

PRACTICAL LIMITS OF RESERVOIRS OPERATION IN FLOODS SITUATION

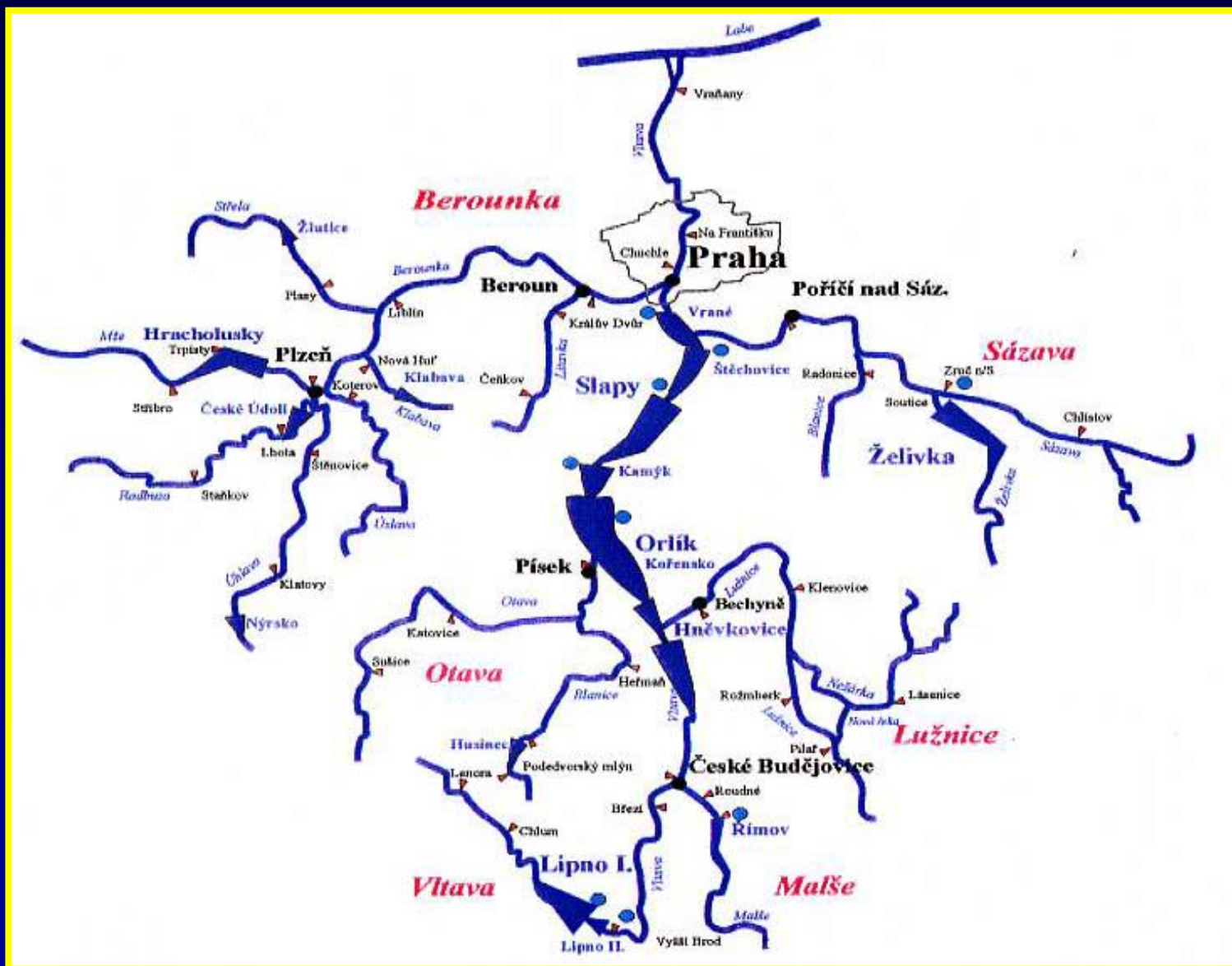
FLOOD EXPERIENCE 2002 - 2006

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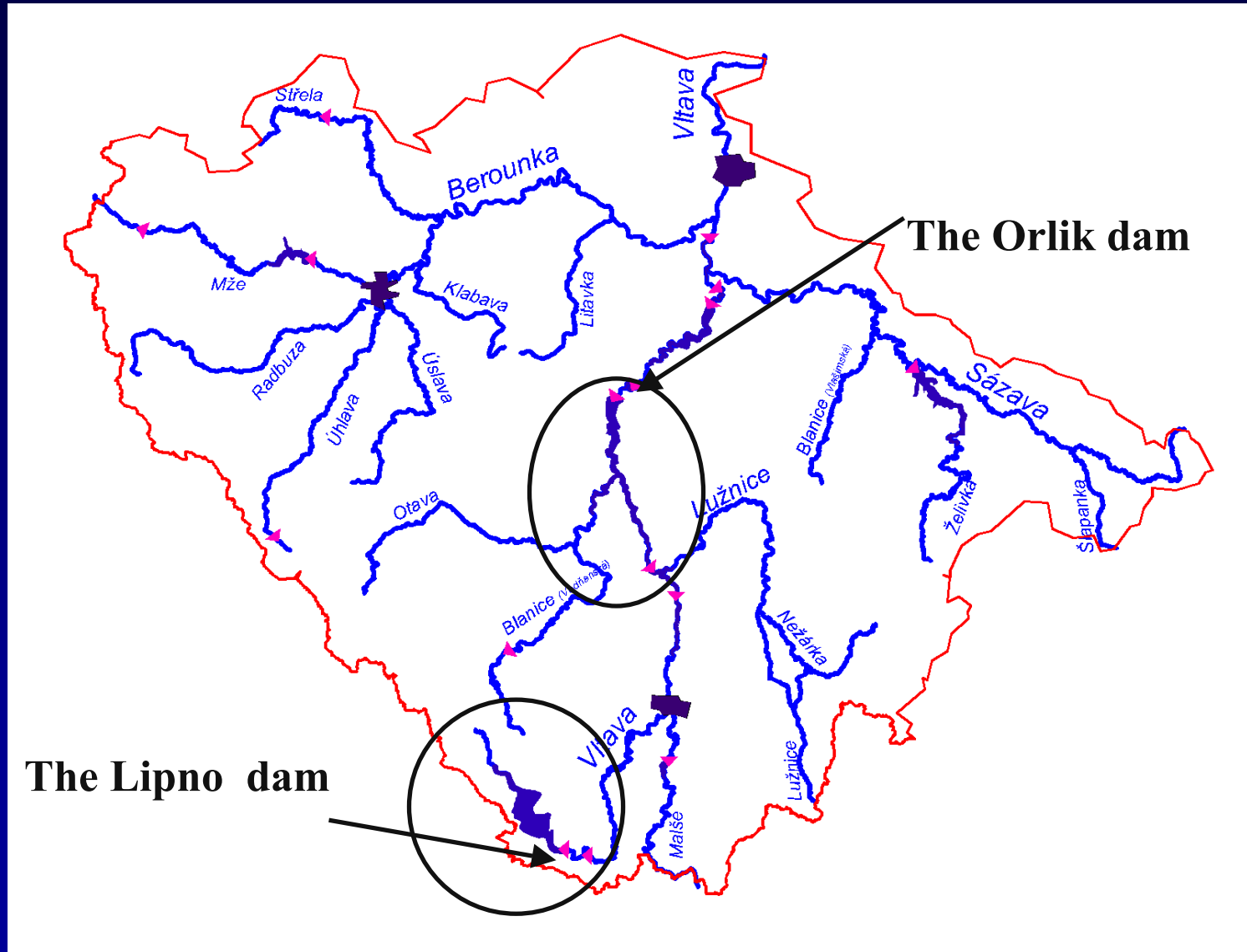


POVODÍ VLTAVY, státní podnik

SCHEME OF THE VLTAVA RIVER BASIN



RESERVOIRS WITH SIGNIFICANT PROTECTIVE EFFECT



PRIMARY FUNCTIONS OF THE VLTAVA CASCADE

- 1. PROVISION OF MINIMAL OUTFLOW**
 - 2. PRODUCTION OF ELECTRIC POWER**
 - 3. FLOOD PROTECTION**
 - 4. SUPPLY OF WATER**
 - 5. DISCHARGE IMPROVING FOR SHIPPING**
- ...THE OTHERS**

