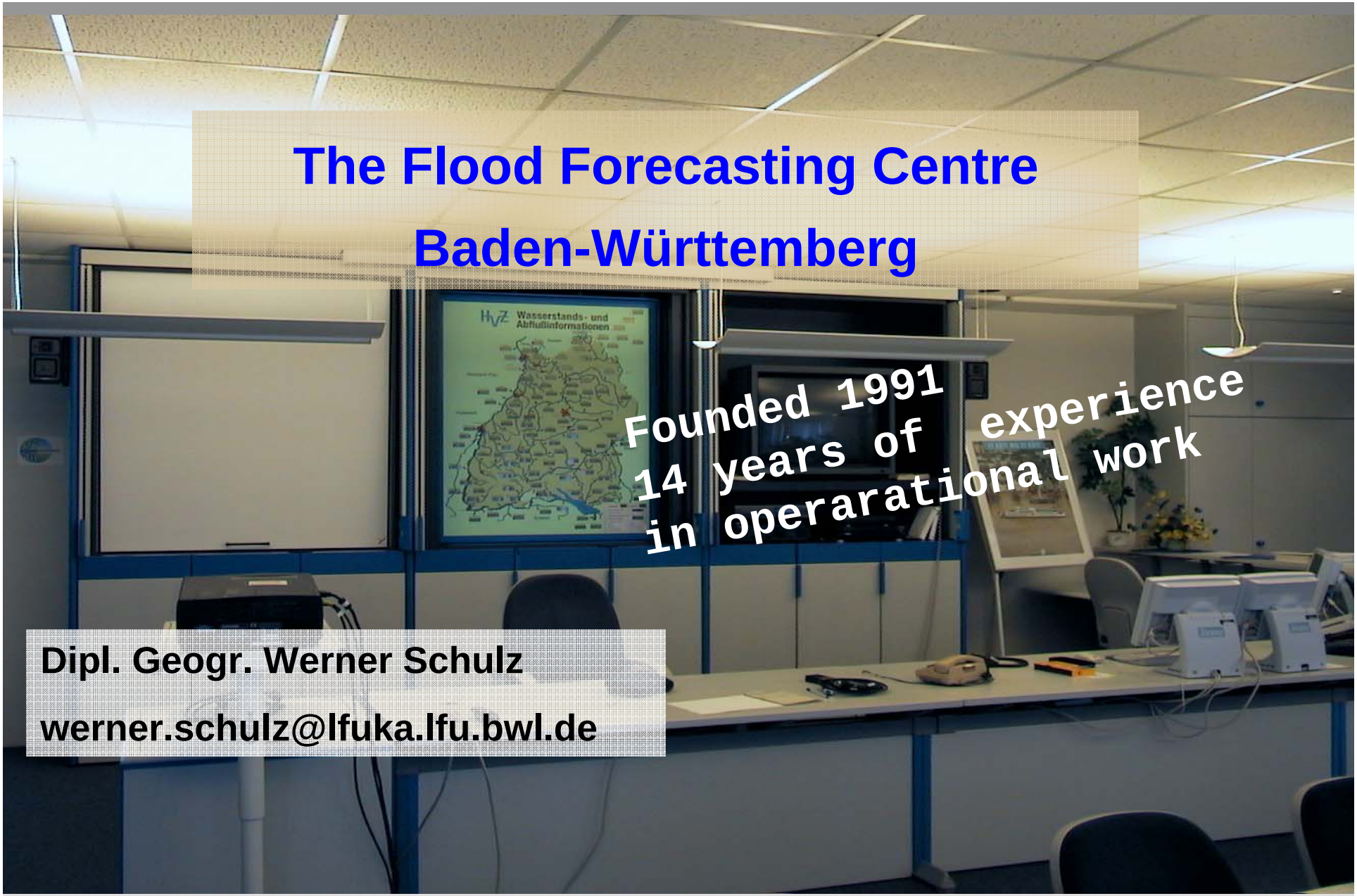
The Flood Forecasting Centre Baden-Württemberg



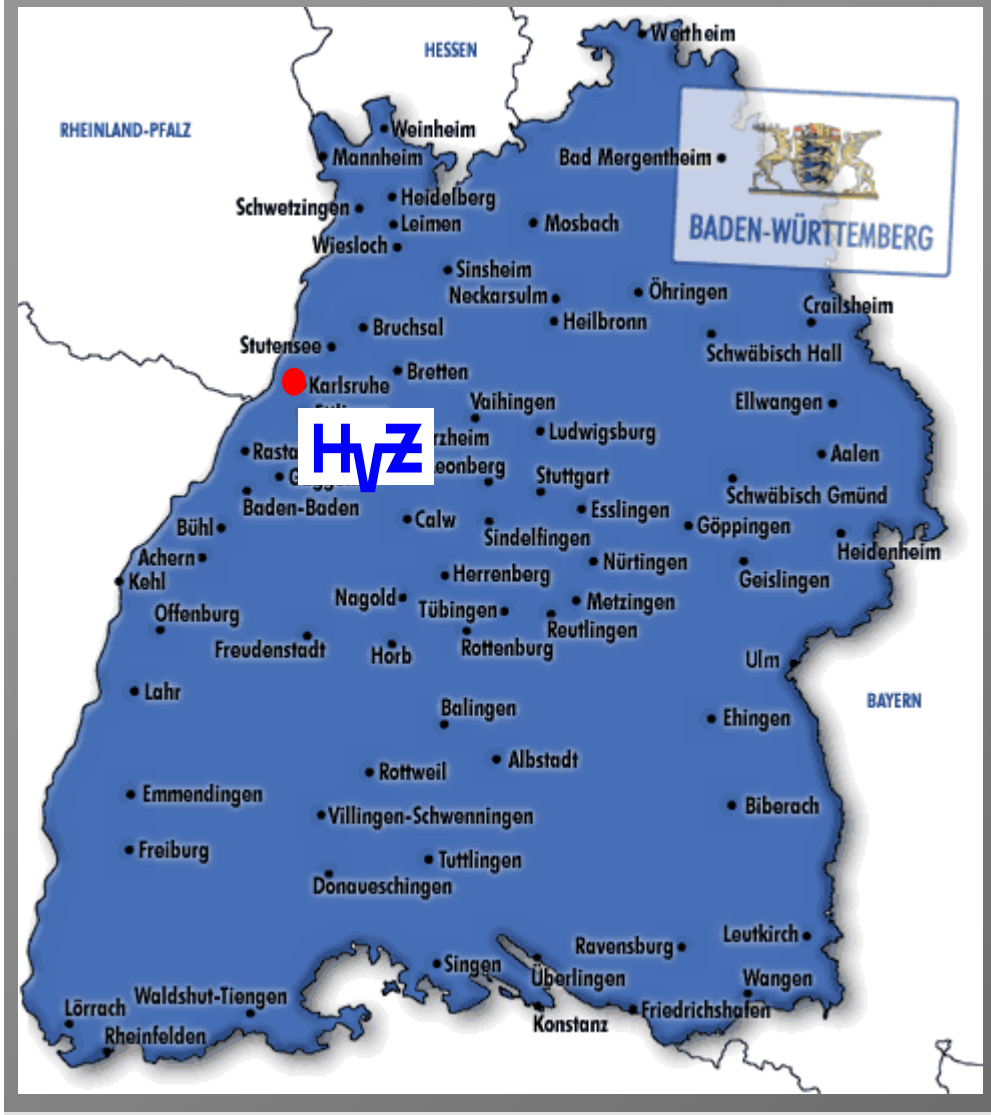
Dipl. Geogr. Werner Schulz

werner.schulz@lfuka.lfu.bwl.de

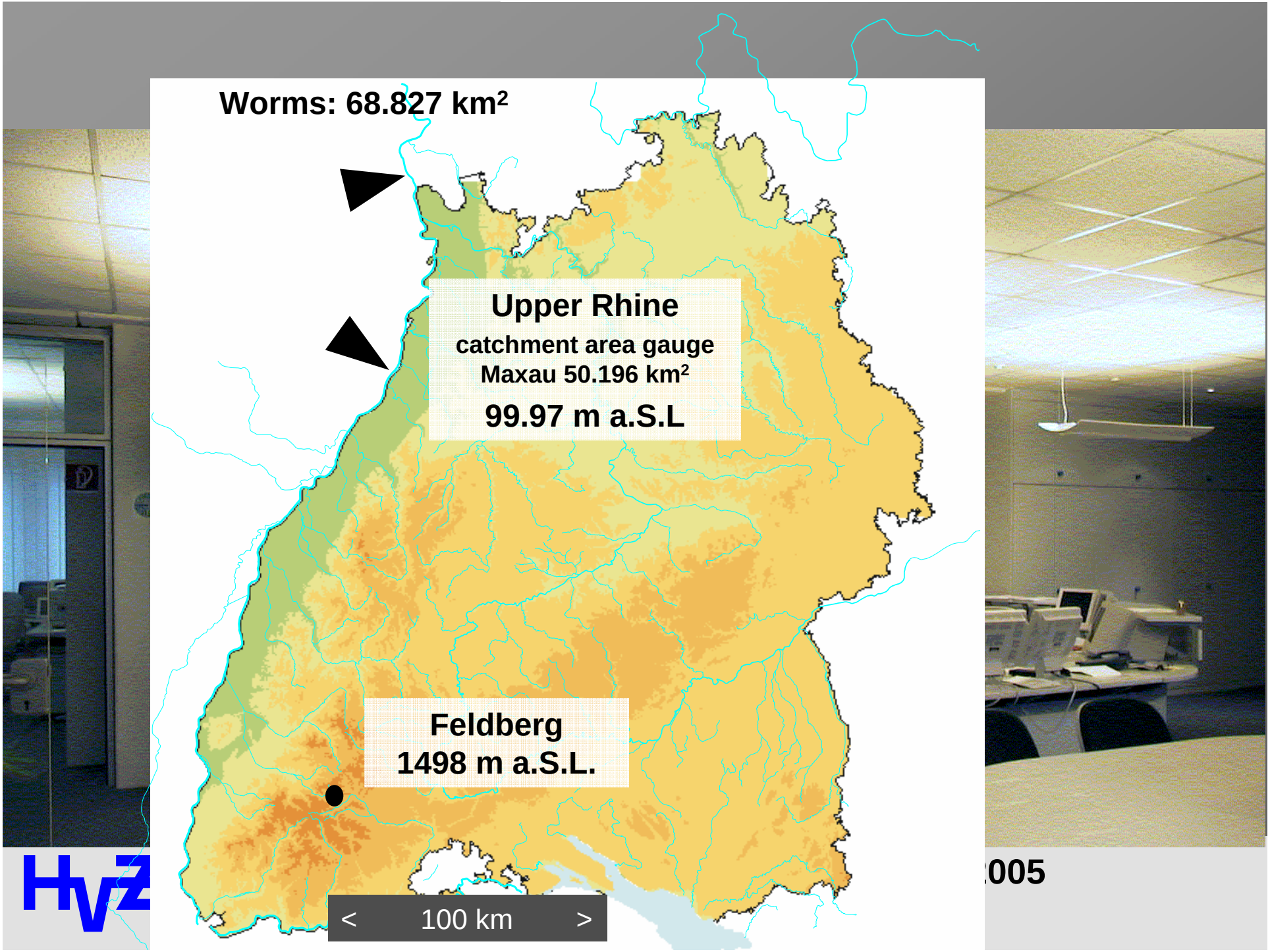
3rd Annual Flood Forum **7 - 8 April 2005**

