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# Requirements stemming from QPF user community

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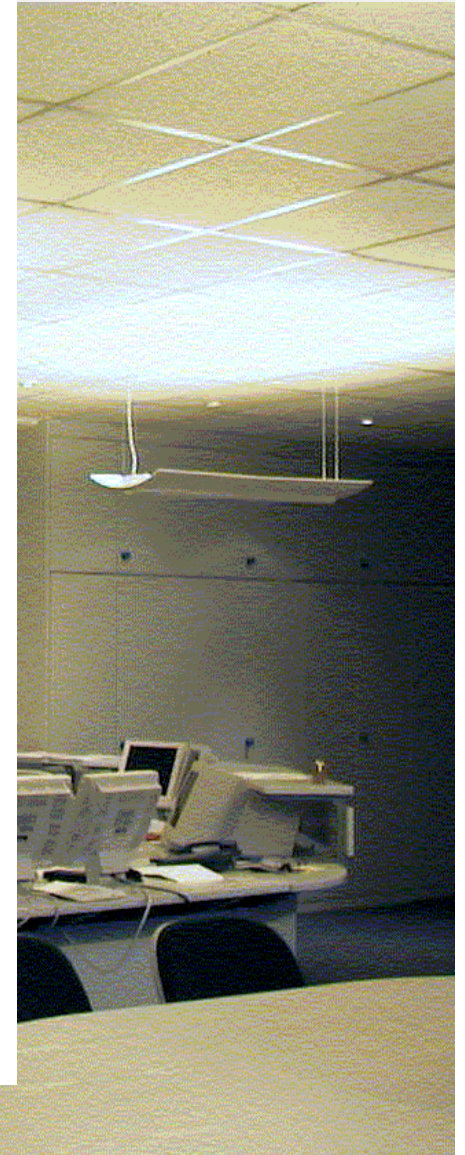
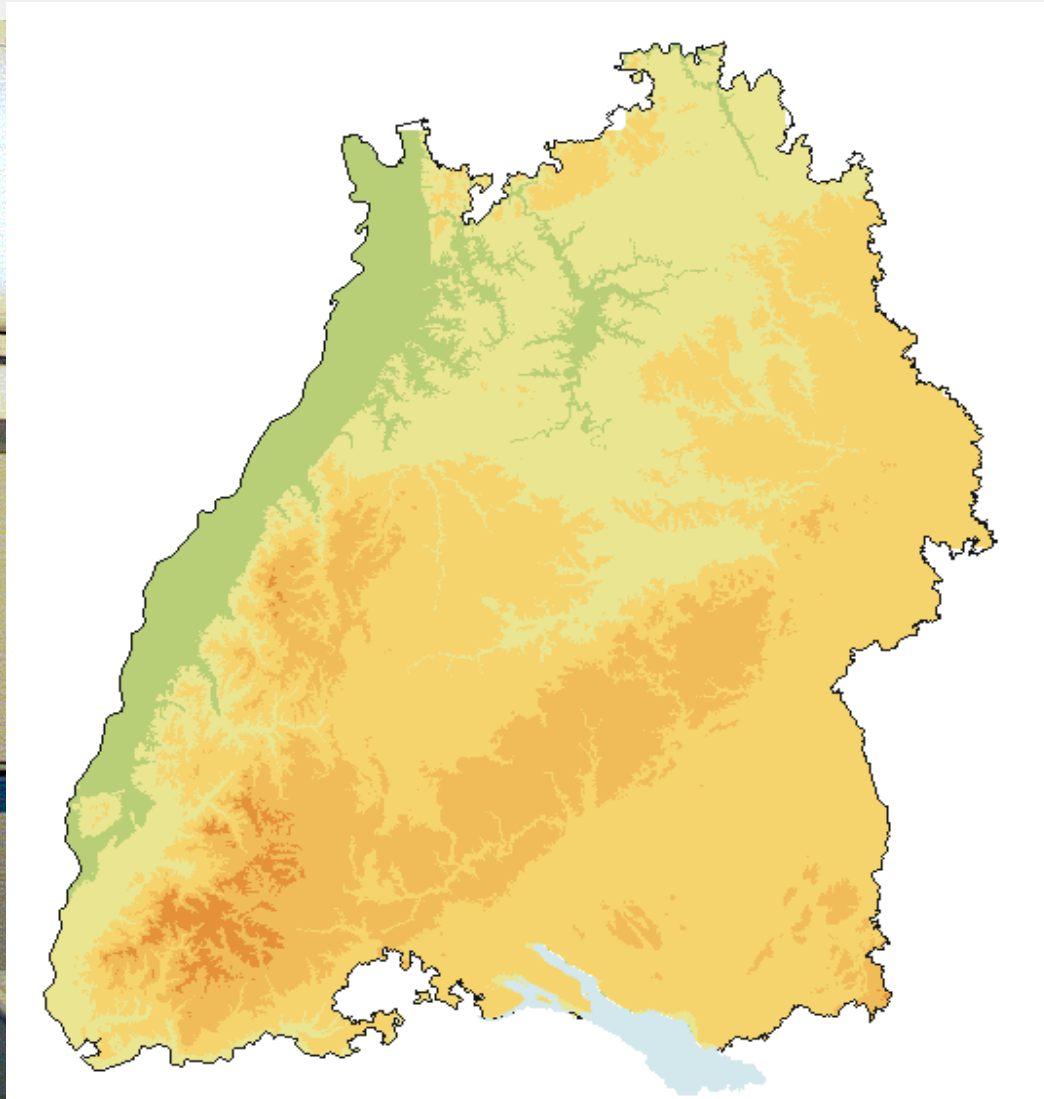
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**[www.hochwasserzentralen.de](http://www.hochwasserzentralen.de)**