**REGULATION AND COORDINATING PROVIDES
VLTAVA RIVER BASIN AUTHORITY DISPATCHING
IN COOPERATION WITH ENERGIČ DISPATCHING CEZ**

VLTAVA FLOOD CHARACTERISTICS

Length of the river Vltava - 430 km

Long-term average discharge $149 \text{ m}^3\text{s}^{-1}$

Q_{100} discharge in Prague - $4020 \text{ m}^3\text{s}^{-1}$

Q_{1890} historical flood discharge in Prague - $4030 \text{ m}^3\text{s}^{-1}$

Q_{2002} 2002 flood discharge in Prague - $5160 \text{ m}^3\text{s}^{-1}$

Travel time of causal rain to Prague profile - 3 days

1 SPA - Watchfulness discharge in Prague $450 \text{ m}^3\text{s}^{-1}$

2 SPA - Emergency discharge in Prague $1000 \text{ m}^3\text{s}^{-1}$

3 SPA - Danger discharge in Prague $1500 \text{ m}^3\text{s}^{-1}$

LIMITS OF OPERATIONAL RULES FOR RESERVOIRS IN TIME OF FLOODS SITUATIONS

- VERY URBANIZED REGION**
- TECHNICAL MEASURES OF PROTECTIONS**
- PRAGUE - CONFLUENCE OF 3 RIVERS
VLTAVA, BEROUNKA, SÁZAVA**
- HYDROLOGY FORECASTS RELIABILITY**
- HARMLESS OUTFLOW**

LIMITING CONDITIONS OF RESERVOIRS MANIPULATION

CONDITIONS

- KNOWN IN ADVANCE**
- UNKNOWN IN ADVANCE**

**IT'S NECESSARY TO PERFORM ALL RESERVOIRS
PURPOSES IN 1 YEAR REGULATION PERIOD
*IN FLOOD TIME, IN PERIOD DROUGHT, TO KEEP MINIMAL OUTFLOW,
RULES OF ACUMULATION, CONDITIONS FOR RECREATION***

CONDITIONS KNOWN IN ADVANCE

INCLUDED IN FLOOD PLANS

- SUSPENDING OF NAVIGATION ON THE VLTAVA WATERWAY**
- FLOOD PROTECTING TECHNICAL ARRANGEMENTS**

SUSPENDING OF NAVIGATION ON THE VLTAVA WATERWAY



LIMITS OF NAVIGATION DISCHARGE IN PRAGUE

450 m³.s⁻¹

600 m³.s⁻¹

800 m³.s⁻¹

TECHNICAL ARRANGEMENTS

- VESSELS ARE MOOVED TO THE PUBLIC PROTECTIVE PORTS
- $450 \text{ m}^3 \cdot \text{s}^{-1}$ ENCLOSURING OF GATE ON THE VRAŇANY WEIR
- $600 \text{ m}^3 \cdot \text{s}^{-1}$ ENCLOSURING OF GATE ON THE SMÍCHOV WEIR

