Conclusions (1)



Conclusions (2)



- General improvement of QPF with the introduction of the prog. rain eq. with 45 v.l. and orog. filter, especially over the Alps
- In particular, over the alpine areas A, B, C, the QPF is now slightly underestimated !
- Over the Aosta Valley (M), there is the strongest reduction of the overestimation
- Over the Apennines (H, L2), we never get a decent improvement ⟶ synoptic ?