

An example of application of statistical downscaling

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Downscaling of Model Generated Rainfall Data onto Hydrological Catchment

AIM:

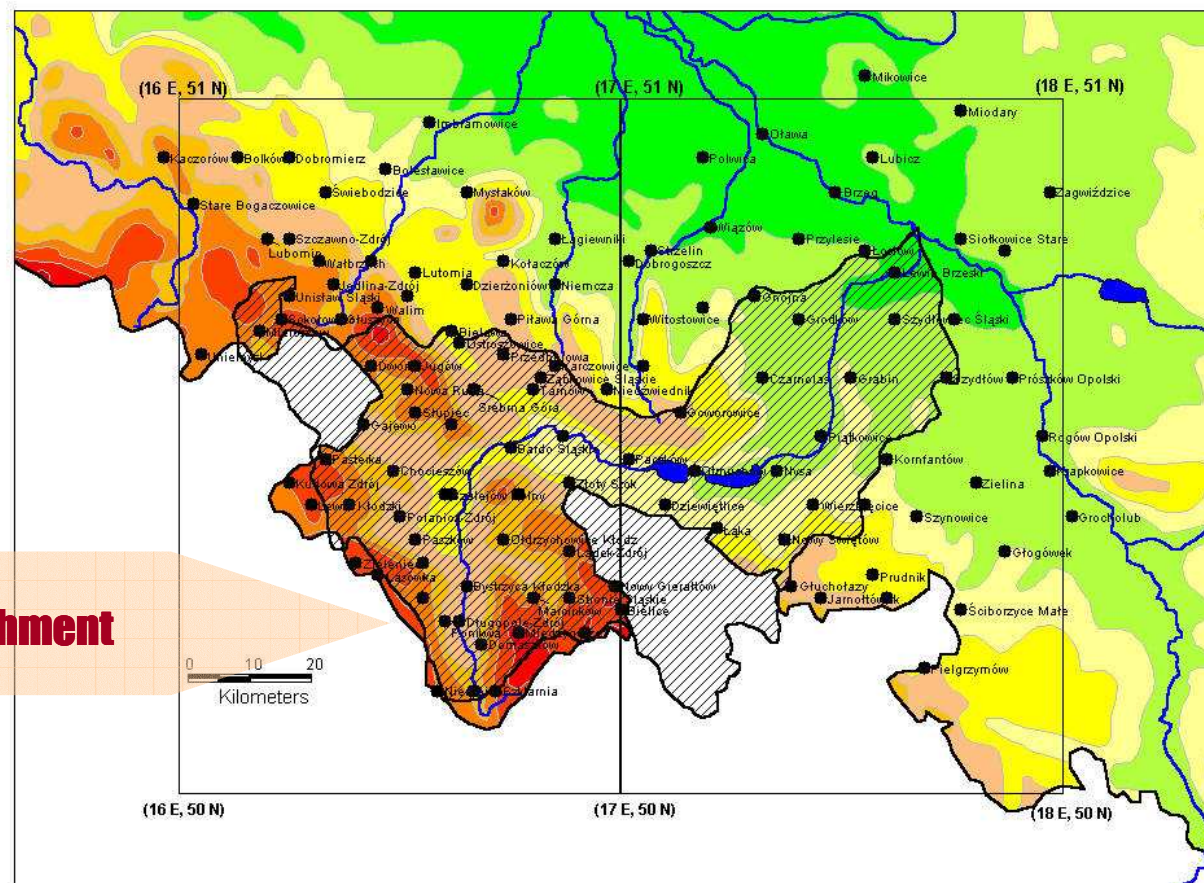
to develop a statistical post-processing procedure in order to **downscale** simulated data into required scales to **improve** forecasts using a MOS approach

Simulations by the **UMPL** atmospheric model

.... a mesoscale version of the UKMO Unified Model implemented to the region of Central Europe centered over Poland.

A spatial resolution of generated rainfall was of order 17 km.