**Symposium on Advances in the Representation of the Atmospheric State,  
University of Hohenheim, 13 September - 14 September 2004**



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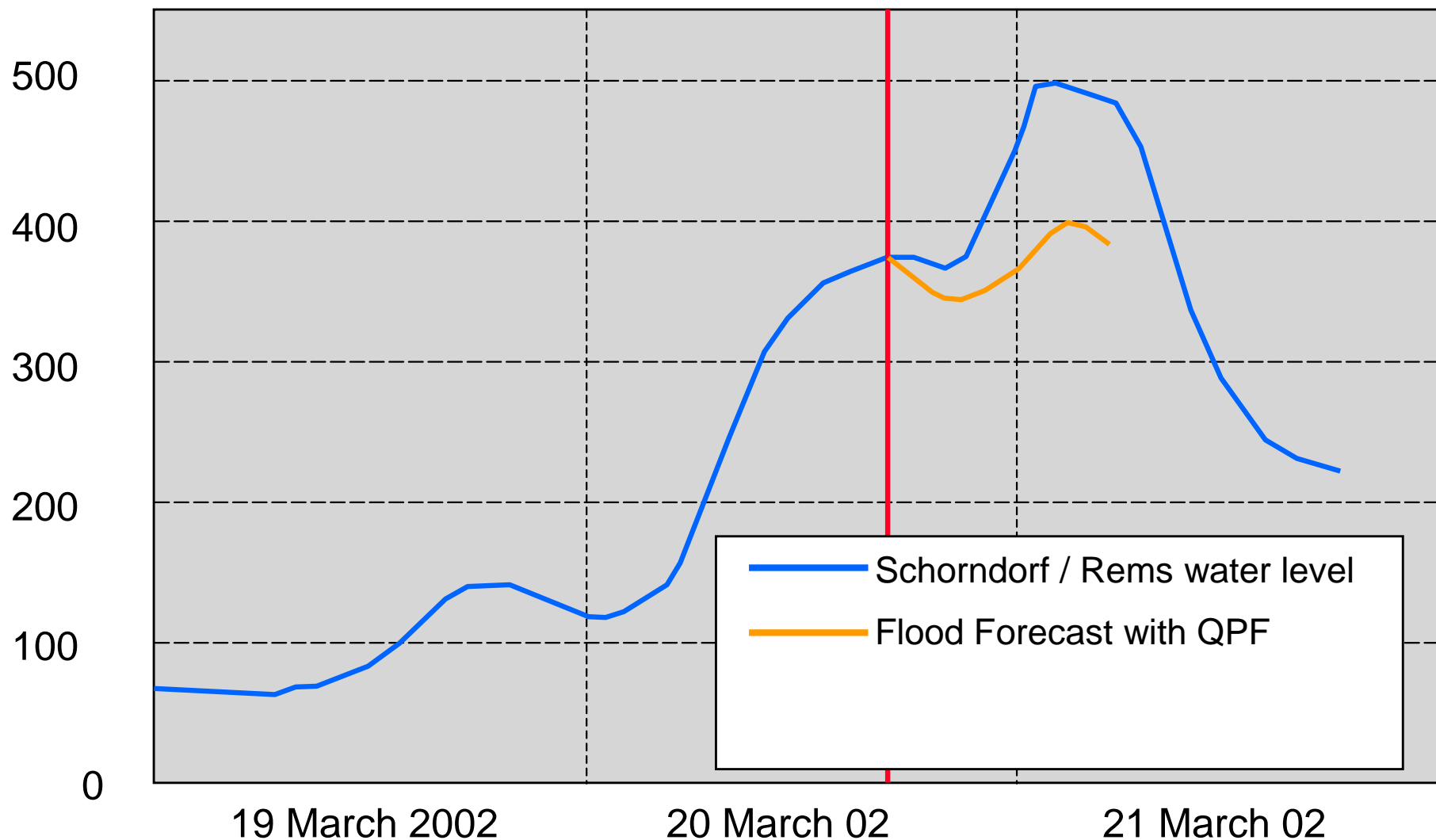




