



JRC studies for the IKSE Elbe Flood Action Plan



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JRC IKSE studies

- **TOP 2.2: Talsperren Saale & Moldau**
 - Results Saale
 - Combined results Moldau & Saale
- **TOP 2.1: Polder & Deichrückverlegungen**
 - List of polders & dykeshifts + parameters
 - Influence of dykeshifts
 - Influence of polders & dykeshifts
 - Results for 2006 flood
- **TOP 3: Elbe-EFAS: Hochwasser Frühwarnung**
 - update



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SAALE Study

- **Reference (Status - current steering):**

- The flood storage for the reservoirs Bleiloch and Hohenwarte together amounts to
 - 25 million m³ in summer and
 - 40 million m³ in winter.
- The minimum discharge (Q_{min}) amounts to 5 m³/s downstream of the Loquitzmündung.

- **Scenario (Plan – optimised steering):**

- The flood storage for the reservoirs Bleiloch and Hohenwarte together amounts to
 - 35 million m³ in summer and
 - 55 million m³ in winter.
- The minimum discharge (Q_{min}) amounts to 6 m³/s as reservoir outflow of the reservoir Eichicht.



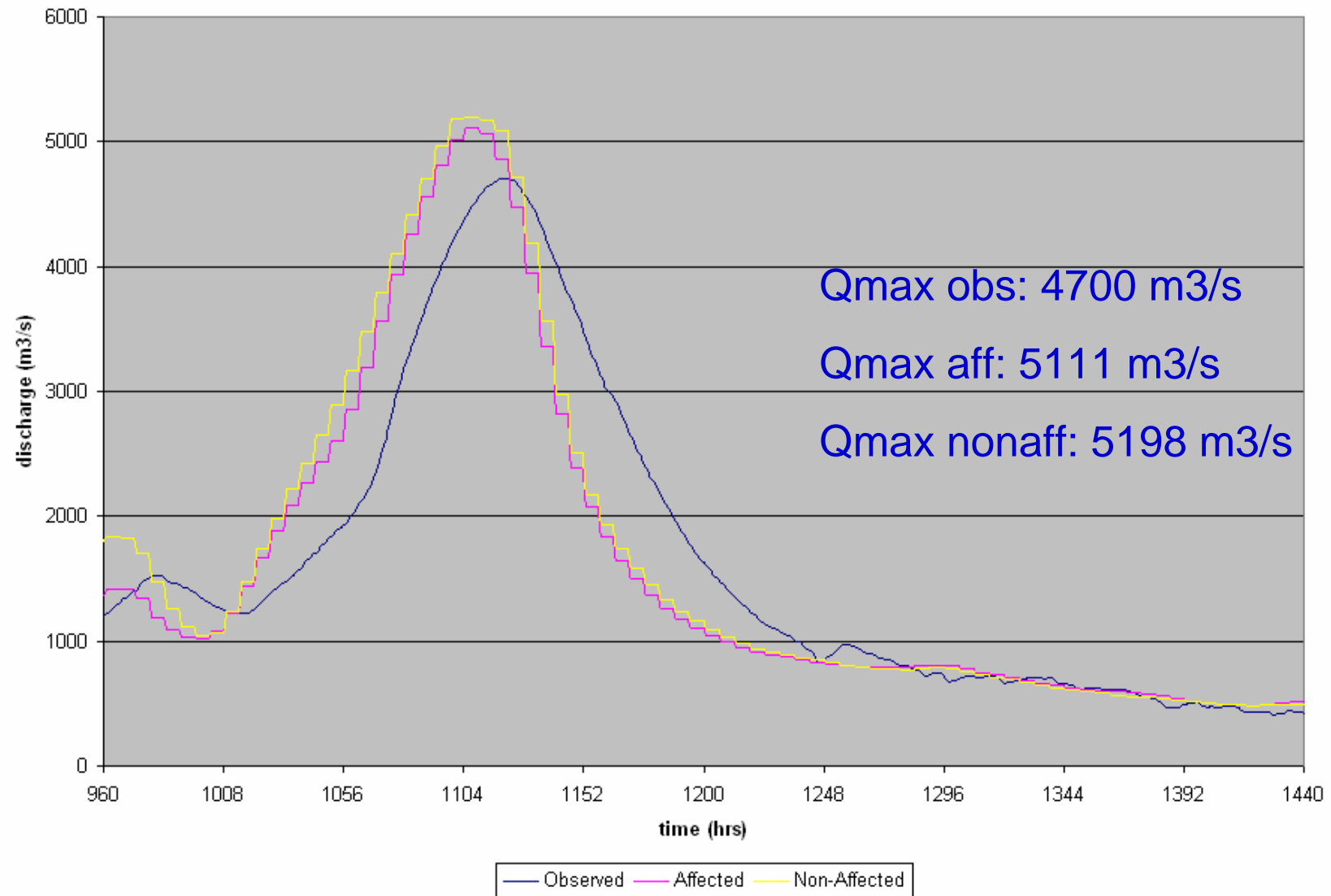
Results: Saale reservoir influence on Elbe discharge