THE MINIMUM OF NECESSARY TIME – 12 HOURS

FLOOD LOCK OF THE VRAŇANY NAVIGATION CHANNEL



PUBLIC PROTECTIVE PORTS



PROVISION OF RESTAURANT BOAT in central part of Prague during flood 8/2002



FLOOD PROTECTING ARRANGEMENTS

TECHNICAL MEASURES

- FLOOD BARRIERS**
- ARRANGEMENTS ON SEWERAGE**

OPERATING MEASURES

- EVACUATING OF ENDANGERED AREAS**
- WARNING AND EVACUATION**
- ACTIVITY ACCORDING TO FLOOD PLANS**

PRAGUE – FLOOD BARRIERS

- FLOOD BARRIERS

MOBILE

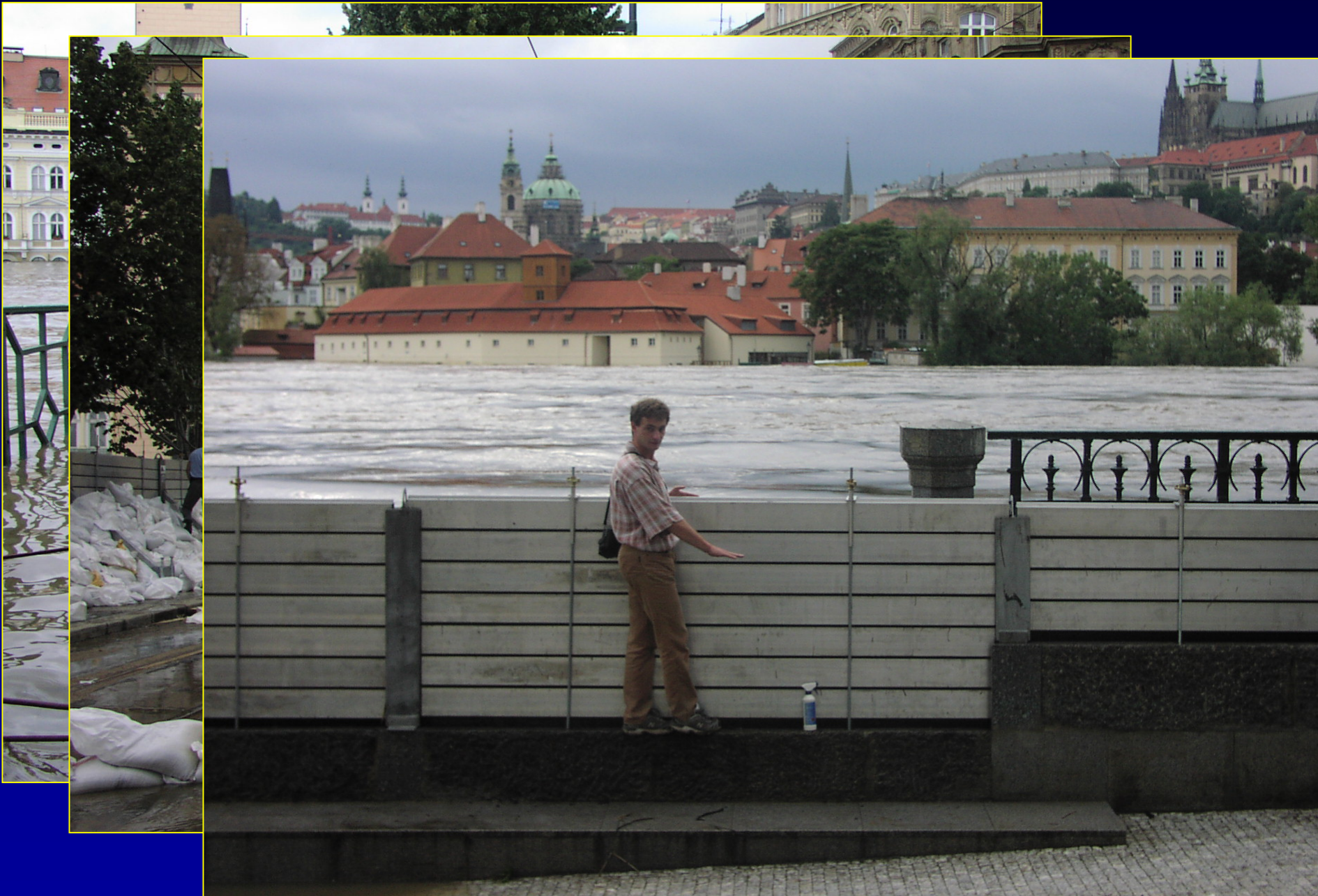
STATIONARY

- INSTALATION OF BARRIERRS ARE SET UP BY CITY OF PRAGUE

- ACTIVITIES ACCORDING TO PRAGUE FLOOD PLAN – TIME 12-24 HOURS

- PROJECT OF PRAGUE FLOOD PROTECTION MEASURES IS RUNNING

FLOOD BARRIERS - AUGUST OF 2002



OPERATING MEASURES

- **EVACUATING OF FLOODING AREAS**
- **WARNING AND EVACUATION OF INHABITANS**
- **ACTIVITY ACCORDING TO FLOOD PLANS**
- **ACTIVITY IN DISTRICTS UNDER RESERVOIRS**
- **TIME ?**
 - **ACCORDING TO REQUIREMENT (12-24 HOURS)**