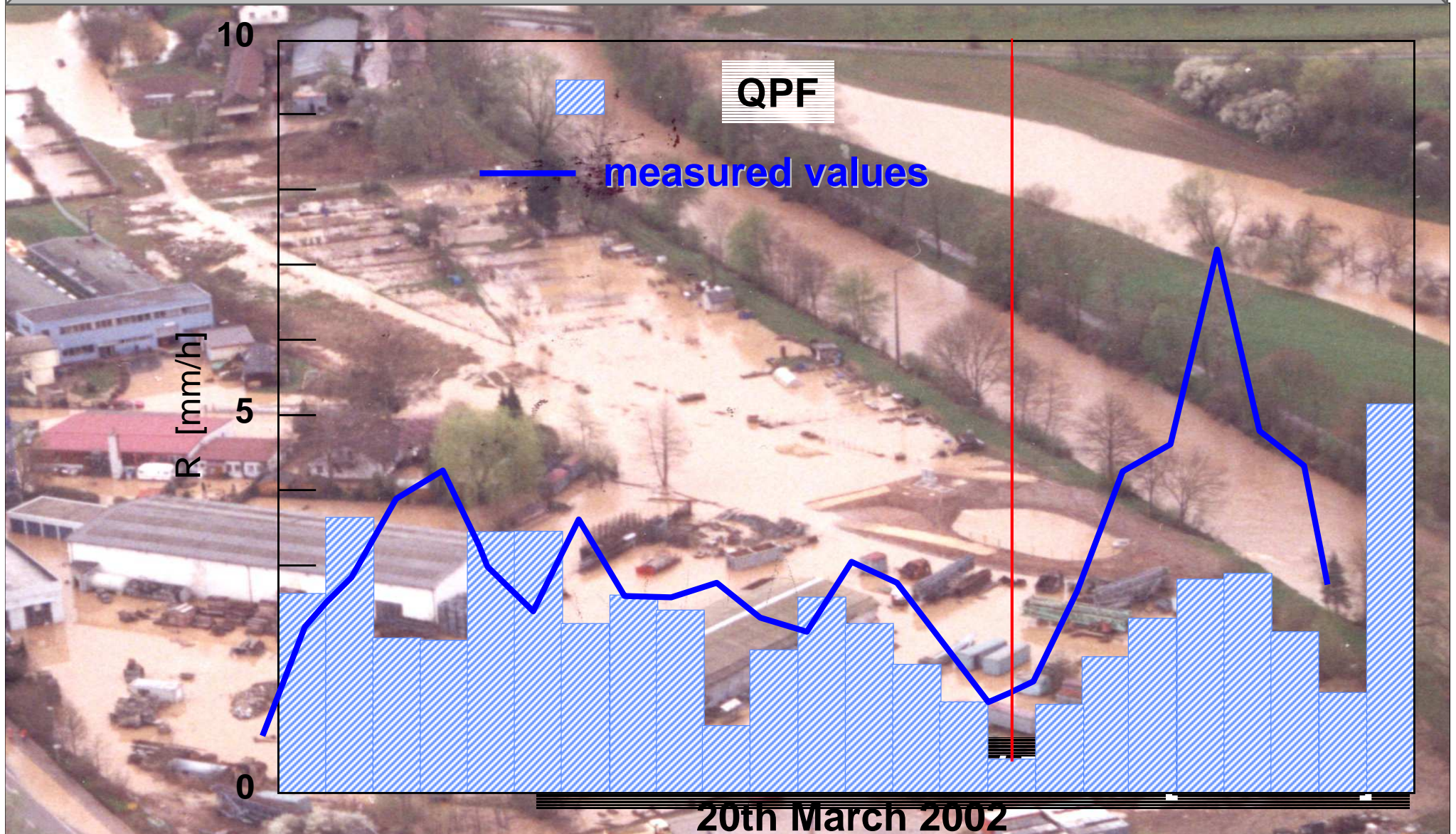
- **localities**
- **recreation areas**
- **industrial areas**