Station	Reference (m ³ /s)	Scenario Steering (m ³ /s)	Difference (m ³ /s)	%
Schoena	4750	4750	0	0.0
Dresden	4694	4694	0	0.0
Torgau	4579	4579	0	0.0
Lutherstadt-Wittenberg	4348	4347	0	0.0
Aken	4064	4064	0	0.0
Barby	4275	4267	-8	-0.2
Magdeburg	4302	4295	-8	-0.2
Tangermünde	4209	4202	-8	-0.2
Wittenberge	4360	4351	-8	-0.2
Doemitz	4370	4361	-8	-0.2
N.Darchau	4380	4372	-8	-0.2
Boitzenburg	4402	4395	-7	-0.2
Hohnstorf	4403	4398	-6	-0.1
Geesthacht	4397	4394	-4	-0.1

- 2002 flood event
- Current steering vs Scenario steering of Saale reservoirs

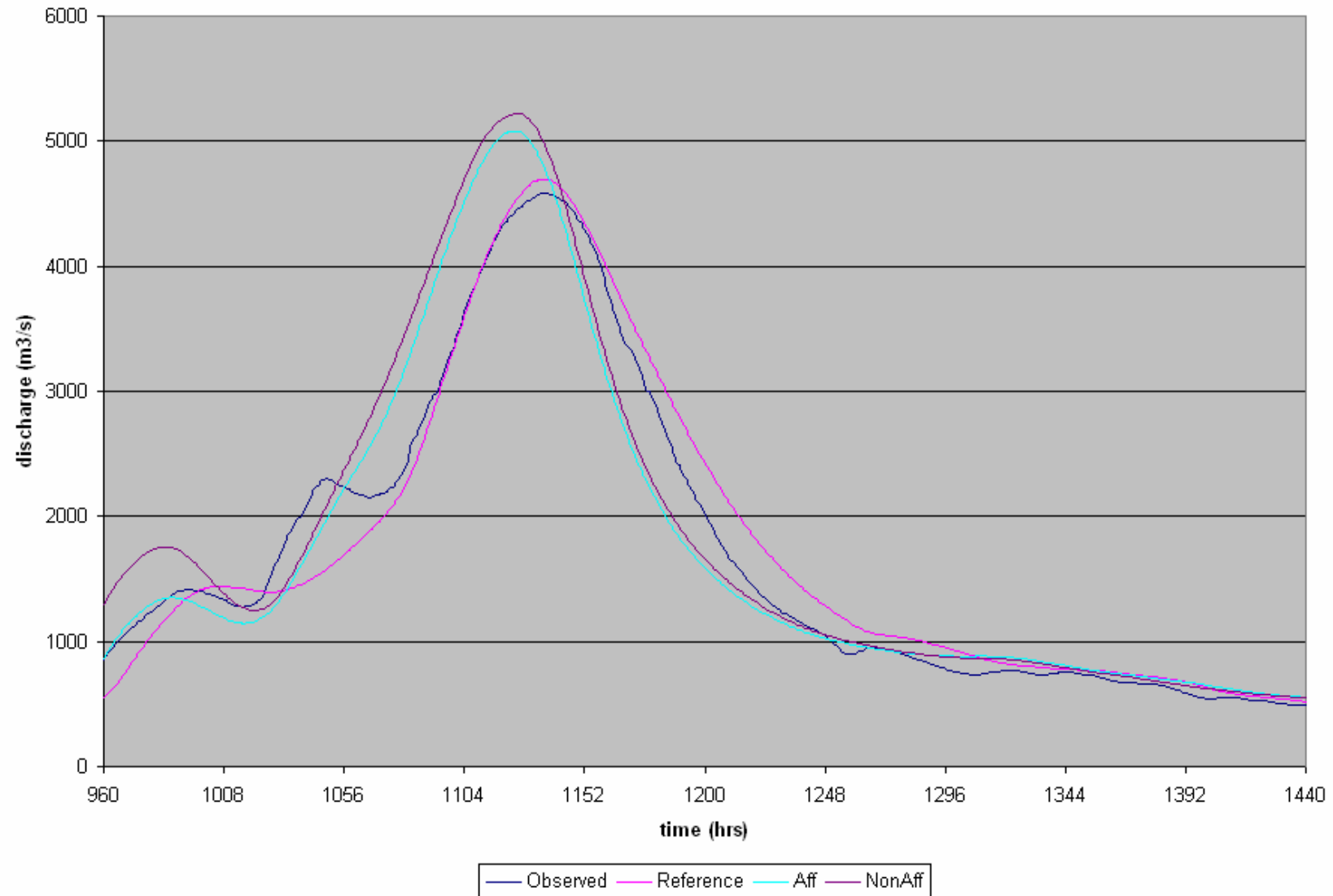


Discharge provided by CHMI for Usti





Effect of Vltava reservoirs at Dresden



Results: influence of Vltava reservoirs on Elbe discharge

Station	With Vltava reservoirs (m ³ /s)	Without Vltava reservoirs (m ³ /s)	Difference (m ³ /s)	%
Schoena	5163	5247	84	1.6
Dresden	5080	5219	139	2.7
Torgau	4920	5062	143	2.9
Lutherstadt-Wittenberg	4672	4844	171	3.7
Aken	4302	4455	153	3.6
Barby	4448	4609	161	3.6
Magdeburg	4466	4626	160	3.6
Tangermuende	4338	4500	162	3.7
Wittenberge	4502	4664	162	3.6
Doemitz	4511	4673	162	3.6
N.Darchau	4524	4686	162	3.6
Boitzenburg	4544	4705	161	3.5
Hohnstorf	4547	4707	160	3.5
Geesthacht	4545	4705	160	3.5

- 2002 flood event
- Based on CHMI dataseries for Usti