Nysa Klodzka catchment



UMPL domain

Rotated equidistant projections

Center Latitude : 56.0 deg North

Center Longitude : 19.3 deg West

Rotation : 0.0 deg

Column Increment : 0.15 deg

Row Increment : 0.15 deg

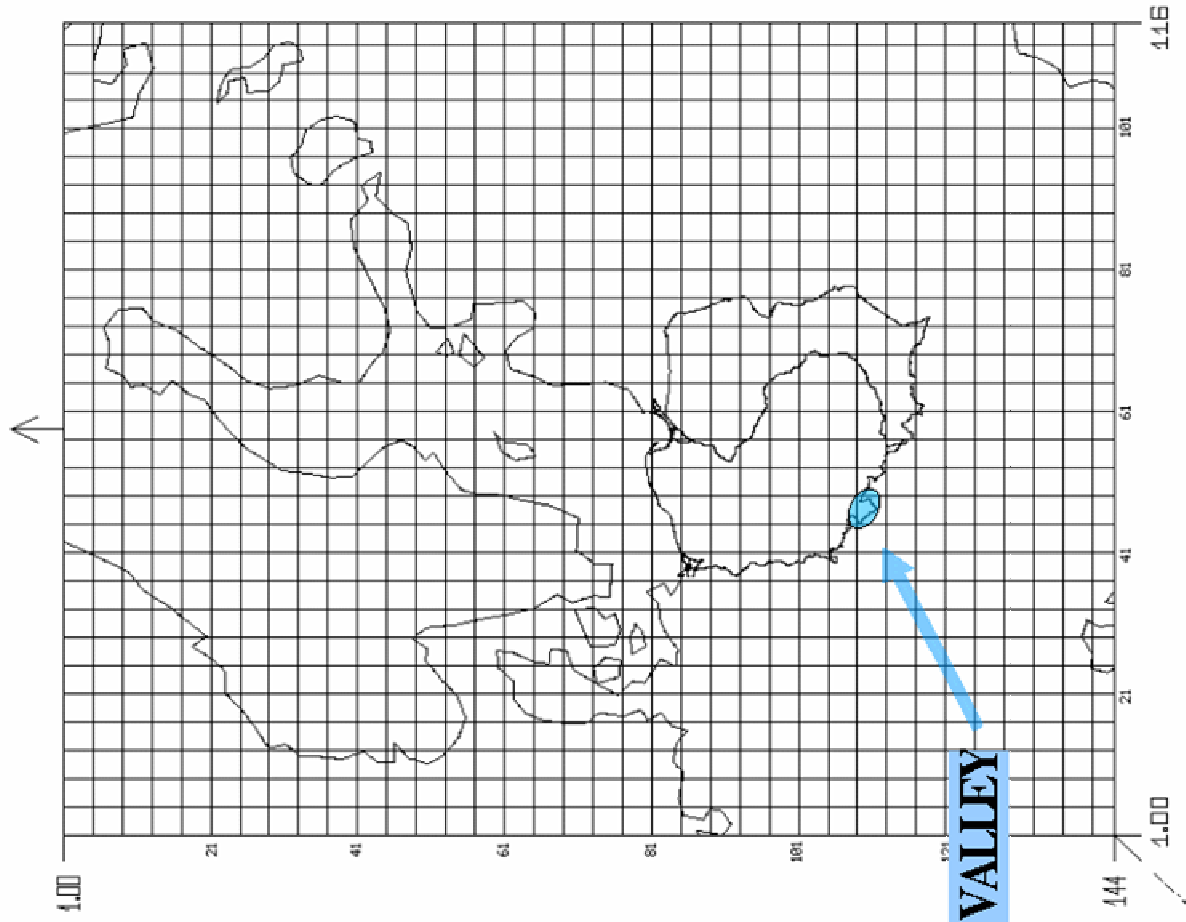
Number of Rows : 144

Number of Columns : 116

grid(0,0) Longitude : 8.625 deg West