Vientiane, Lao PDR

General Information



- Area 35 752 km²
- Inhabitants 10,5 Mio.
- 1111 local authorities
- 291 Inhabitants / km²


Worms: 68.827 km²
Upper Rhine
catchment area gauge
Maxau 50.196 km²
99.97 m a.S.L
Feldberg
1498 m a.S.L.
< 100 km >

HvZ

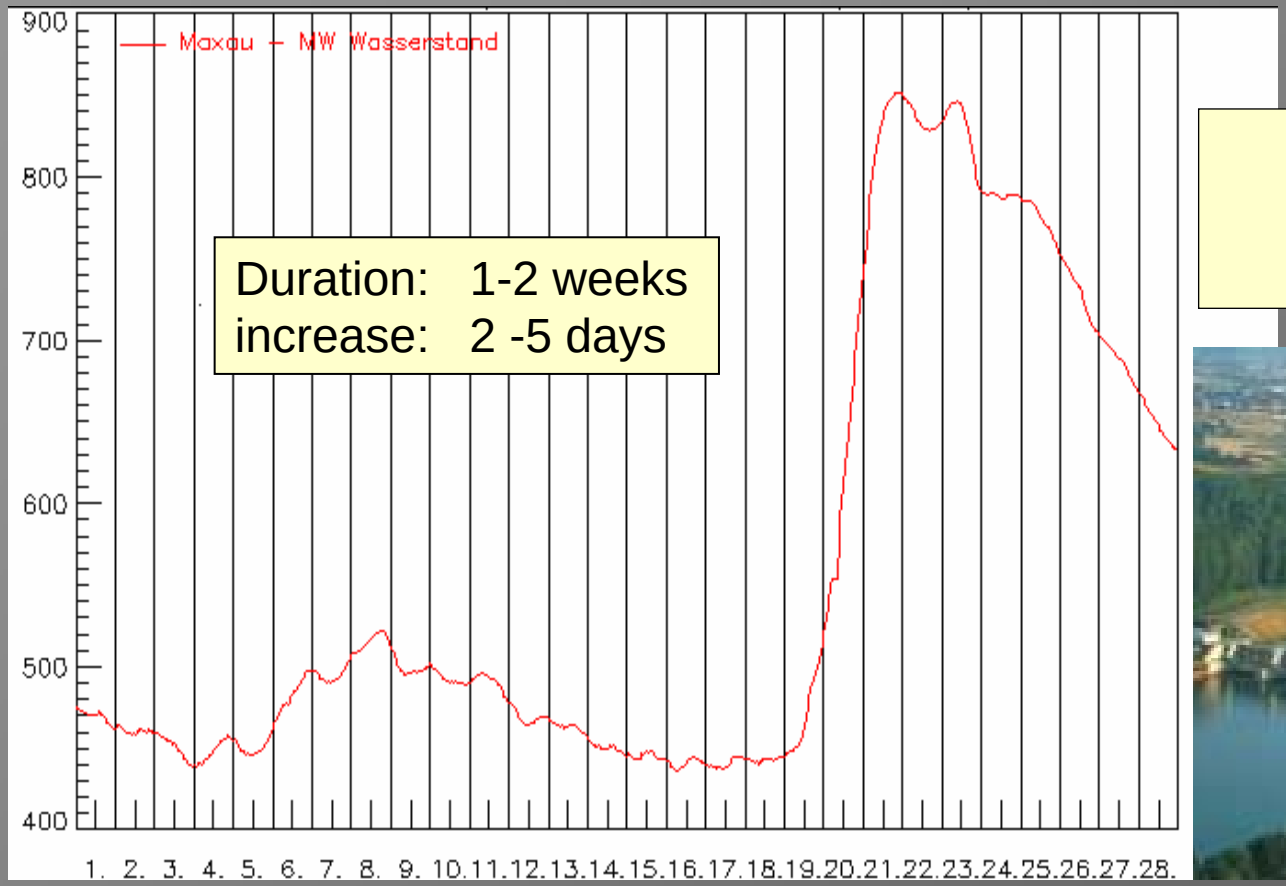
005

Schorndorf, Flood of the River Rems (500 km²)
20th March 2002

3rd Annual Flood Forum **7 - 8 April 2005**

Vientiane, Lao PDR

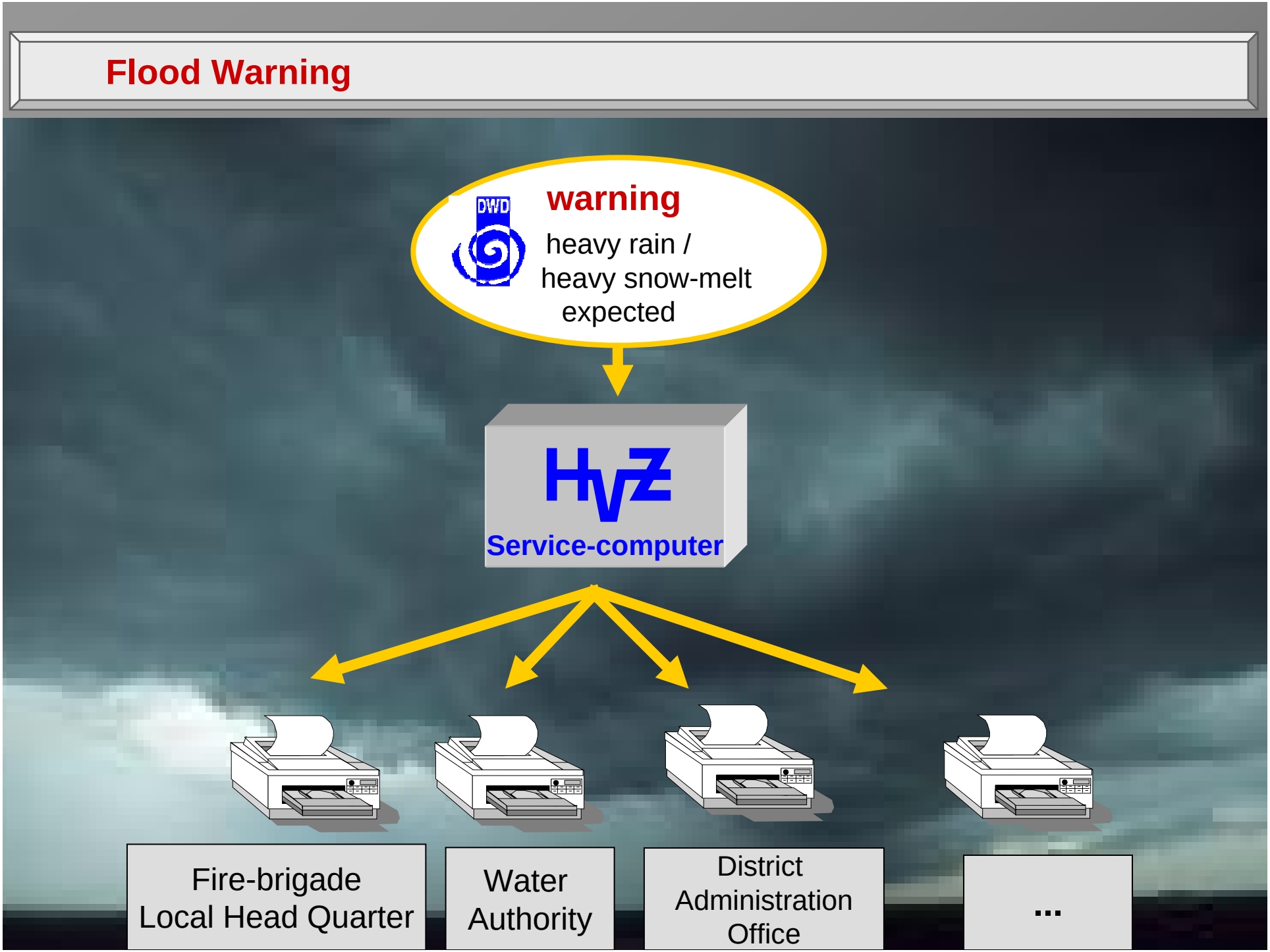
Floods in Baden-Württemberg: typical Events