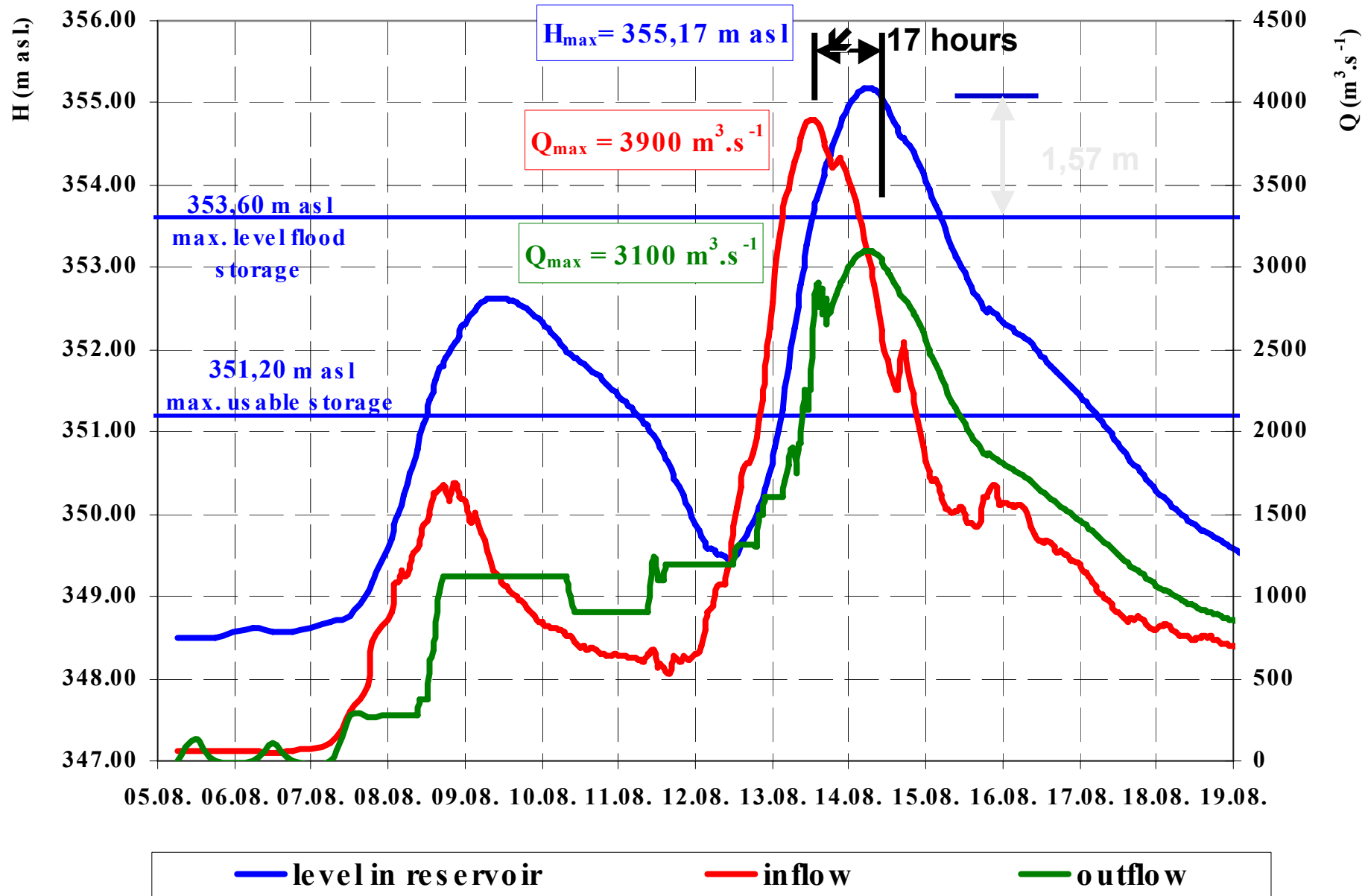
CONDITIONS - UNKNOWN IN ADVANCE

- ARE COMING OUT DURING THE FLOOD TIME
- HARDLY PREDICTABLE
DISPATCHER HAS TO RESPONSE IMMEDIATELY
- FOR EXAMPLE:
DELAY OF EVACUATION,
PROBLEMS TECHNOLOGICAL GATES
(HYDROPOWER, SPILLWAY, BOTTOM OUTLETS)