Latitude : 10.725 deg North

in rotated coordinates



NYSA KLODZKA VALLEY

TIME: 1997-2000 : MAY TO SEPTEMBER

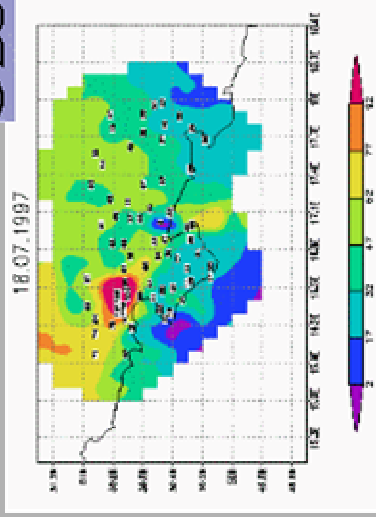
AREA: THE NYSA KLODZKA VALLEY

OBSERVATIONS

Institute of Meteorology
and Water Management

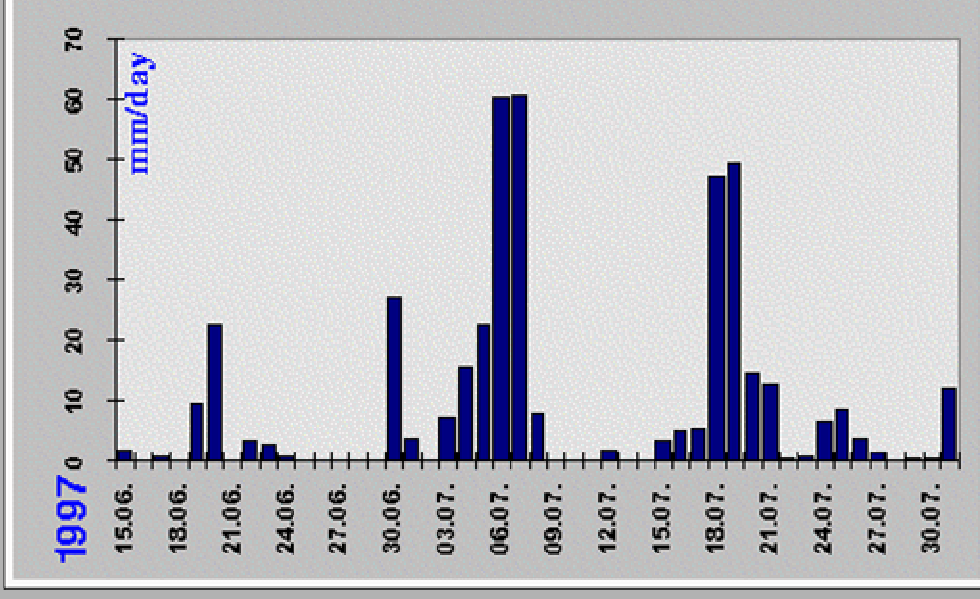
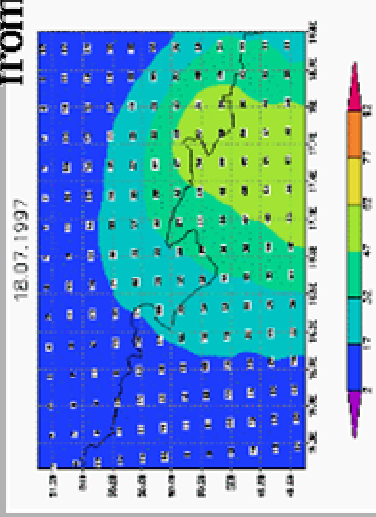
daily precipitation totals