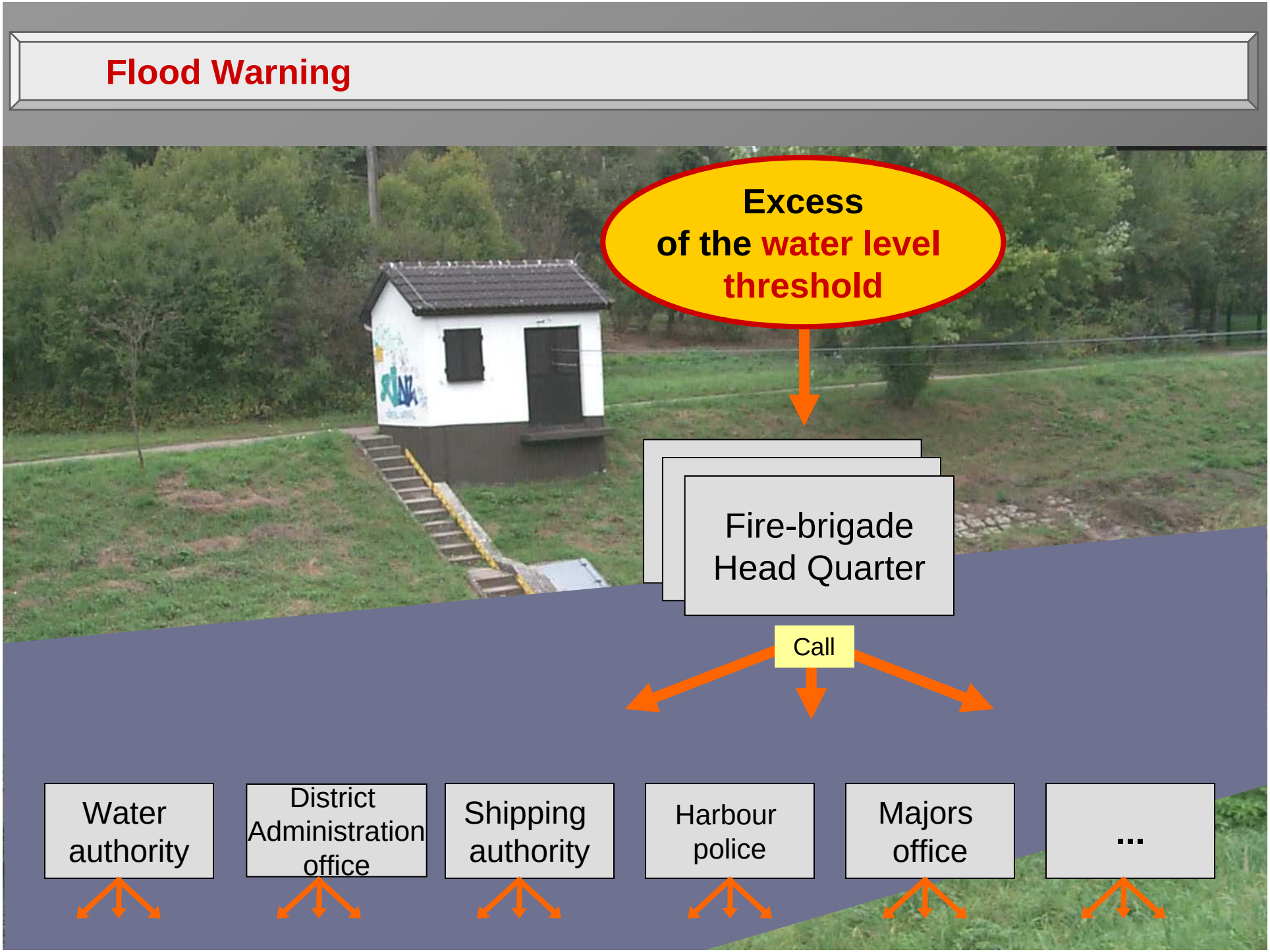
Duration: 1-2 weeks
increase: 2 -5 days

> 50,000 km²
extensive rainfall
> ~ 70 mm in 48 h

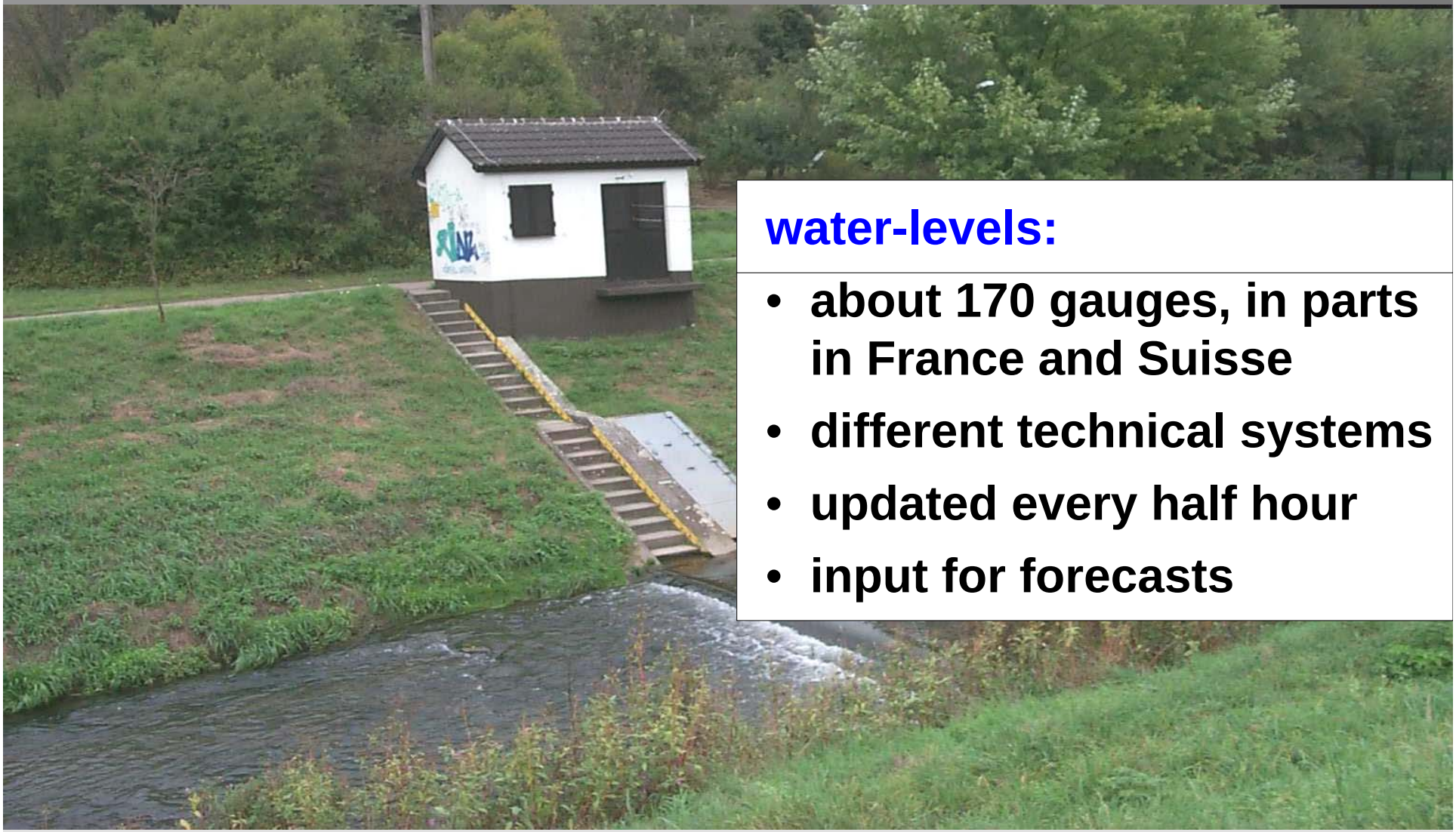
Flood Warning



Flood Warning



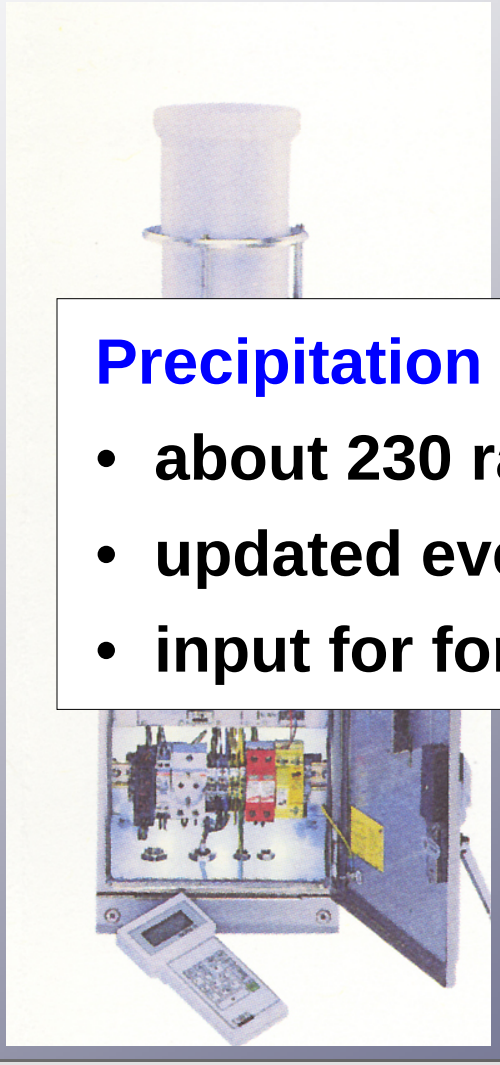
HVZ Data pool: topical Water Levels



water-levels:

- about 170 gauges, in parts in France and Suisse
- different technical systems
- updated every half hour
- input for forecasts

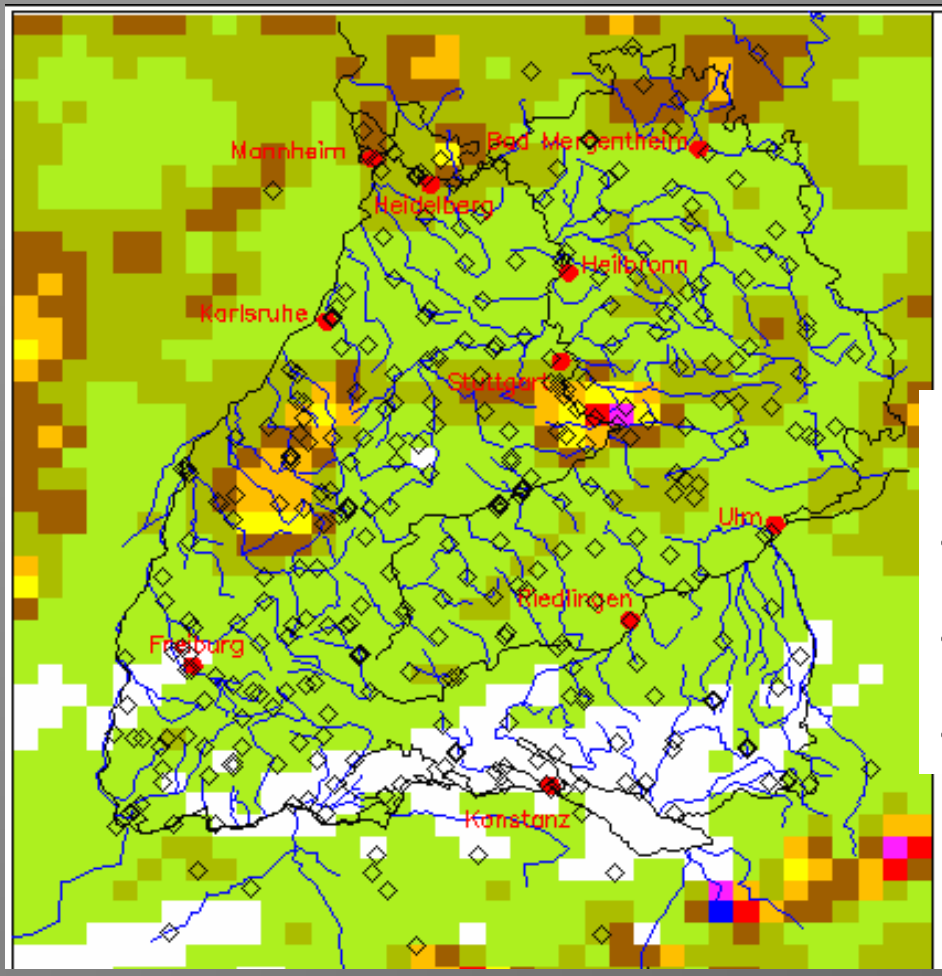
HVZ Data Pool: Precipitation Measurements



Precipitation :