**Flood River Rems /  
Waldhausen, March 2002**

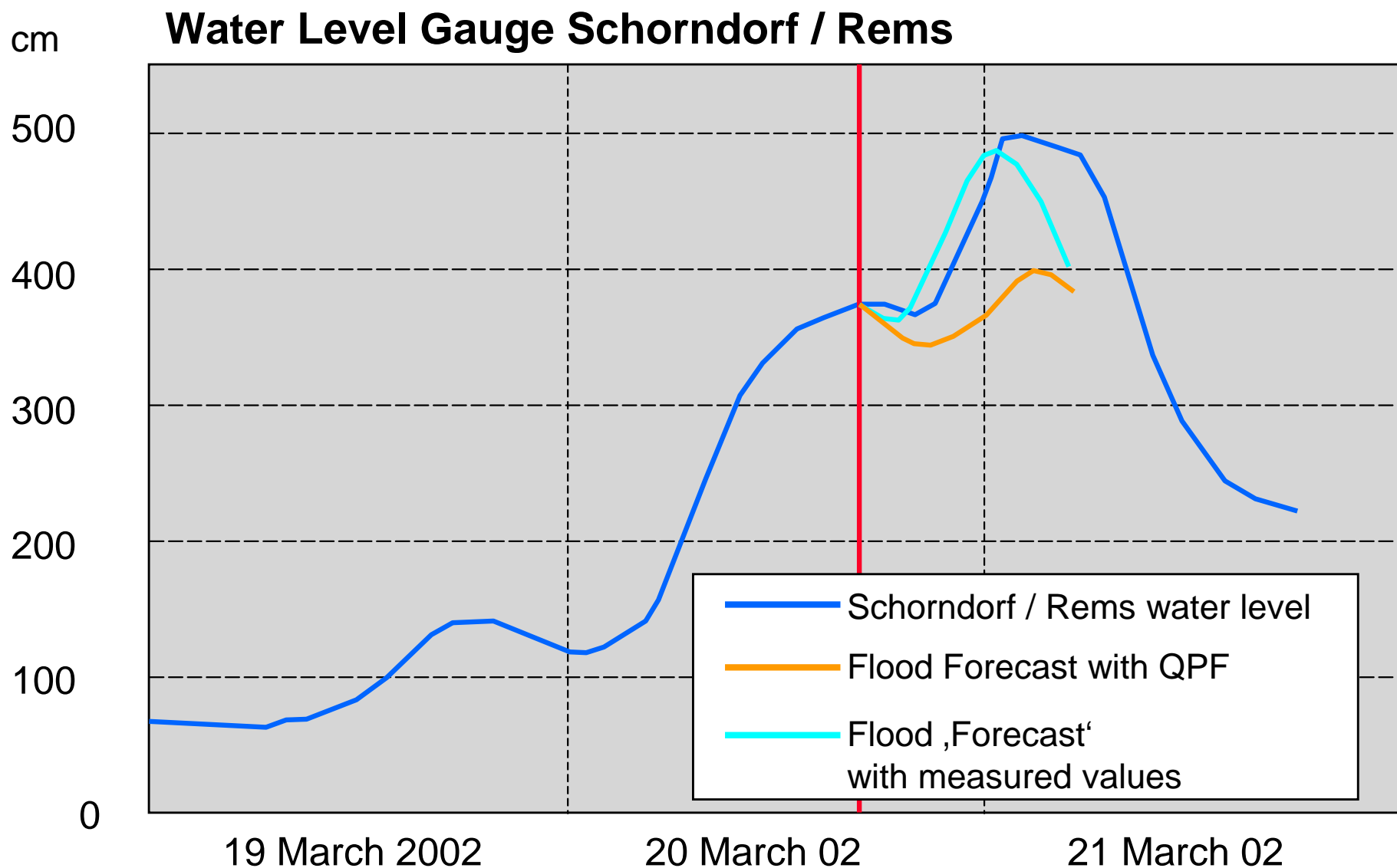
### Water Level Gauge Schorndorf / Rems



# Requirements to QPF from Hydrological Users

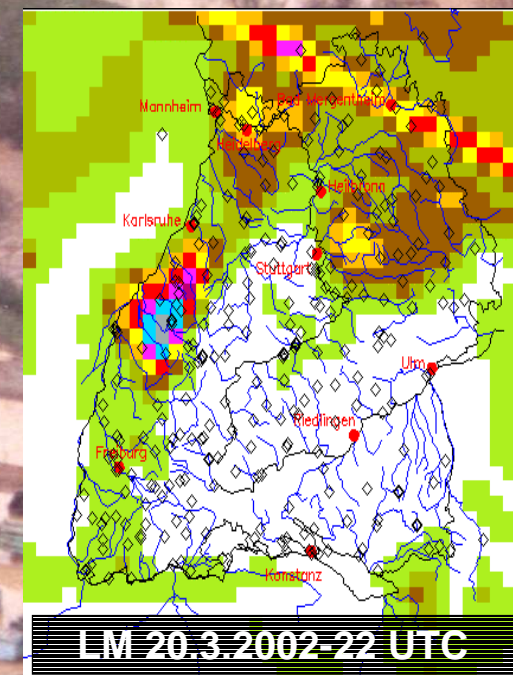
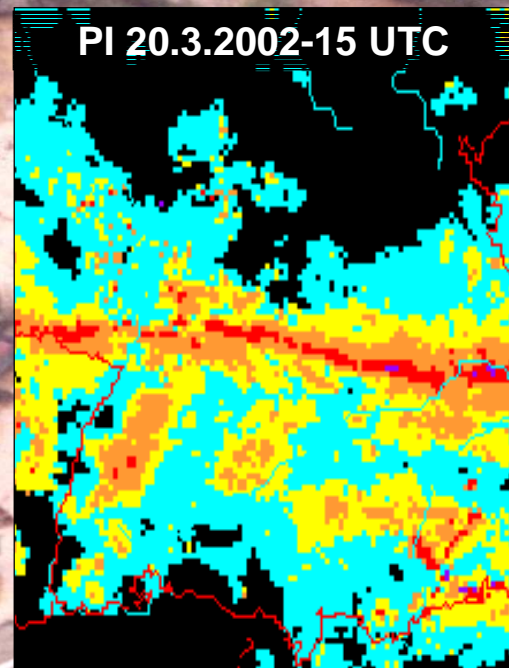
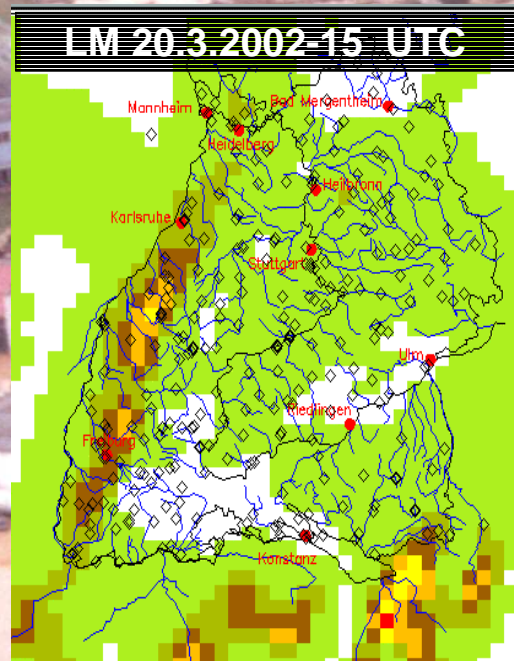