70 rain gauges

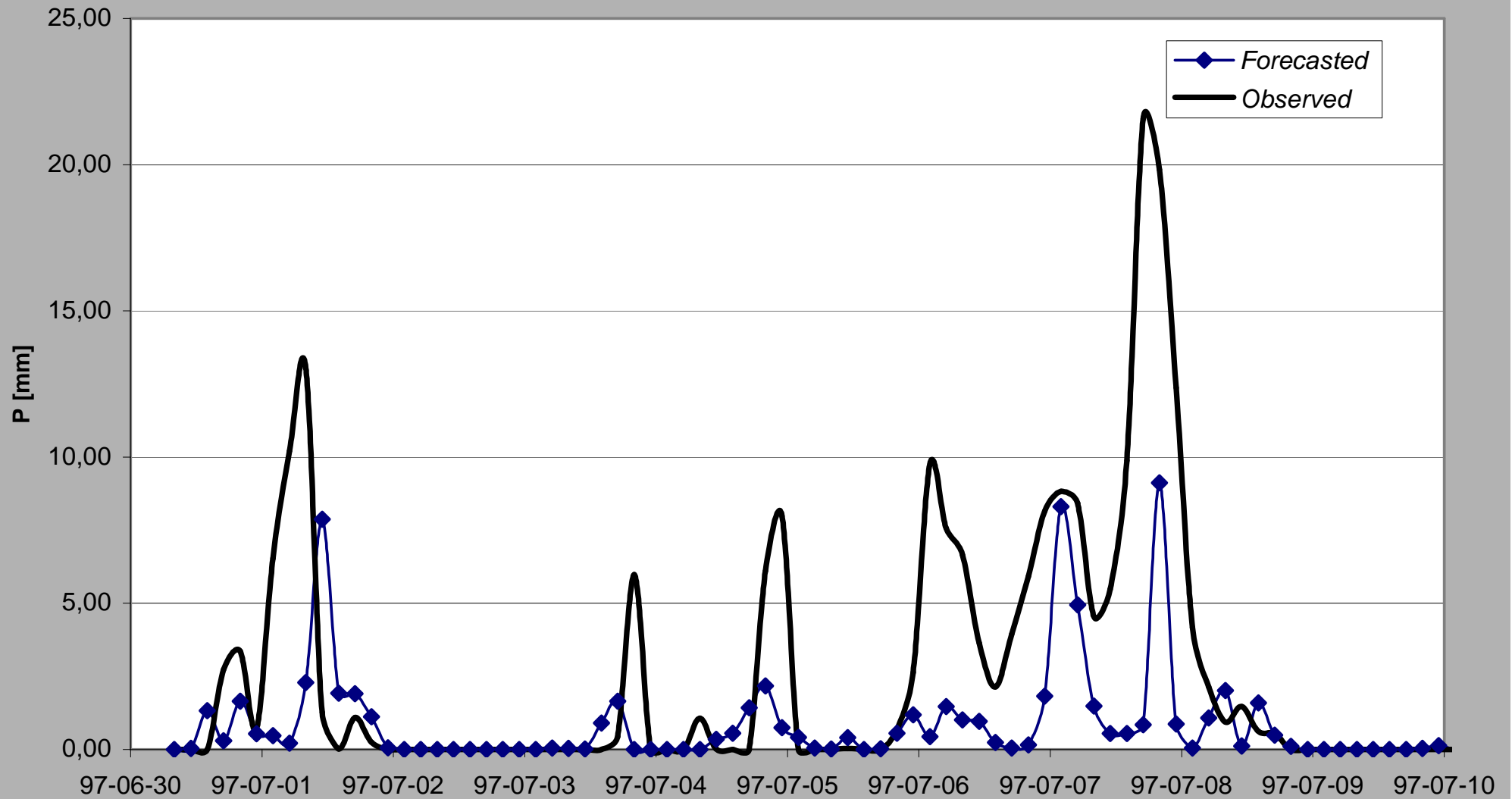


NUMERICAL FORECASTS

The UMPL model developed at ICM
from the UKMO Unified Model ver. 4.0



Precipitation: Observations and UMPL forecasts



UMPL forecasts

MODEL (grid data) Y

OBS (station data) X

EOFA

CCA

REGRESSION

X=REGR(Y)

FORECAST:

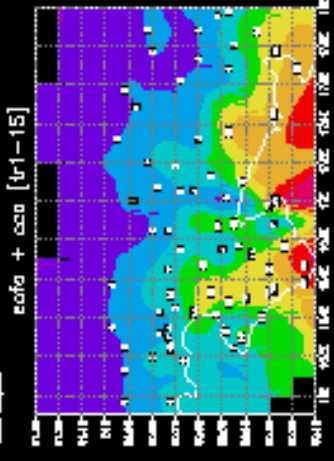
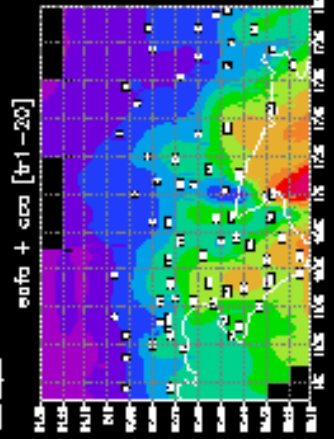
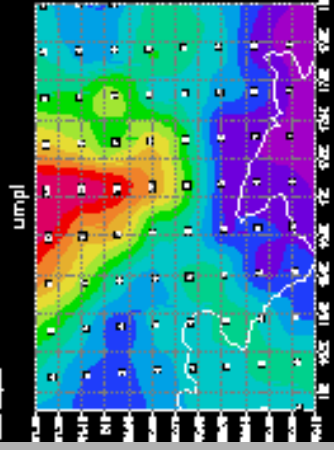
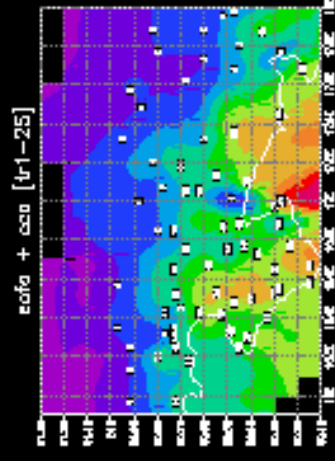
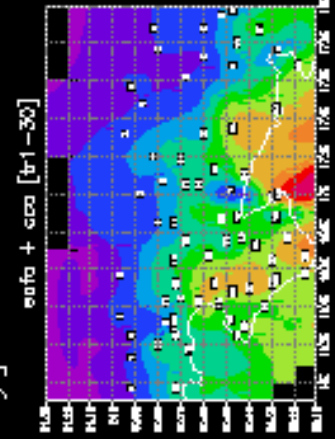
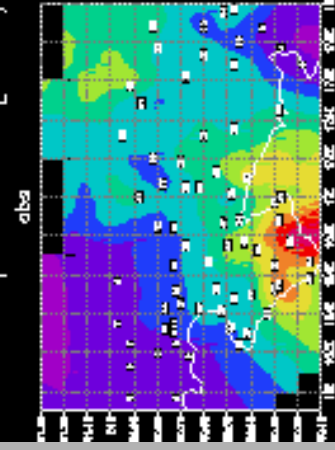
Y_{tomorrow}