- **about 230 rain gauges**
- **updated every hour**
- **input for forecasts**

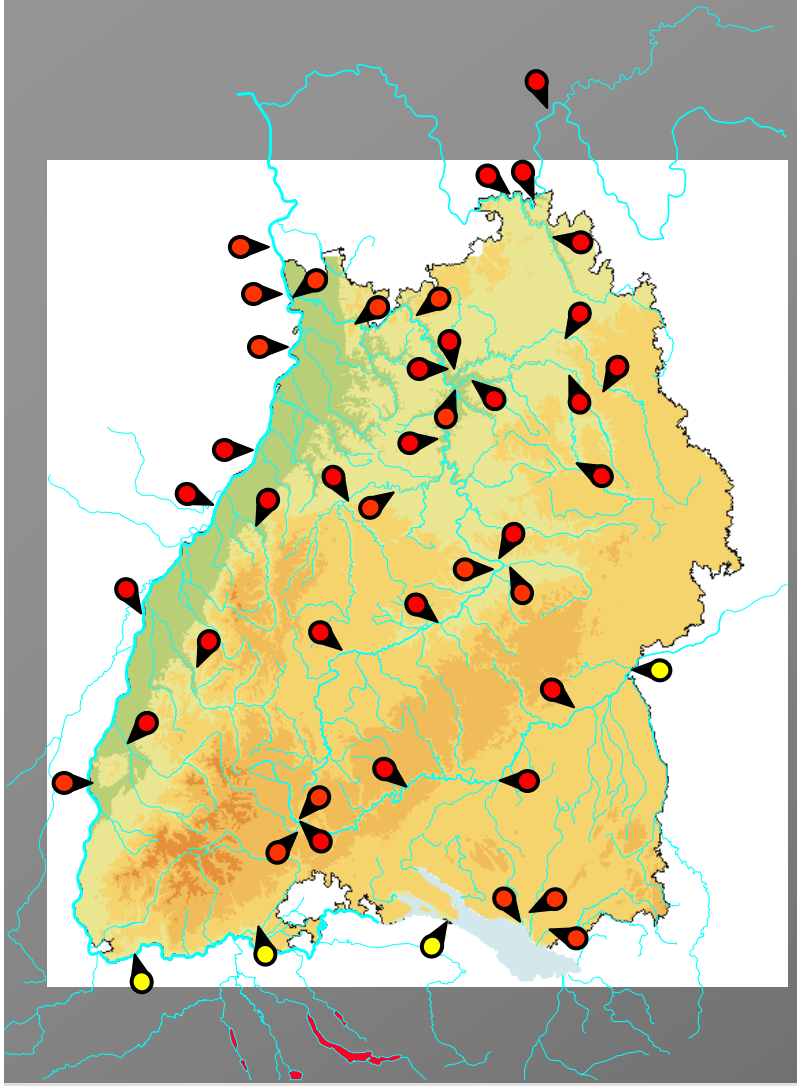
HVZ Data Pool: Precipitation Forecasts



Precipitation Forecasts

- 48 –hour forecast: 3 times a day
- 7 – days forecast: 3 times a day
- Input for forecasts

Flood- Forecast Models of the HVZ

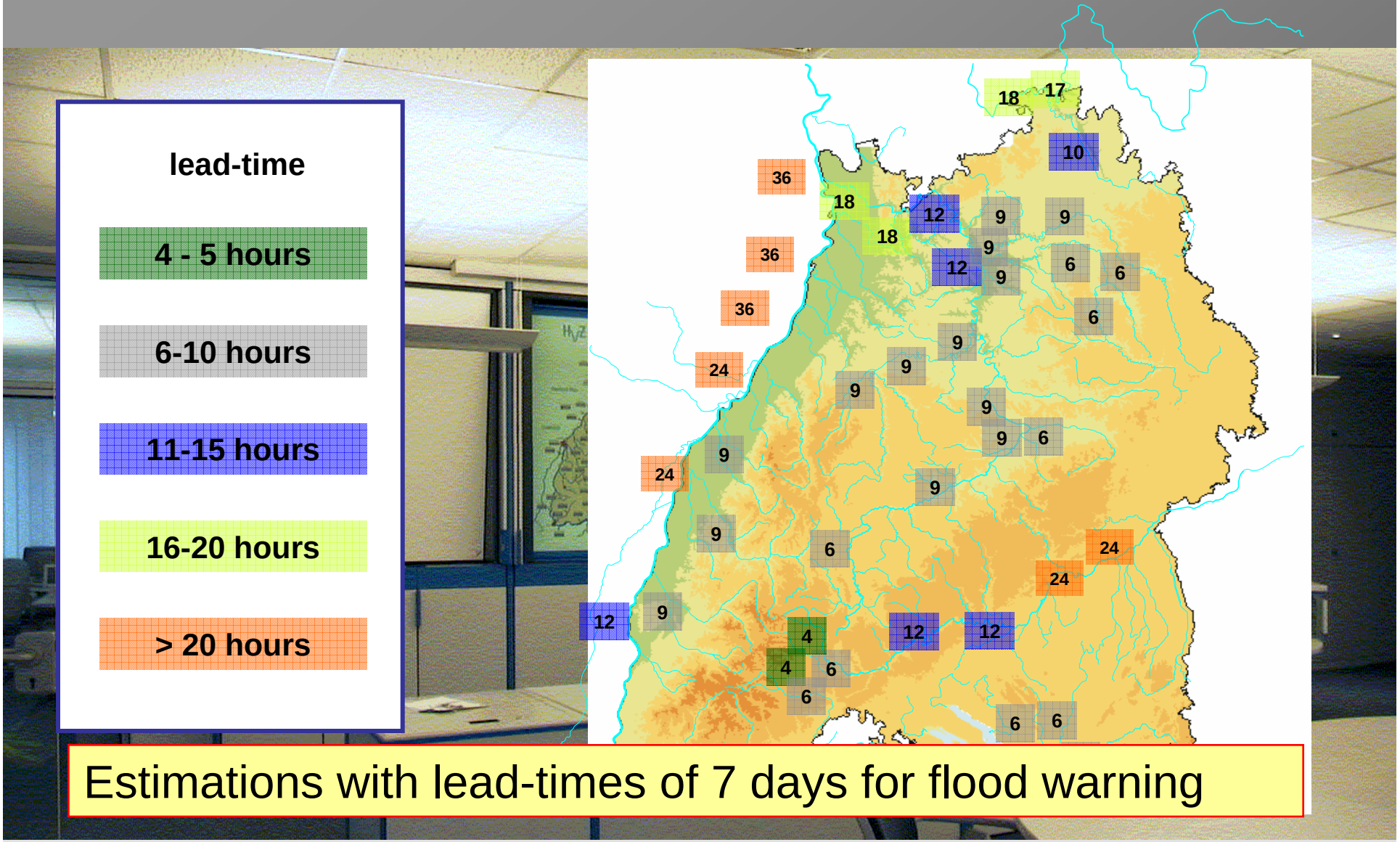


Forecasts are calculated and published fully automatically for about 45 gauges (hourly)

Hydrological models

- Kalman-Filter-Models
- Catchment Models (RR)
- Synoptic Model Rhine
- Water-Balance Models

Forecast Lead-times during a Flood Event



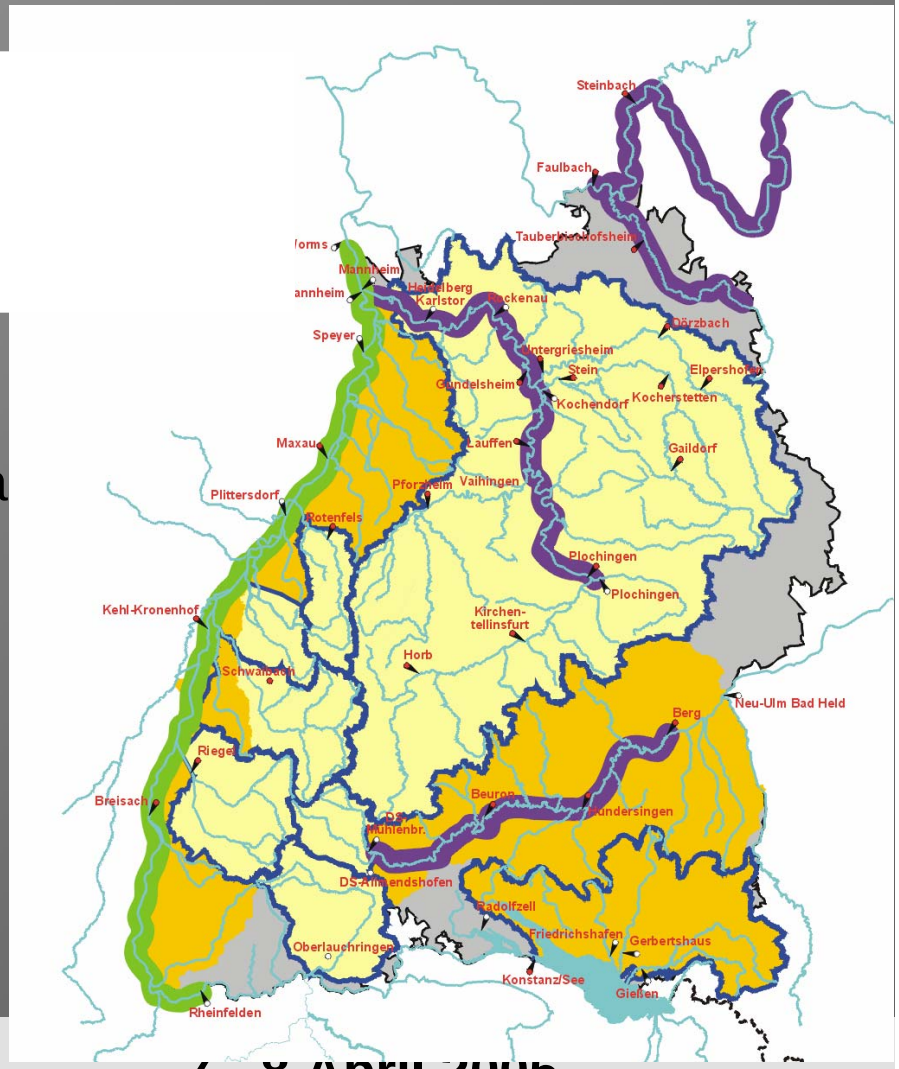
Estimations with lead-times of 7 days for flood warning

Flood- Forecast Models of the HVZ

Kalman-Filter-Models

- Statistical Model:
  regression between upstream gauges and forecast gauge
- fast, small data-requirements
- but without consideration of rainfall data
- and unreliable for extreme events