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# Wünsche an die Weiterentwicklung

## Discrepancy between predicted and real rainfall



HW März 2002 an der Rems [500 km<sup>2</sup> EZG]

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## Requirements to QPF from Hydrological Users

### Quality improvement should focus on

- higher accuracy of the QPF,
  - particularly in the first hours
  - regarding to the location
  - and the time of rainfall
- closer adjustment between measurements and forecasts

# Requirements to QPF from Hydrological Users

Quality improvement should focus on  
higher accuracy of the QPF  
depending on relevant amounts of rainfall

watersheds < 500 km<sup>2</sup>

> 25 mm in 1h -  
> 35 mm in 6h



500 – 10,000 km<sup>2</sup>

> 50 mm in 24 h



> 50,000 km<sup>2</sup>

extensive rainfall  
> ~ 70 mm in 48 h



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# Requirements to QPF from Hydrological Users



high

Accuracy of QPF for heavy rain

$\pm 1$  h

Accuracy in time

$\pm 6$  h

$\ll 20$  km

Accuracy in location (coverage 90%)

$< 200$

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# Requirements to QPF from Hydrological Users



## Needed resolution in time and area

1 km grid

Update every hour

Lead-time 4 hours

**quant. Radar-Nowcasting**

2.8 km grid

update every 3 hour

lead time 18 h

**LMK - prediction**

7 km (40 km) grid

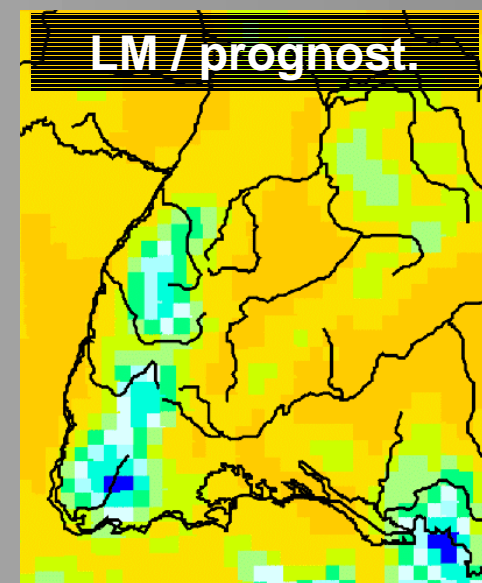
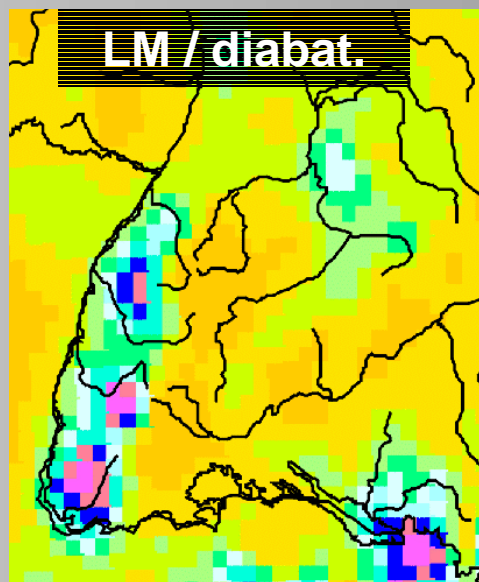
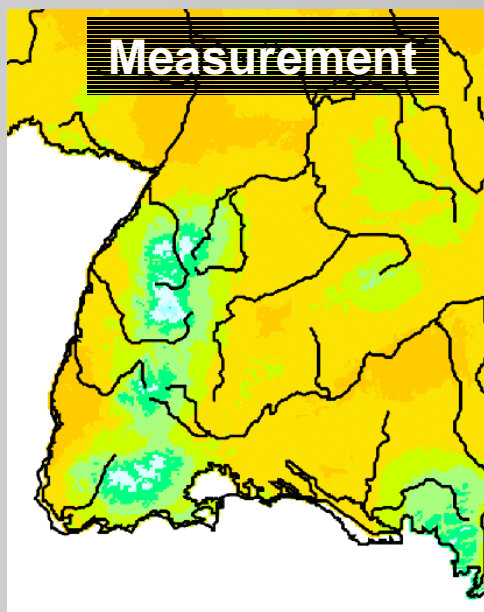
update every 6 h (24 h)

lead-time 48 (172 h)