Regression

X_{tomorrow}

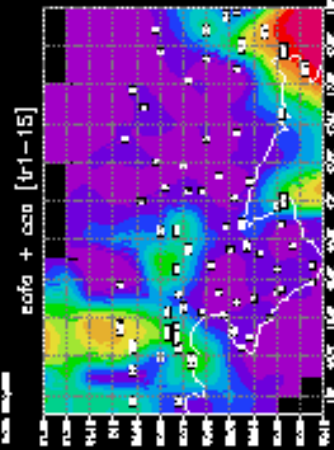
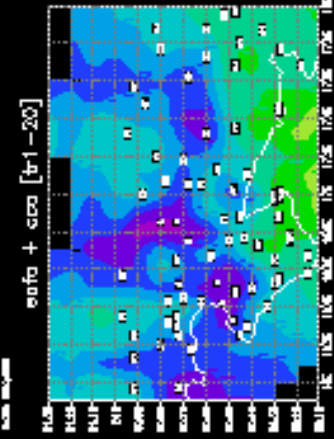
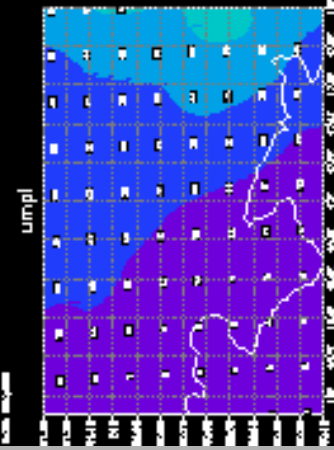
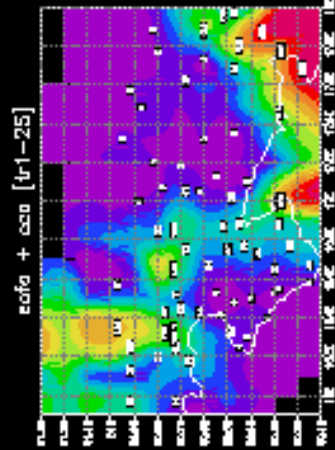
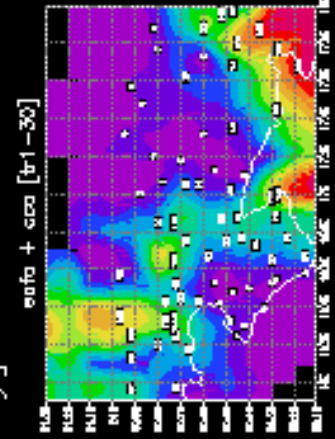
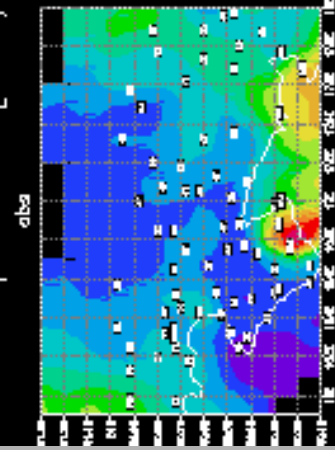
Precipitation [mm/day]

30Jun1997



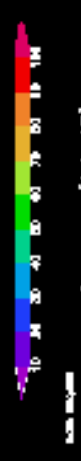
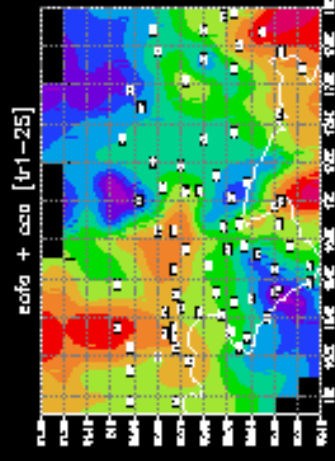
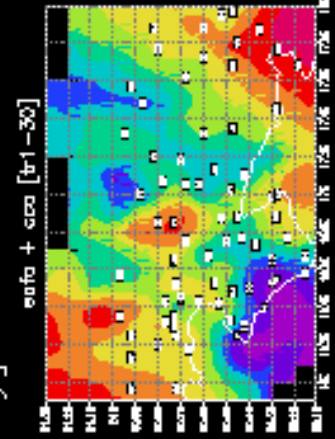
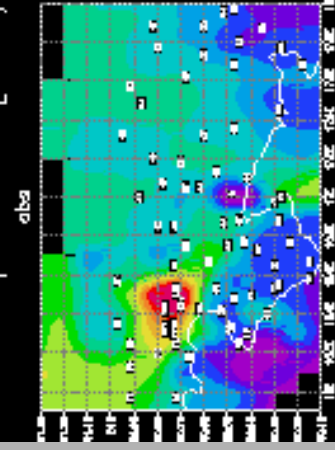
Precipitation [mm/day]

05Jul1997

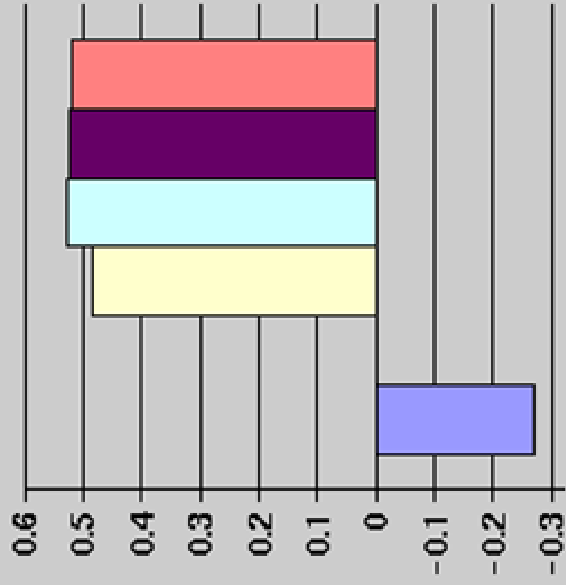


Precipitation [mm/day]