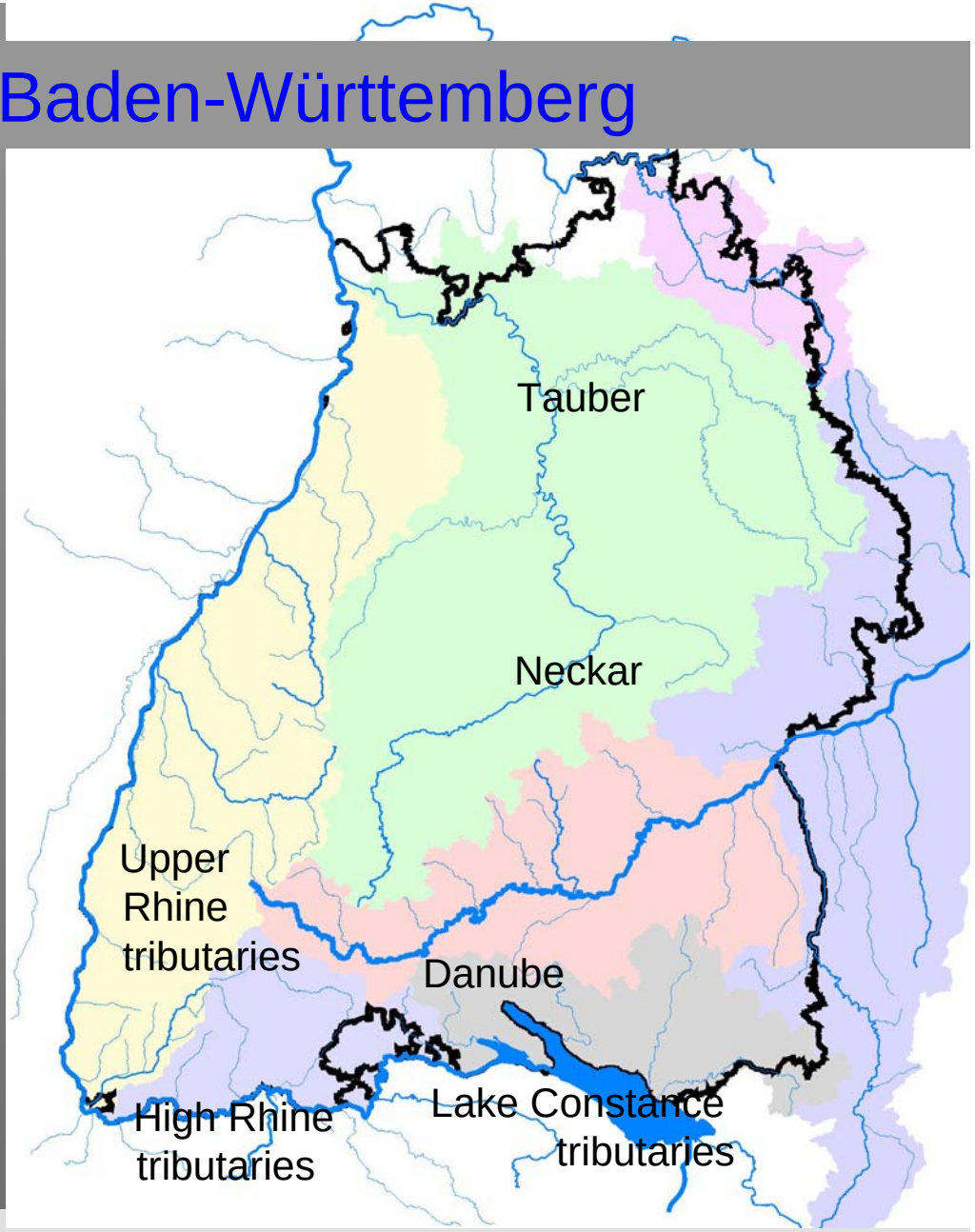
- used for the greater rivers with minor hydraulic gradient (Danube, Main, Neckar)



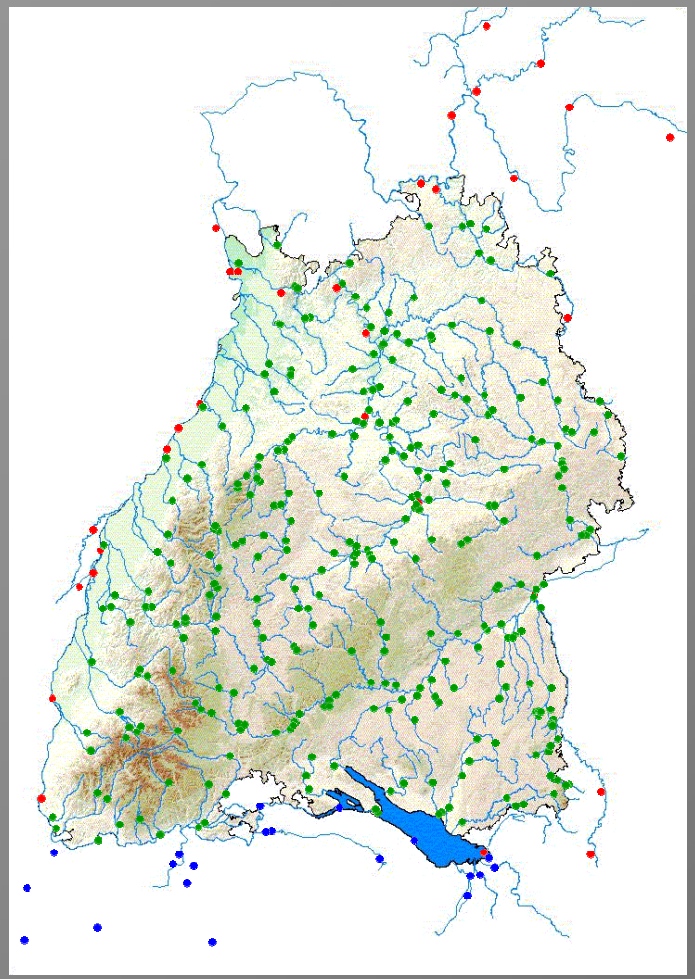
Flood Models in Baden-Württemberg

Catchment models

- Catchments are divided in partial areas
- Rainfall-outflow-modelling per area
- Translation and retention at each river-stretch according to the geometry of the river
- Use of rainfall-measurements and quantitative precipitation forecasts
- also suitable for fast-acting catchments



Collecting of Data under operational Conditions



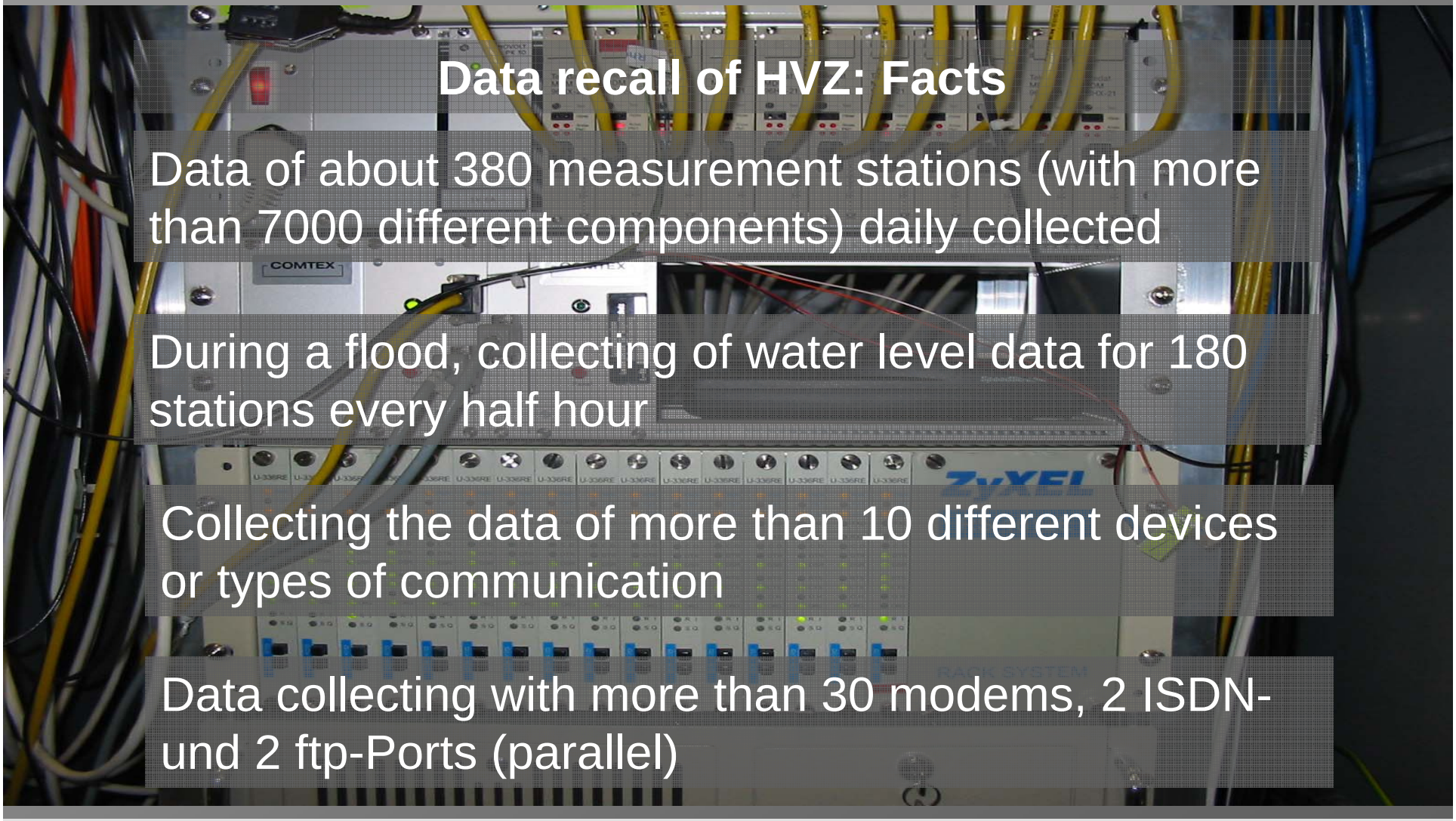
The data are collected from different measurement stations.
The HVZ recall the data…

… from own measurement stations

… from measurement stations of other administrations (Bavaria, water management of the Federal Republic, France)

… from files via ftp (Suisse, Austria)

Collecting of Data under operational Conditions



Data recall of HVZ: Facts

Data of about 380 measurement stations (with more than 7000 different components) daily collected

During a flood, collecting of water level data for 180 stations every half hour

Collecting the data of more than 10 different devices or types of communication

Data collecting with more than 30 modems, 2 ISDN- und 2 ftp-Ports (parallel)

Experiencies in operation

The systems works reliable and with sufficient speed (180 measurement stations in 10 minutes)

The manufacturers of the measurement stations provides the interface for data communication.