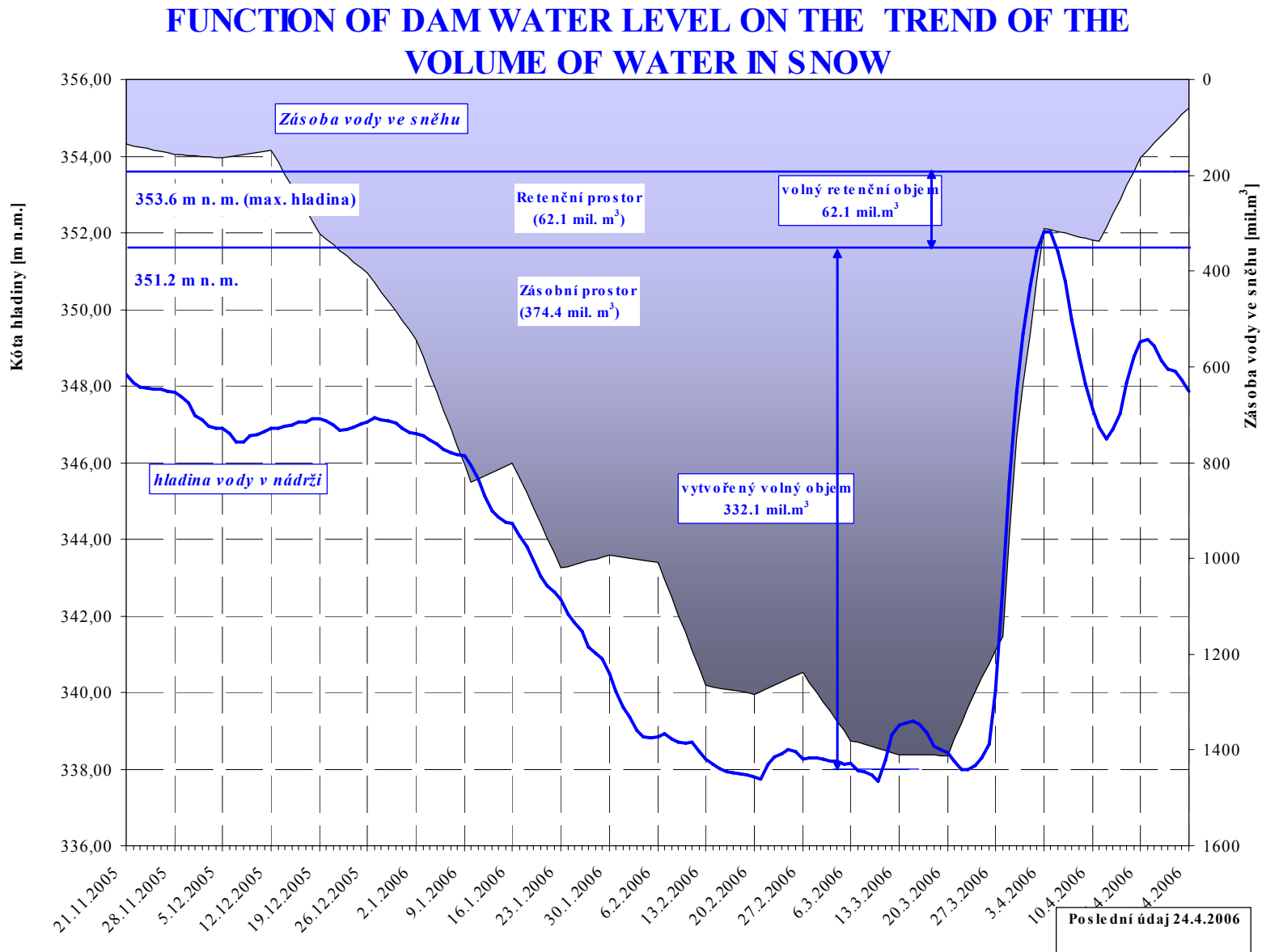
CONCLUSIONS - DISPATCHING CONTROL

- **HYDROLOGICAL FORECAST (48 HOURS, OR 24 HOURS) – RELIABILITY OF THE FORECAST**
- **INDETERMINATE INPUTS, OPERATIONING WITH THE REGARD TO THE FACTOR OF SAFETY**
- **UNIVERSAL OPERATING ALGORITHM DOESN'T EXIST**
- **DIMENSION OF FLOODS**
- **PERSONAL FACTOR**