**LM / GME – prediction**

## Requirements for the future development

### Analyses and reduction of the inaccuracies of existing QPF's



Example: Model Output Statistic (MOS)

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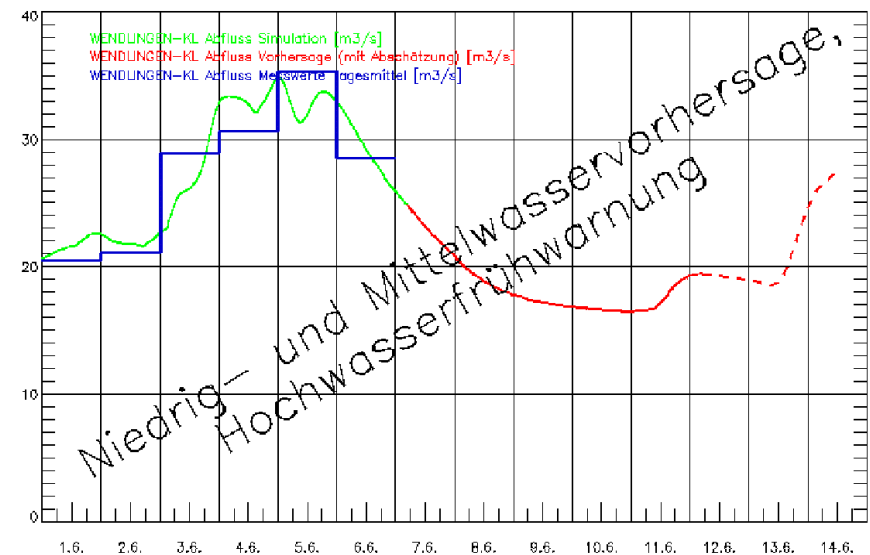
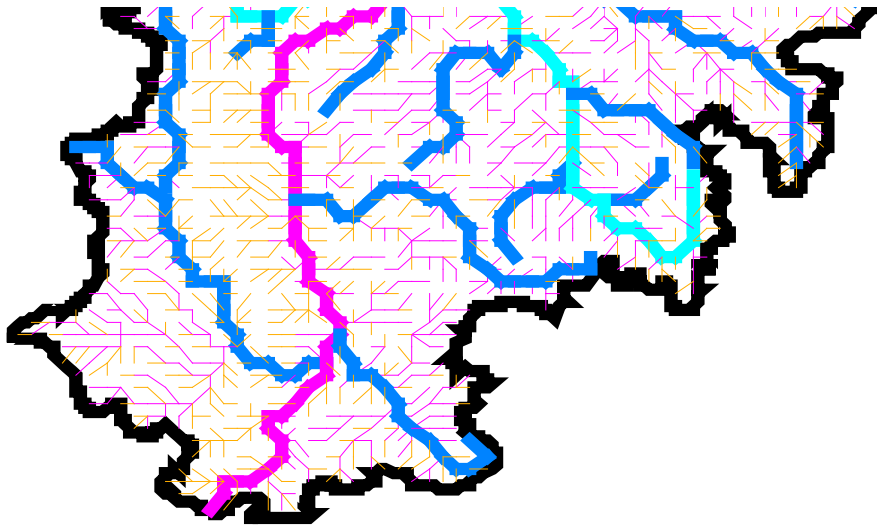


Thank you  
very much for your  
attention

# Weiterverarbeitung der Niederschlagsvorhersage

## Hochwasser-Vorhersagemodelle (HVZ):

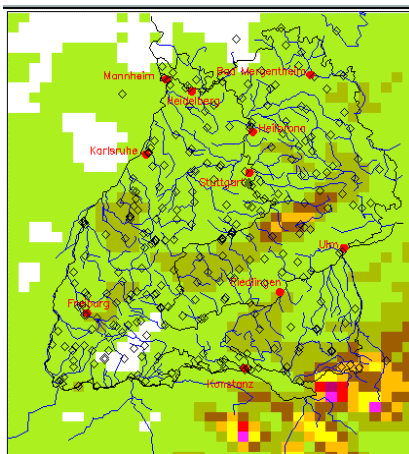
- räumliche Auflösung: **1 km-Raster**
- **Aktualisierung** der Vorhersagen: bei Hochwasser **stündlich**, ansonsten täglich (HW-Frühwarnung ☒ [www.hvz.baden-wuerttemberg.de](http://www.hvz.baden-wuerttemberg.de))
- kontinuierliche Berechnung von Verdunstung u. Bodenfeuchte  
☒ insg. 6 meteorologische Eingangsparameter