Direct call (modem -> station) is more efficient than ftp

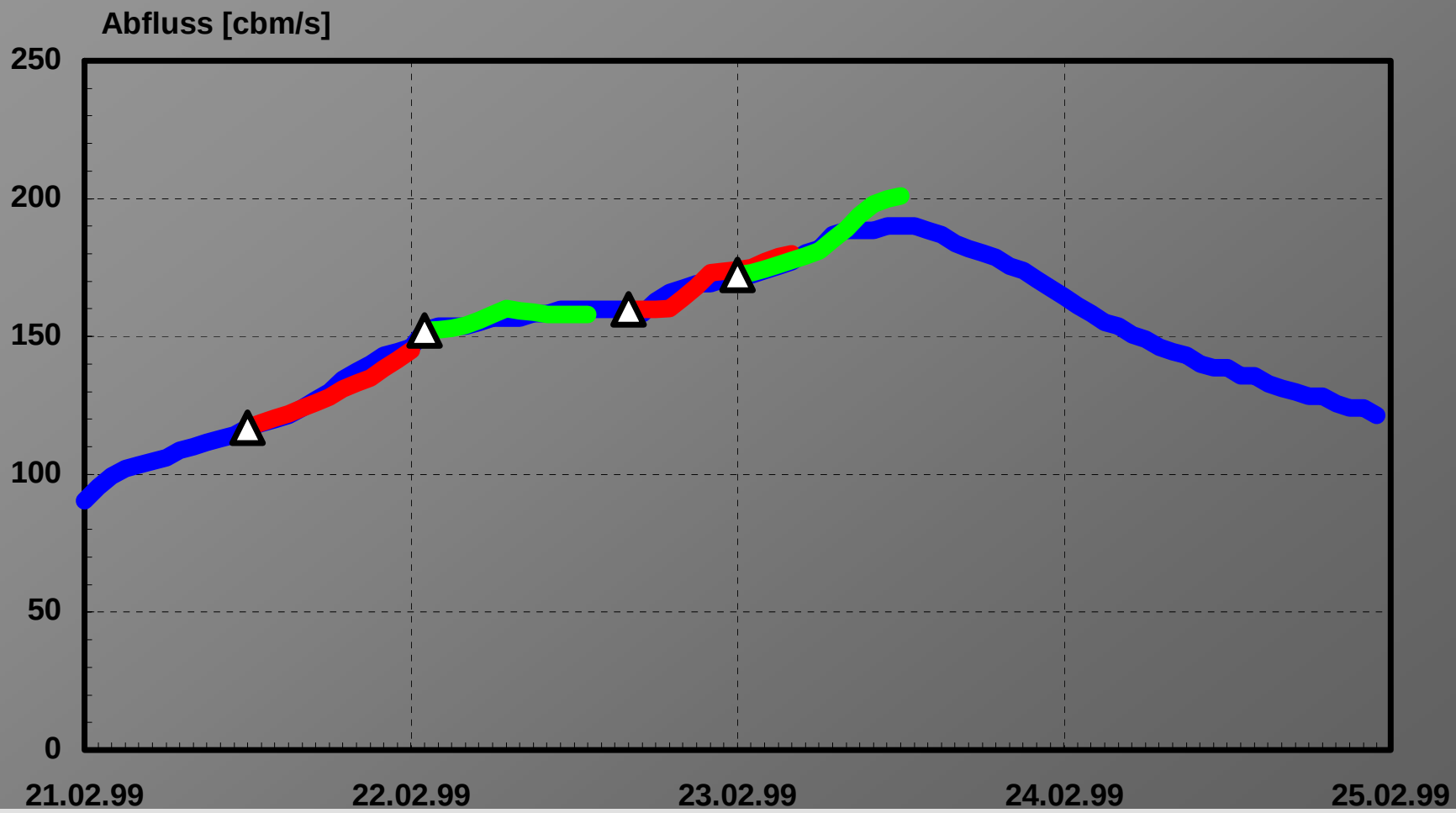
Steering of the flood forecast models

- Activating of single models **for the automatic forecast service**
- Selection of the meteorologic forecast-input
  (QPF input / rainfallpersistence / QPF-forecastfactors)
- Simultaneously calculation with different models
  (e.g. catchment model Neckar or KF-Neckar)
- Effects of controlled retention
  according to agreed regulation or individual case)

Under development:

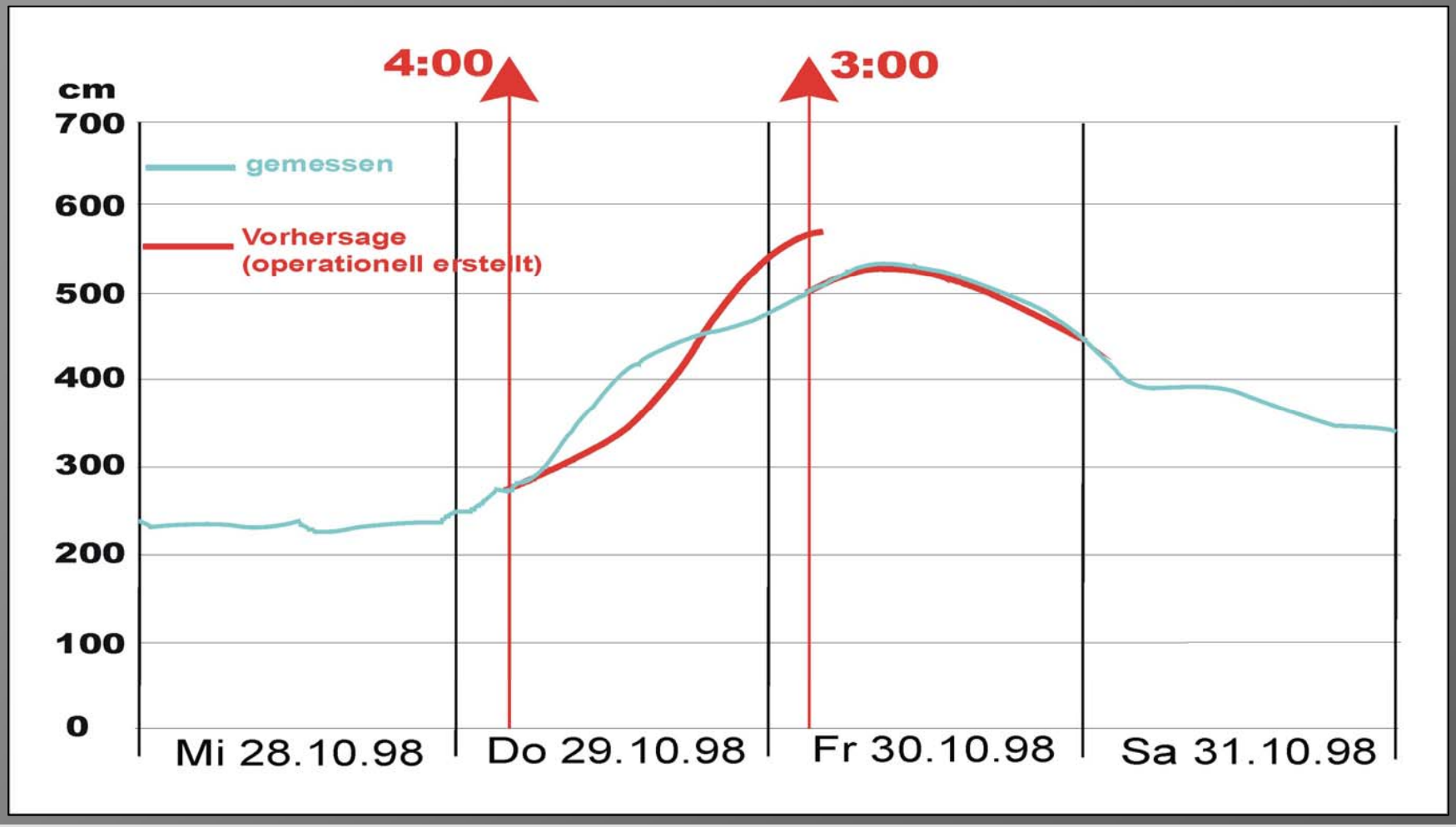
- **Effect of dam failure or non modular flow**