- Note: discharges are higher than observed data for 2002!



Results: combined effects of Vltava & Saale reservoirs on Elbe discharge

Station	Vltava + Saale reservoirs (m3/s)	Saale Scenario Steering (m3/s)	Difference (m3/s)	%
Schoena	5163	5163	0	0.0
Dresden	5080	5080	0	0.0
Torgau	4920	4920	0	0.0
Lutherstadt-Wittenberg	4672	4672	0	0.0
Aken	4302	4302	0	0.0
Barby	4448	4442	-7	-0.2
Magdeburg	4466	4457	-9	-0.2
Tangermünde	4338	4331	-7	-0.2
Wittenberge	4502	4495	-7	-0.2
Doemitz	4511	4504	-7	-0.2
N.Darchau	4524	4517	-7	-0.2
Boitzenburg	4544	4536	-8	-0.2
Hohnstorf	4547	4538	-9	-0.2
Geesthacht	4545	4536	-9	-0.2

- 2002 flood event
- Based on CHMI dataserie for Usti
- Saale: current & scenario reservoir steering



Results: combined effects of Vltava & Saale reservoirs on Elbe discharge

Station	Without Vltava reservoirs (m ³ /s)	Saale Scenario Steering (m ³ /s)	Difference (m ³ /s)	%
Schoena	5247	5247	0	0.0
Dresden	5219	5219	0	0.0
Torgau	5062	5062	0	0.0
Lutherstadt-Wittenberg	4844	4844	0	0.0
Aken	4455	4455	0	0.0
Barby	4609	4601	-8	-0.2
Magdeburg	4626	4617	-8	-0.2
Tangermuende	4500	4492	-8	-0.2
Wittenberge	4664	4656	-8	-0.2
Doemitz	4673	4665	-9	-0.2
N.Darchau	4686	4678	-7	-0.2
Boitzenburg	4705	4699	-6	-0.1
Hohnstorf	4707	4699	-8	-0.2
Geesthacht	4705	4696	-9	-0.2