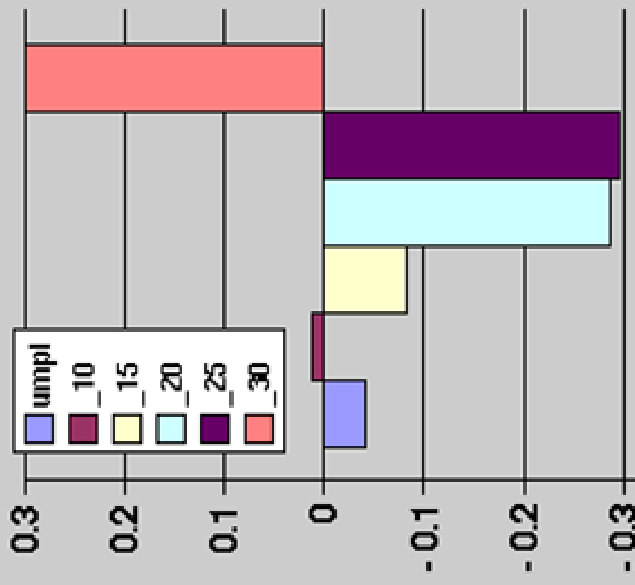
18Jul1997



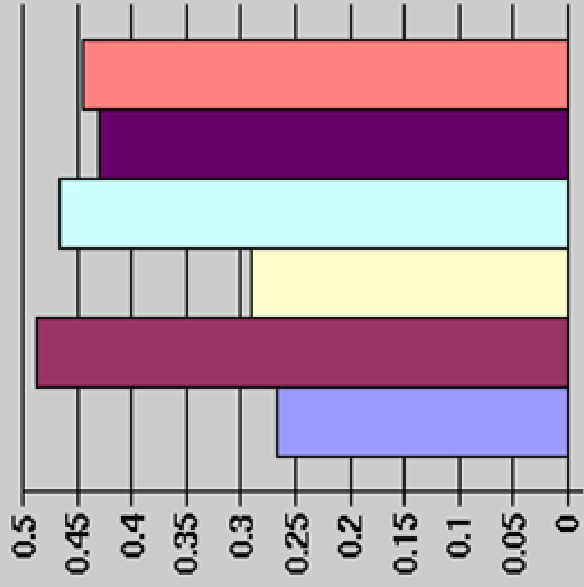
Spatial correlation 1997



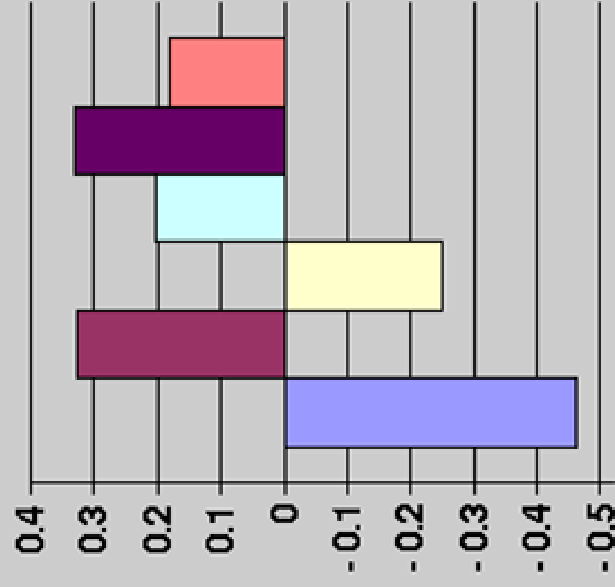
30.06



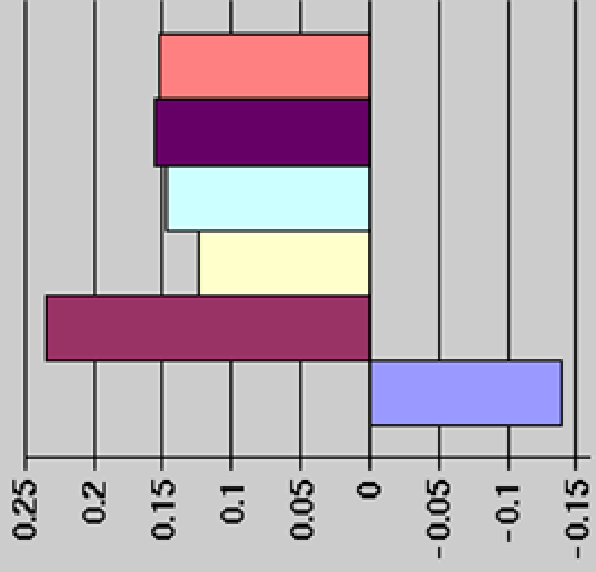
17.07



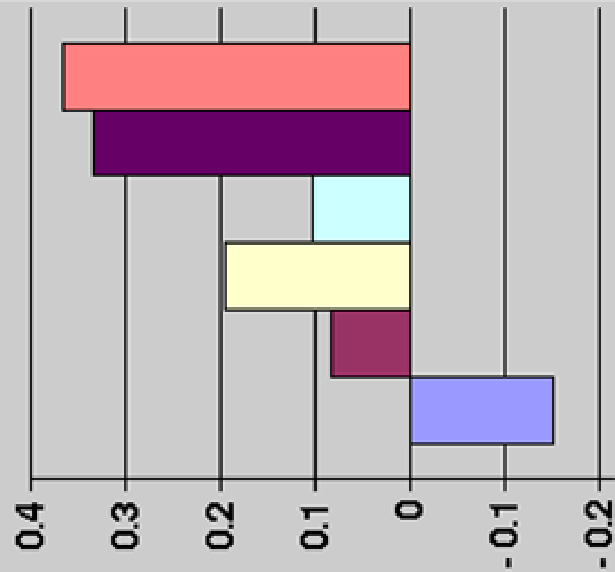
6.07



18.07



7.07



20.07



DRY: less than a given threshold