Examples of Forecasts

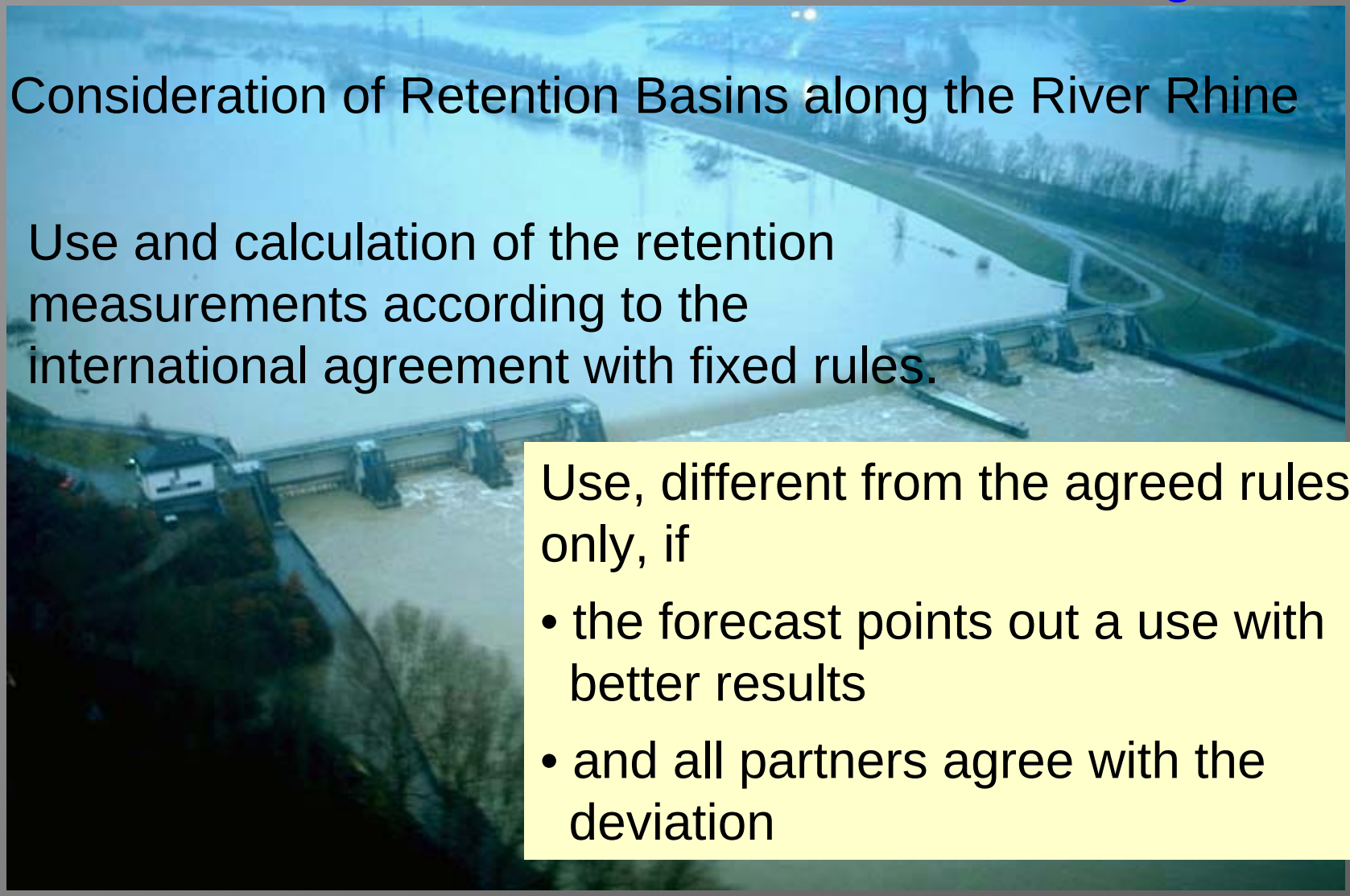


Berechnung von Hochwasser-Vorhersagen

Pegel Heidelberg / Neckar



Flood - Forecasts in Baden-Württemberg



Consideration of Retention Basins along the River Rhine

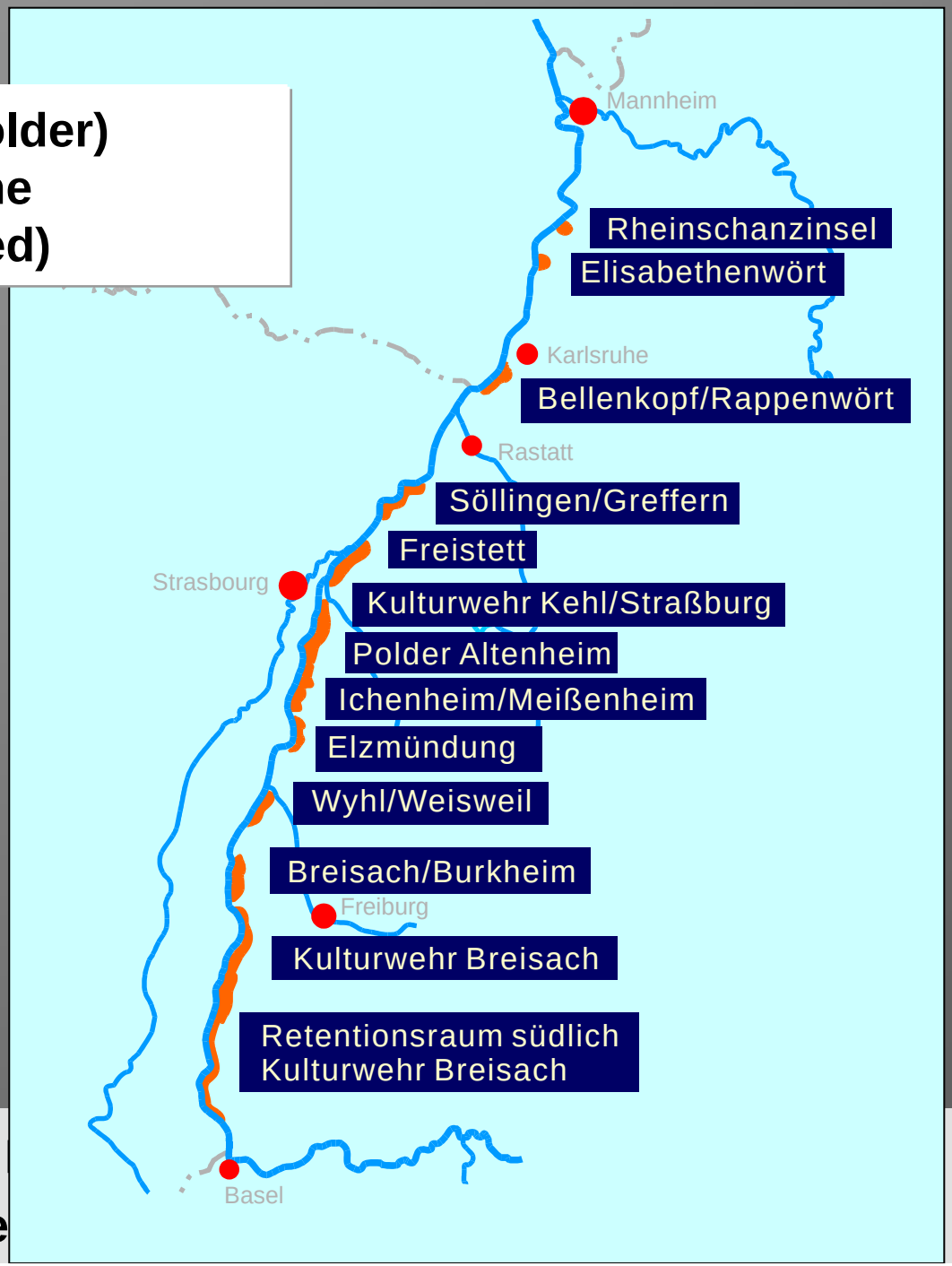
Use and calculation of the retention measurements according to the international agreement with fixed rules.

Use, different from the agreed rules, only, if

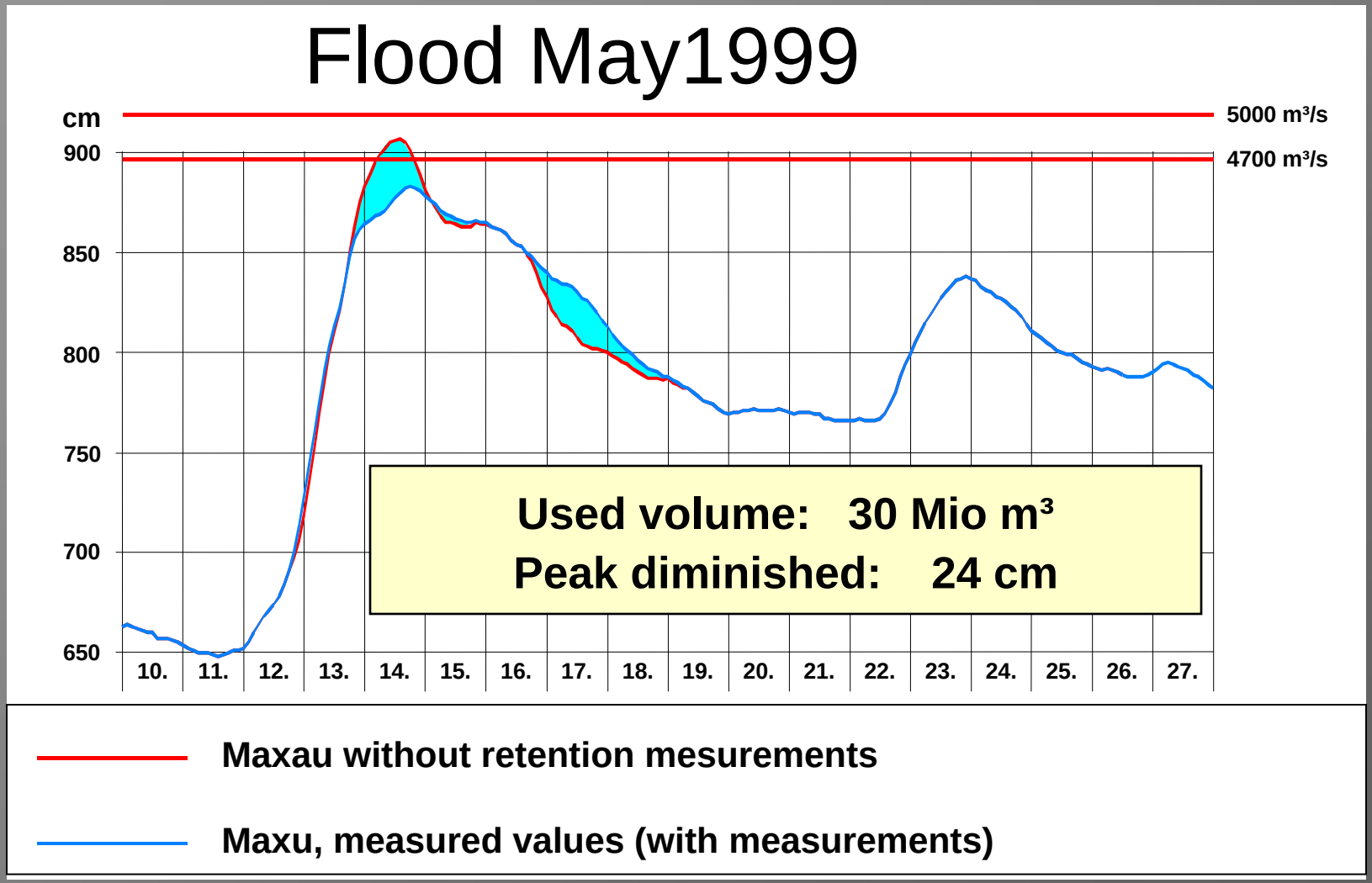
- the forecast points out a use with better results
- and all partners agree with the deviation

Retention-basins (Polder) of the Upper Rhine (in use and planned)

- Forecasts for the tributaries are taken into account
- Effects of 8 (future 27) protection-measurements are taken into account



Forecasts for the River Rhine



Flood - Centres along the River Rhine

Flood - Centres along the River Rhine

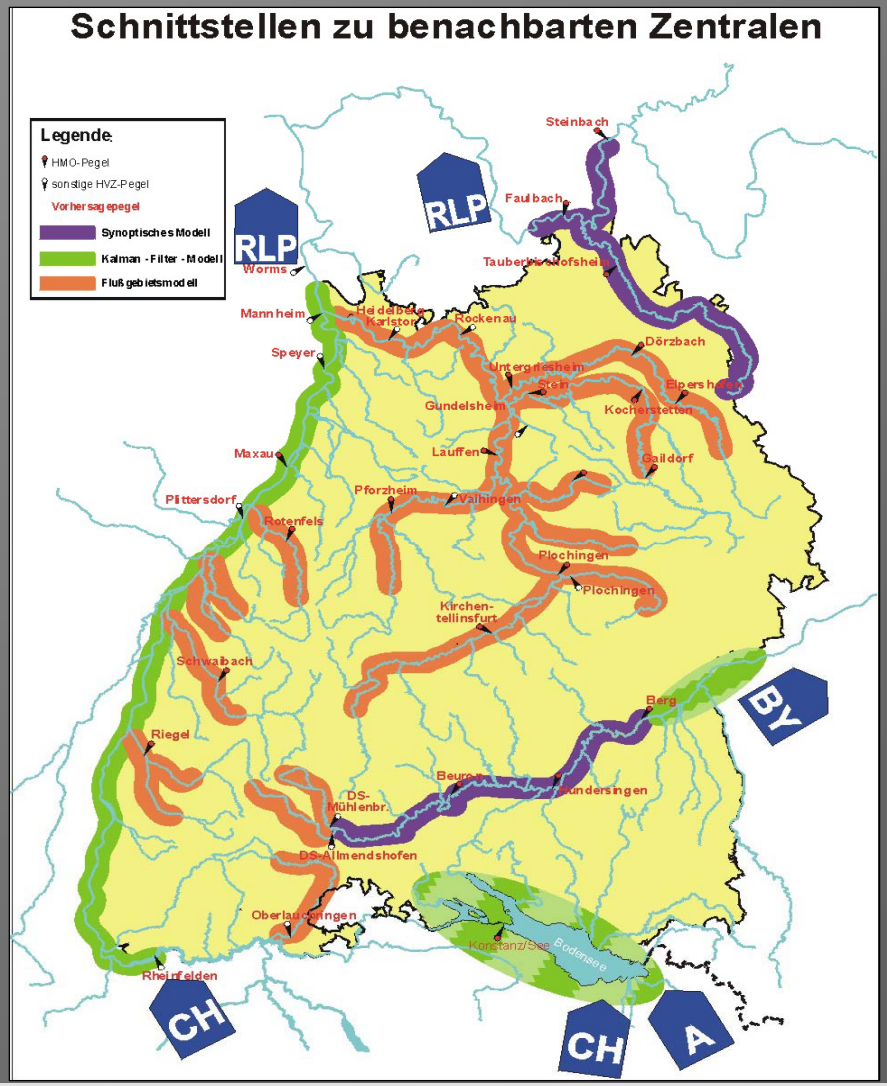
HvZ

3rd A 2005

Data-Exchange HVZ <-> other Centres

Forecast –exchange via ftp

- **Centres along the Rhine:**
  CH → HVZ → RP → NL
- **Centres along the Danube:**
  HVZ → BY
- **Centres Lake Constance:**
  CH ↔ AU ↔ HVZ