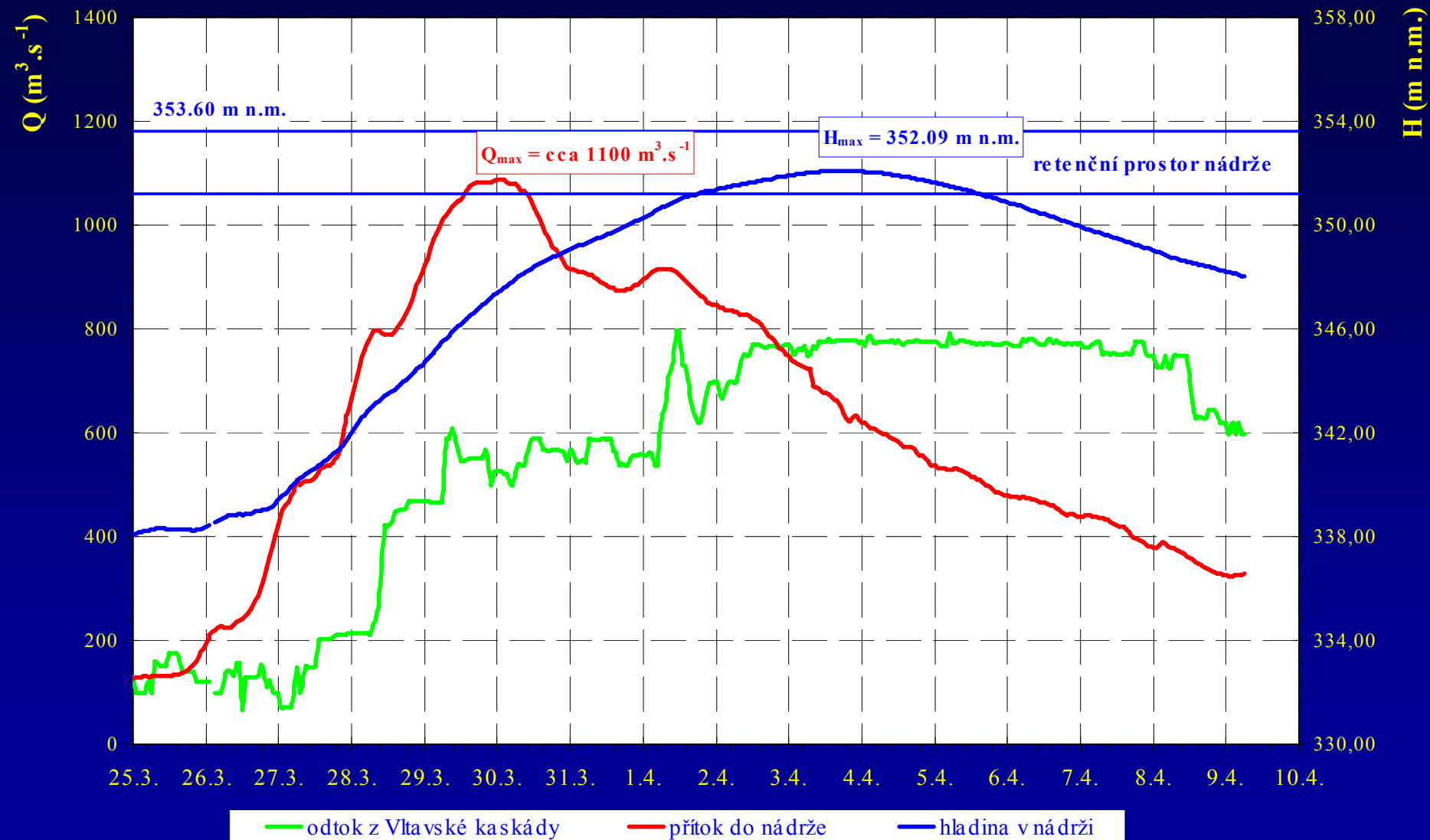
THE ORLIK DAM – AUGUST 2002



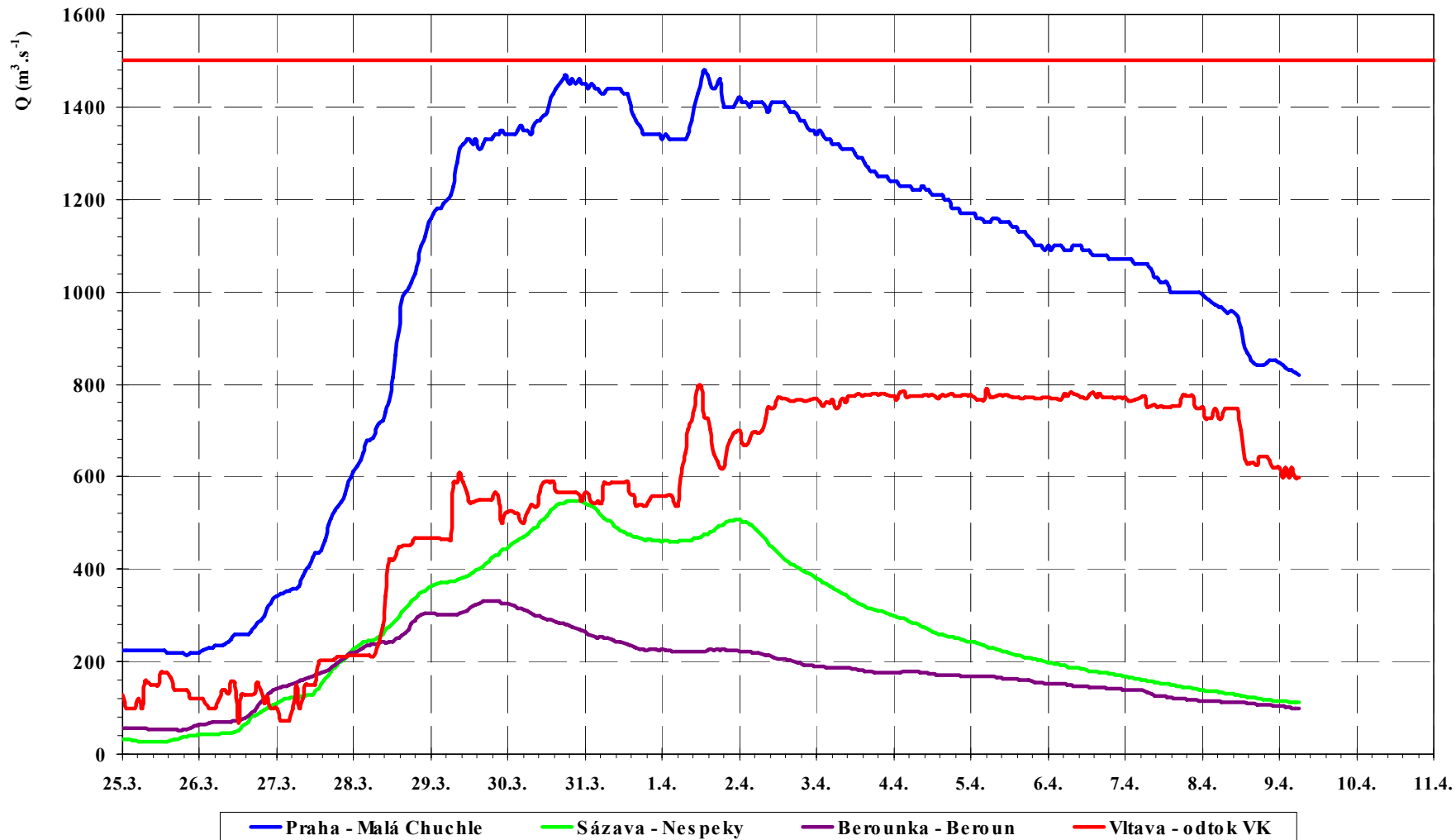
THE ORLIK DAM - NOVEMBER 2005 - APRIL 2006



VD ORLÍK - FLOOD MARCH - APRIL 2006



VLTAVA MALÁ CHUCHLE - DISCHARGE FLOOD MARCH APRIL 2006



THANK YOU FOR YOUR ATTENTION



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