- 2002 flood event: without Vltava reservoirs
- Based on CHMI dataserie for Usti
- Saale: current & scenario reservoir steering



Conclusions Reservoirs

- The simulation results at the last SAALE stream gauge Calbe-Grieزهne – the last gauge before the confluence with the main ELBE - show no significant differences in discharge between current and planned steering rules of the SAALE reservoir cascade (2002 event).
- Saale Reservoirs Scenario steering has a marginal influence in the main Elbe (0.2% difference in discharge; 4-8 m³/s)
- Without the Vltava reservoirs, discharge would have been 1.6-3.7 % higher in 2002 (84-171 m³/s) in the German part of the Elbe river

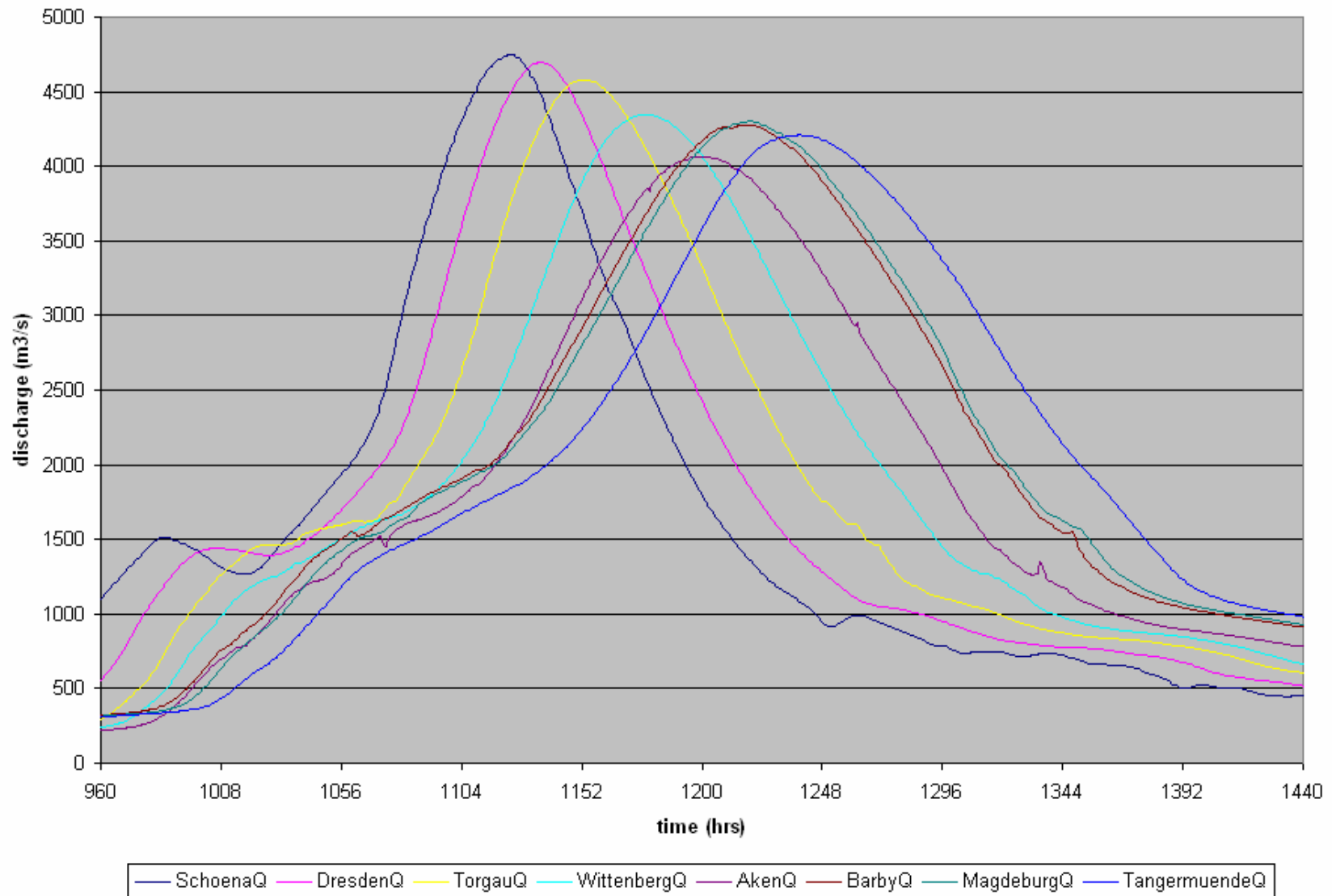


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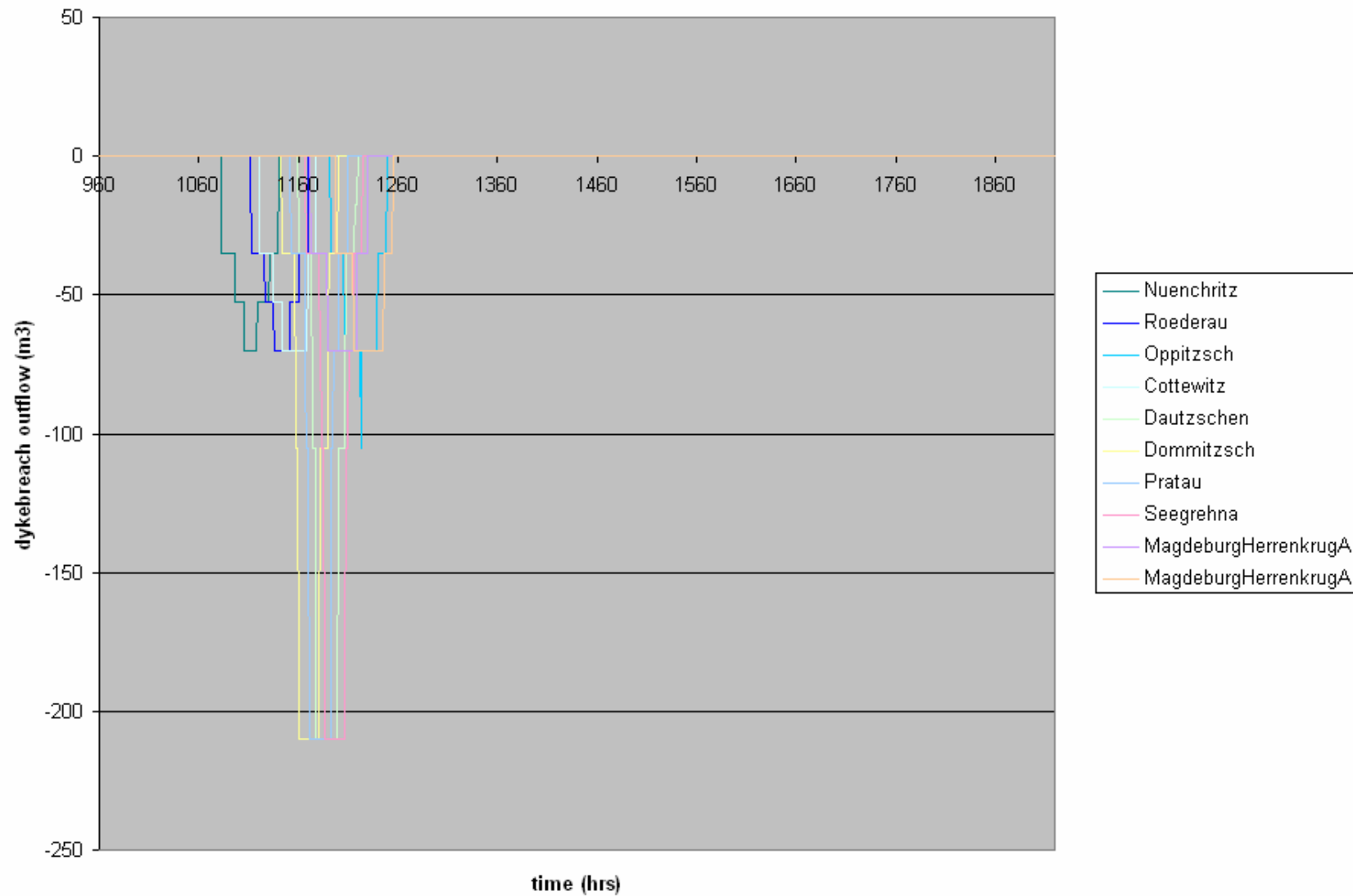