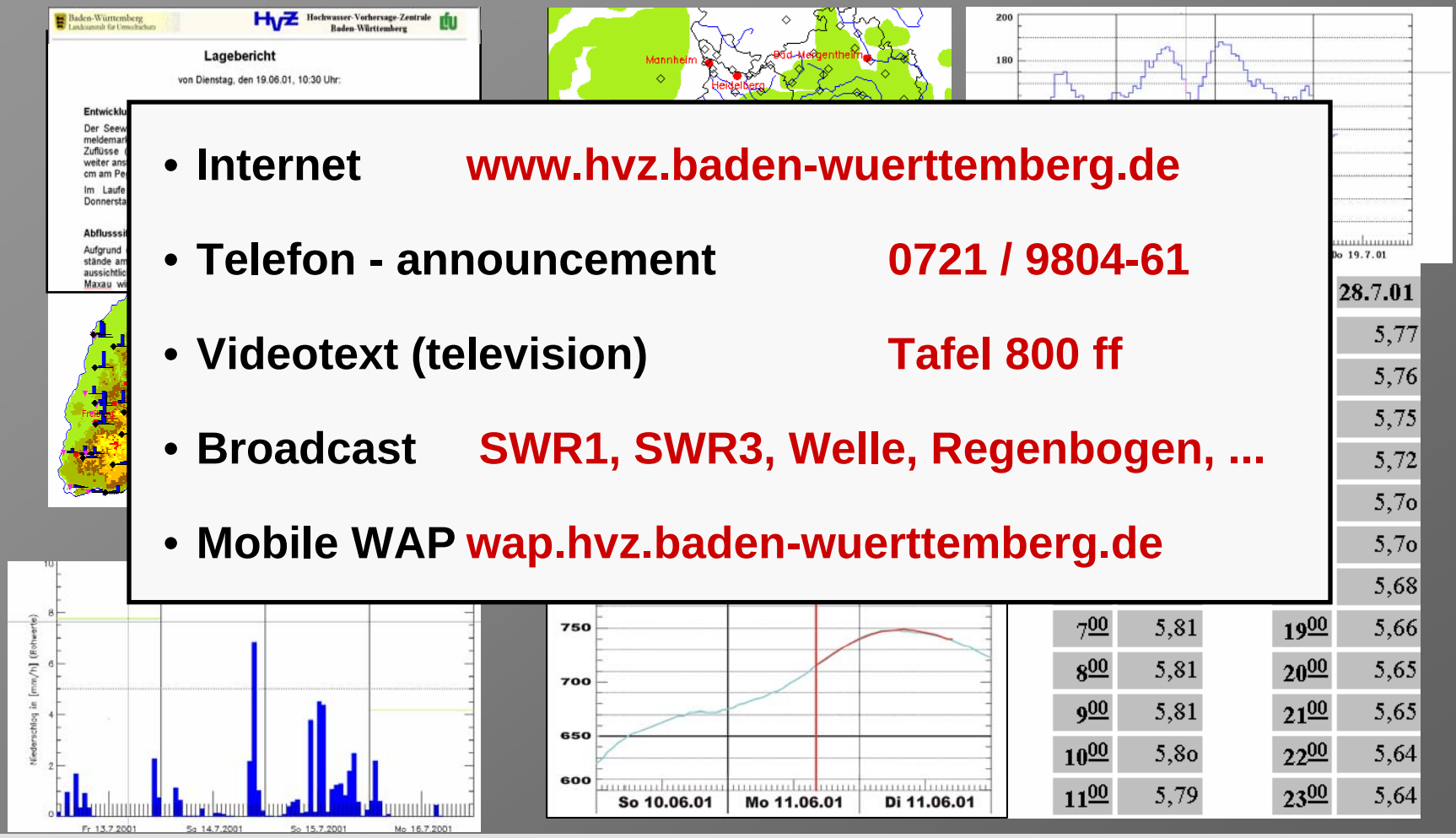
Provided Flood Information

Flood Forecasting Centre Baden-Württemberg / Karlsruhe

published information:

- water levels and discharge	hourly
- **water level forecasts**	**hourly**
- precipitation measurements	hourly
- weather alerts	as required
- situation reports	as required

Published Information



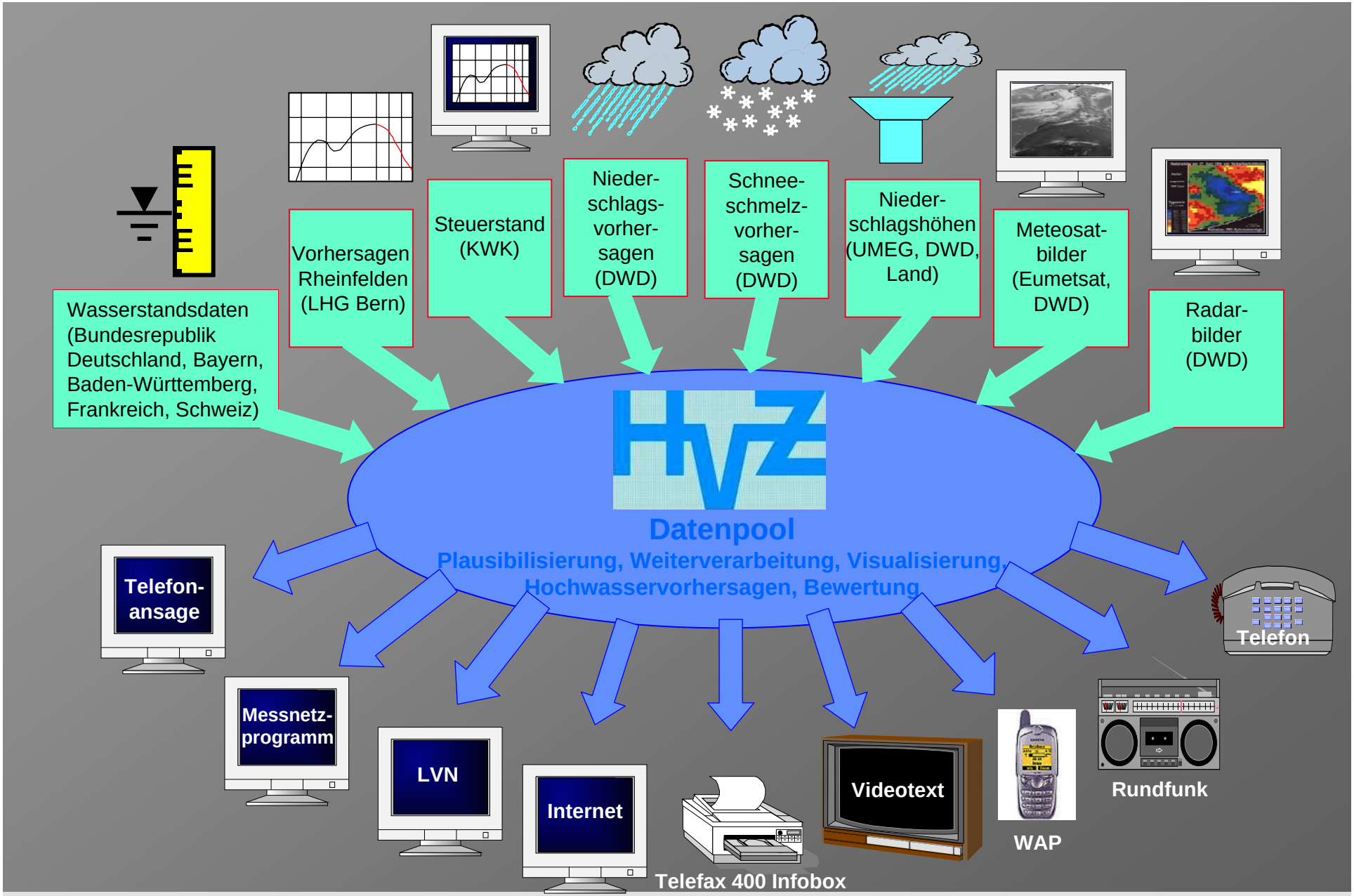
- **Internet** www.hvz.baden-wuerttemberg.de
- **Telefon - announcement** 0721 / 9804-61
- **Videotext (television)** Tafel 800 ff
- **Broadcast** SWR1, SWR3, Welle, Regenbogen, ...
- **Mobile WAP** wap.hvz.baden-wuerttemberg.de

Thank you for your Attention

Maxau, Statistische Werte:

(Jährlichkeiten sind bei diesem Pegel nur aus den Scheitelabflüssen der hydrologischen Winterhalbjahre ermittelt, Ausbauzustand 1977, ohne die Wirkung von Hochwasserrückhaltemassnahmen)

Niedrigster Wasserstand der Jahre 1980-2002: 30.10.1985	3.15	[m]
Mittelwert niedrigster Wasserstände der Jahre 1980-2002	3.71	[m]
Mittelwert Wasserstand der Jahre 1980-2002	5.04	[m]
10-jährlicher HW-Wasserstand	8.48	[m]
20-jährlicher HW-Wasserstand	8.77	[m]
50-jährlicher HW-Wasserstand	9.11	[m]
100-jährlicher HW-Wasserstand	9.41	[m]
2-jährlicher HW-Abfluss	3100	[m³/s]
5-jährlicher HW-Abfluss	3700	[m³/s]
10-jährlicher HW-Abfluss	4100	[m³/s]
20-jährlicher HW-Abfluss	4450	[m³/s]
25-jährlicher HW-Abfluss	4600	[m³/s]
50-jährlicher HW-Abfluss	4900	[m³/s]
75-jährlicher HW-Abfluss	5200	[m³/s]
100-jährlicher HW-Abfluss	5300	[m³/s]
200-jährlicher HW-Abfluss	5700	[m³/s]
1000-jährlicher HW-Abfluss (Schätzwert)	6500	[m³/s]



3rd Annual Flood Forum **7 - 8 April 2005**

Vientiane, Lao PDR

Worms, Statistische Werte:

(Jährlichkeiten sind bei diesem Pegel nur aus den Scheitelabflüssen der hydrologischen Winterhalbjahre ermittelt, Ausbauzustand 1977, ohne die Wirkung von Hochwasserrückhaltemassnahmen)

Niedrigster Wasserstand der Jahre 1980-2001: 31.10.1985	0.34	[m]
Mittelwert niedrigster Wasserstände der Jahre 1980-2001	0.79	[m]
Mittelwert Wasserstand der Jahre 1980-2001	2.26	[m]
10-jährlicher HW-Wasserstand	6.85	[m]
20-jährlicher HW-Wasserstand	7.25	[m]
50-jährlicher HW-Wasserstand	7.64	[m]
100-jährlicher HW-Wasserstand	7.99	[m]
10-jährlicher HW-Abfluss	4750	[m³/s]
20-jährlicher HW-Abfluss	5200	[m³/s]
50-jährlicher HW-Abfluss	5750	[m³/s]
100-jährlicher HW-Abfluss	6300	[m³/s]

Dissemination of Information

Flood Forecasting Centre Baden-Württemberg / Karlsruhe

published information:

- water levels and discharge	hourly
- **water level forecasts**	**hourly**
- precipitation measurements	hourly
- weather alerts	as required
- situation reports	as required

Intranet

Internet
WAP
telephone announcement
Fax 400 polling service

television
broadcast

Water management
governmental authorities

Administration of the neighbour states

Citizens