WET: greater or equal than a given threshold

		Observed	
		DRY	WET
Forecast	DRY	a	b
	WET	c	d

HIT RATE

$$\text{HR} = 100 \cdot d / (b + d)$$

FALSE ALARM RATE

$$\text{FAR} = 100 \cdot c / (c + d)$$

HR + FAR > 100



OVERESTIMATION of precipitation

HR + FAR < 100

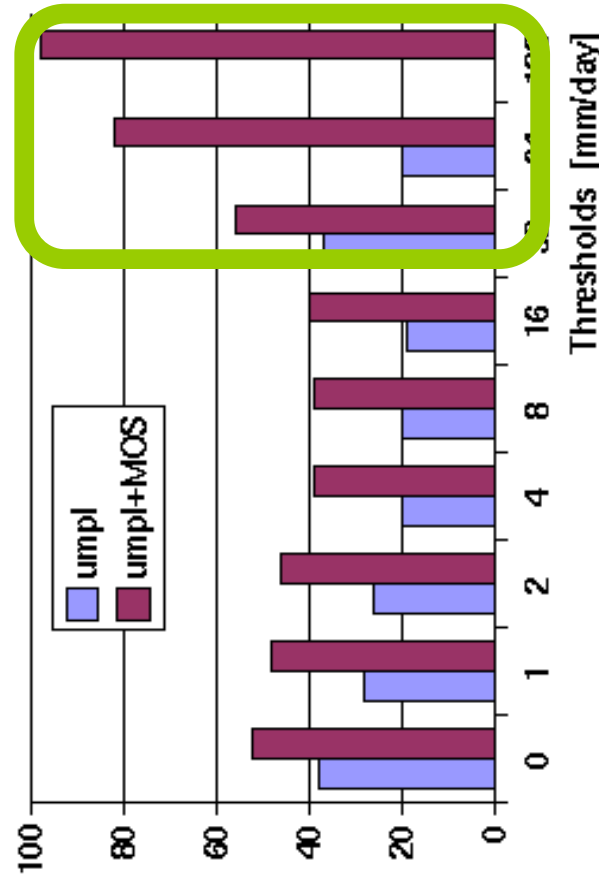
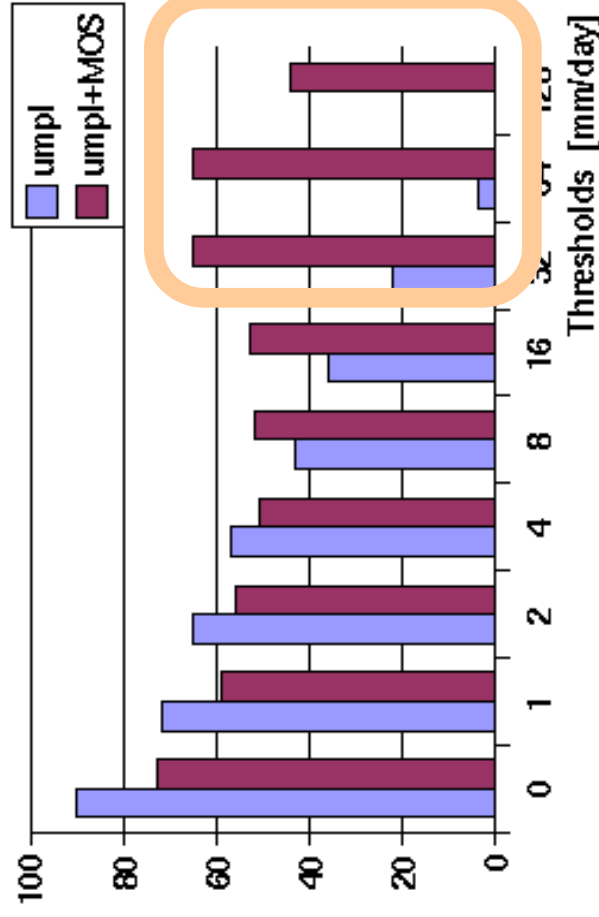