# Wünsche an die Weiterentwicklung

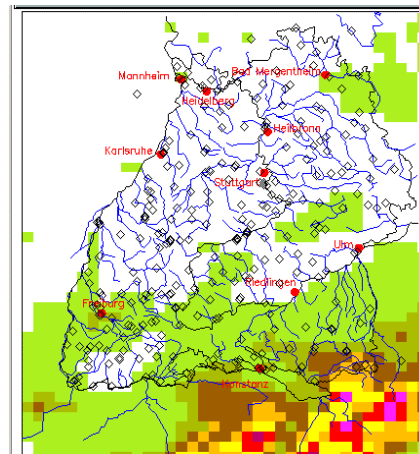
## Mittlere Priorität: Ensemble-Vorhersagen mit

- überschaubarer Anzahl von quant. Vorhersagen (autom. Zuordnung der Ensemble-Mitglieder in Klassen, Auswahl eines jeweils typischen Vertreters)
- zugehörige „Eintrittswahrscheinlichkeit“ der Ensemble-Klasse



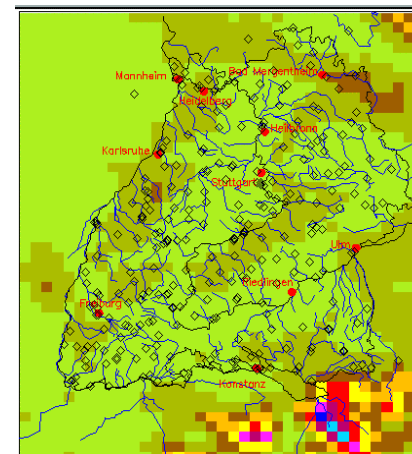
Ensembleklasse 1

$p = 48\%$



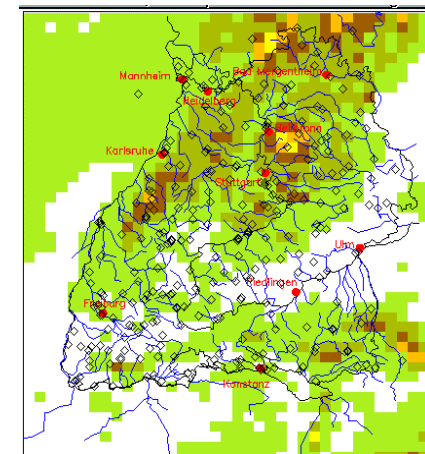
Ensembleklasse 2

$p = 18\%$



Ensembleklasse 3

$p = 27\%$

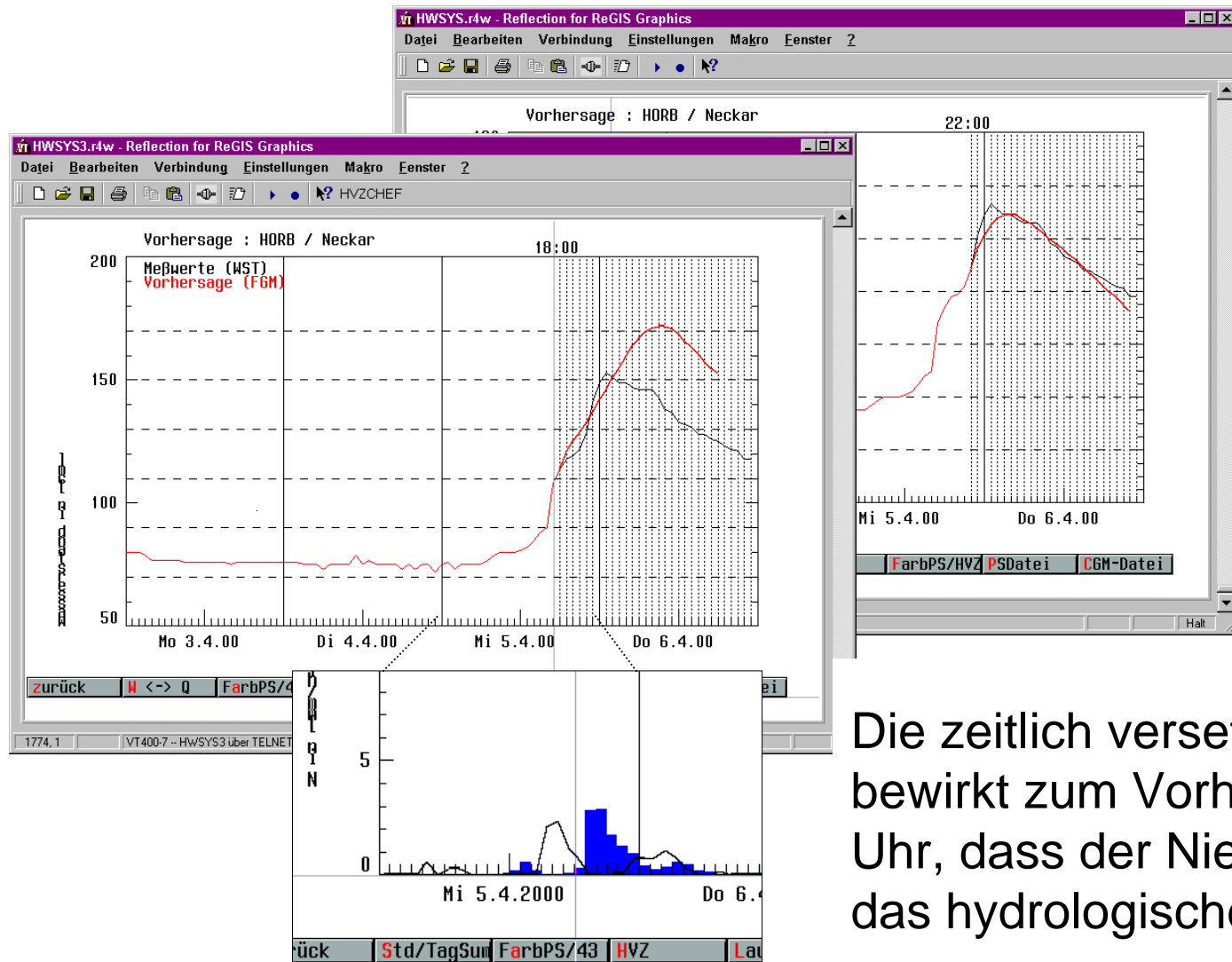


Ensembleklasse 4

$p = 7\%$



# Problem: zeitlicher Versatz in N-Vorhersage

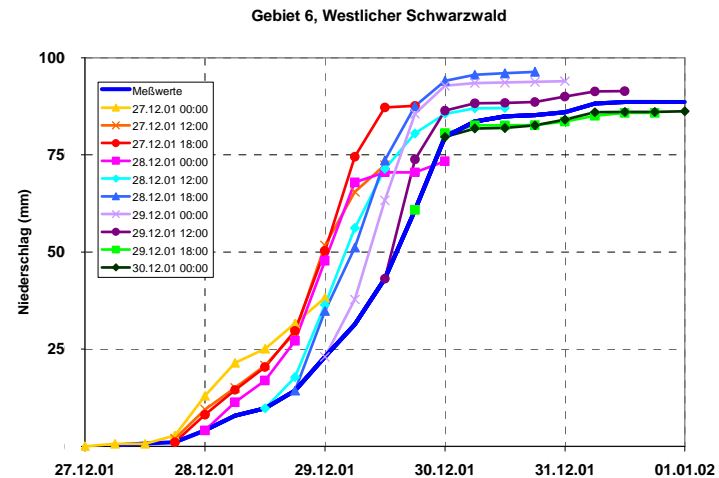
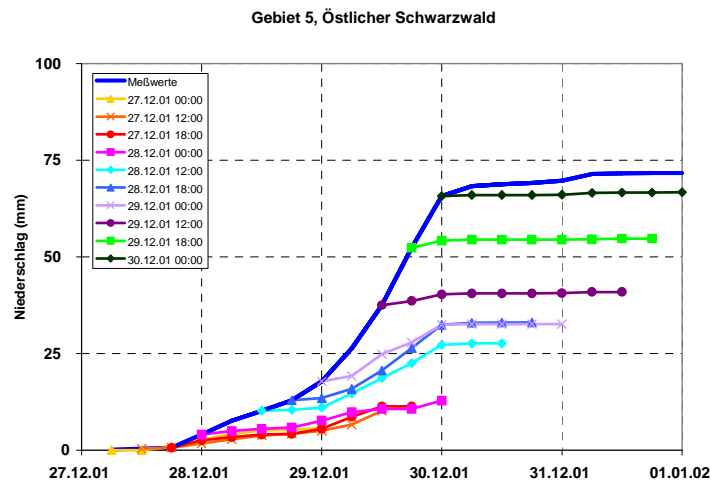


Die zeitlich versetzte N-Vorhersage bewirkt zum Vorhersagezeitpunkt 18 Uhr, dass der Niederschlag doppelt in das hydrologische Modell eingeht

## 2. Einbindung numerischer Wettervorhersagen

### Probleme beim Lokalmmodell aus Sicht der HVZ

- räumliche, zeitliche und mengenmäßige Ungenauigkeiten, v.a. beim Niederschlag, insbesondere in der Skala < 1000 qkm
- Systematische Über- /Unterschätzung des Niederschlags bei Gebirgen (deutliche Verbesserung seit LM-Version April 2004)





## *Limit of Predictability*

### **Forecast Lead-Time Dependence**

**Flood forecast skill decreases as a function of lead time  
(Sequential Forecast) for the two storm events**

### **Catchment Scale Dependence**

**Flood forecast skill increases as a function of basin area  
(Sequential Forecast) for the two storm events**