UNDERESTIMATION of precipitation

Hit Rate

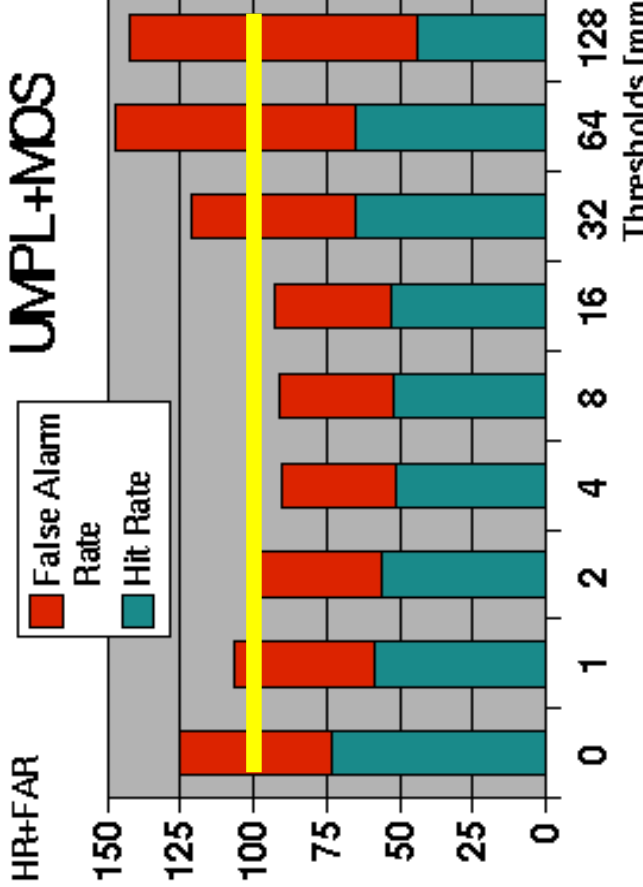
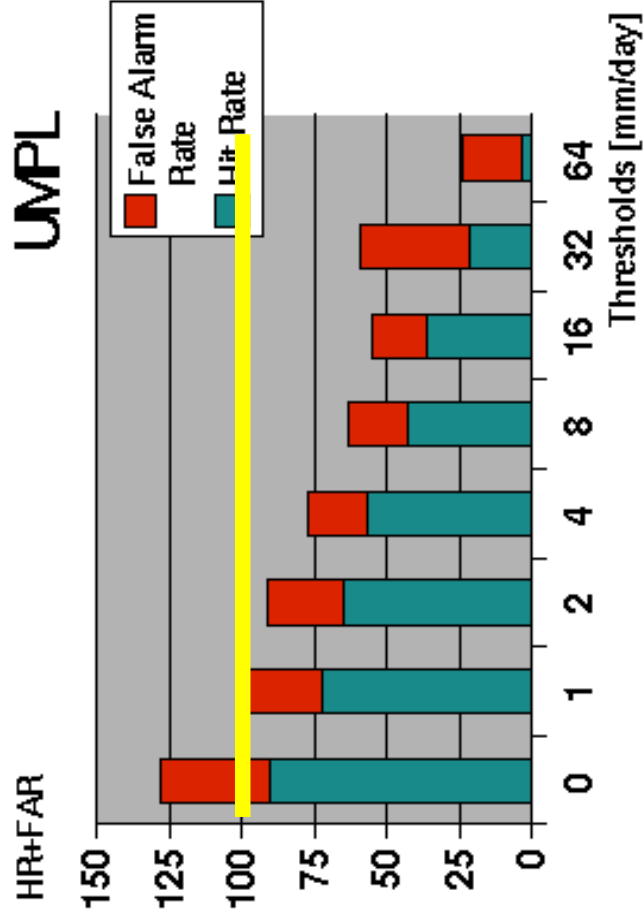
False Alarm Rate

1997, 30



UMPL

UMPL+MOS



Conclusions:



numerical forecasts underestimate large precipitation rates

**statistical downscaling improves predictions for large precipitation
in some cases**