Simulated wave propagation





Dykebreaks: assumptions





Influence of dyke breaches

Station	Dykebreaks (m ³ /s)	No Dykebreaks / Reference (m ³ /s)	Difference (m ³ /s)	%
Schoena	4750	4750	0	0.0
Dresden	4694	4694	0	0.0
Torgau	4462	4579	117	2.6
Lutherstadt-Wittenberg	4063	4348	285	6.5
Aken	3705	4064	359	8.8
Barby	3933	4275	343	8.0
Magdeburg	3962	4302	341	7.9
Tangermuende	3825	4209	384	9.1
Wittenberge	3986	4360	373	8.6
Doemitz	4004	4370	XXX	XXX
N.Darchau	4019	4380	361	8.2
Boitzenburg	4042	4402	XXX	XXX
Hohnstorf	4043	4403	XXX	XXX
Geesthacht	4042	4397	XXX	XXX

- Influence 2.6-9.1%, downstream Dresden (117-384 m³/s)



Selected polders and dyke-shifts

No	Name	Type	Land	Elbe-km	Area (ha)	Volume (Mm3)
1	Nuenchritz	Polder	Sachsen	(100,5-108,5)	600	15,0
2	Trebnitz/Lößnig	Polder	Sachsen	(117,5-123,8)	900	18,0
3	Aussig/Seidewitz	Polder	Sachsen	(123,0-126,0)	500	17,0
4	Ammelgoßwitz / Dröschkau	Deichrückverlegung	Sachsen	(131,0-138,0)	420	8,6
5	Köllitzsch	Deichrückverlegung	Sachsen	(142,0-145,0)	60	1,4
6	Döbeltitz / Kranichau	Deichrückverlegung	Sachsen	(142,0-146,5)	380	2,2
7	Kamitz / Pülswerda	Deichrückverlegung	Sachsen	(145,5-148,5)	60	1,2
8	Wessnig / Schiffmühlenhaus	Deichrückverlegung	Sachsen	(147,5-148,5)	30	
9	nordlich Pülswerda	Deichrückverlegung	Sachsen	(149,5-149,5)	10	
10	Zwethau	Deichrückverlegung	Sachsen	(156,0-158,0)	120	2,2
11	Dautzschen/Neublesern	Polder	Sachsen	(160,0-165,0)	900	32,0
12	Polbitz	Deichrückverlegung	Sachsen	(167,7-171,0)	100	
13	Dommitzsch Nord / Grenzbach / Proschwitz	Deichrückverlegung	Sachsen	(173,0-176,5)	90	1,8
14	Sachau - Priesitz	Deichrückverlegung	Sachsen-Anhalt	(180,0-184,0)	210	
15	Axien/Mauken	Polder	Sachsen-Anhalt	(180,5-188,8)	1700	44,3
16	Hemsendorf	Deichrückverlegung	Sachsen-Anhalt	(199,0-199,0)	390	
17	Gatzer Bergdeich (Vockerode)	Deichrückverlegung	Sachsen-Anhalt	(246,5-249,0)	212	
18	Oberluch bei Rosslau fertiggestellt	Deichrückverlegung	Sachsen-Anhalt	(253,5-256,6)	140	
19	Lödderitzer Forst unterhalb Aken	Deichrückverlegung	Sachsen-Anhalt	(278,0-283,7)	600	
20	Hohenwarthe	Deichrückverlegung	Sachsen-Anhalt	(340,0-343,0)	140	
21	Klietznick	Deichrückverlegung	Sachsen-Anhalt	(378,0-384,0)	102	
22	Sandau-Süd	Deichrückverlegung	Sachsen-Anhalt	(412,5-416,0)	124	
23	Sandau-Nord	Deichrückverlegung	Sachsen-Anhalt	(416,5-422,0)	60	
24	Lenzen	Deichrückverlegung	Brandenburg	(476,7-483,8)	420	20,0
25	Neu Bleckdede	Deichrückverlegung	Brandenburg	(546,0-554,0)	100	

Sources:

- IKSE Aktionsplan Hochwasserschutz Elbe (2003)
- BfG ELLA Studie – BfG 1542 (2006)
- Email 4 April 2007 Hr. Pieper

Results: Influence of IKSE dykeshifts (2002 flood)

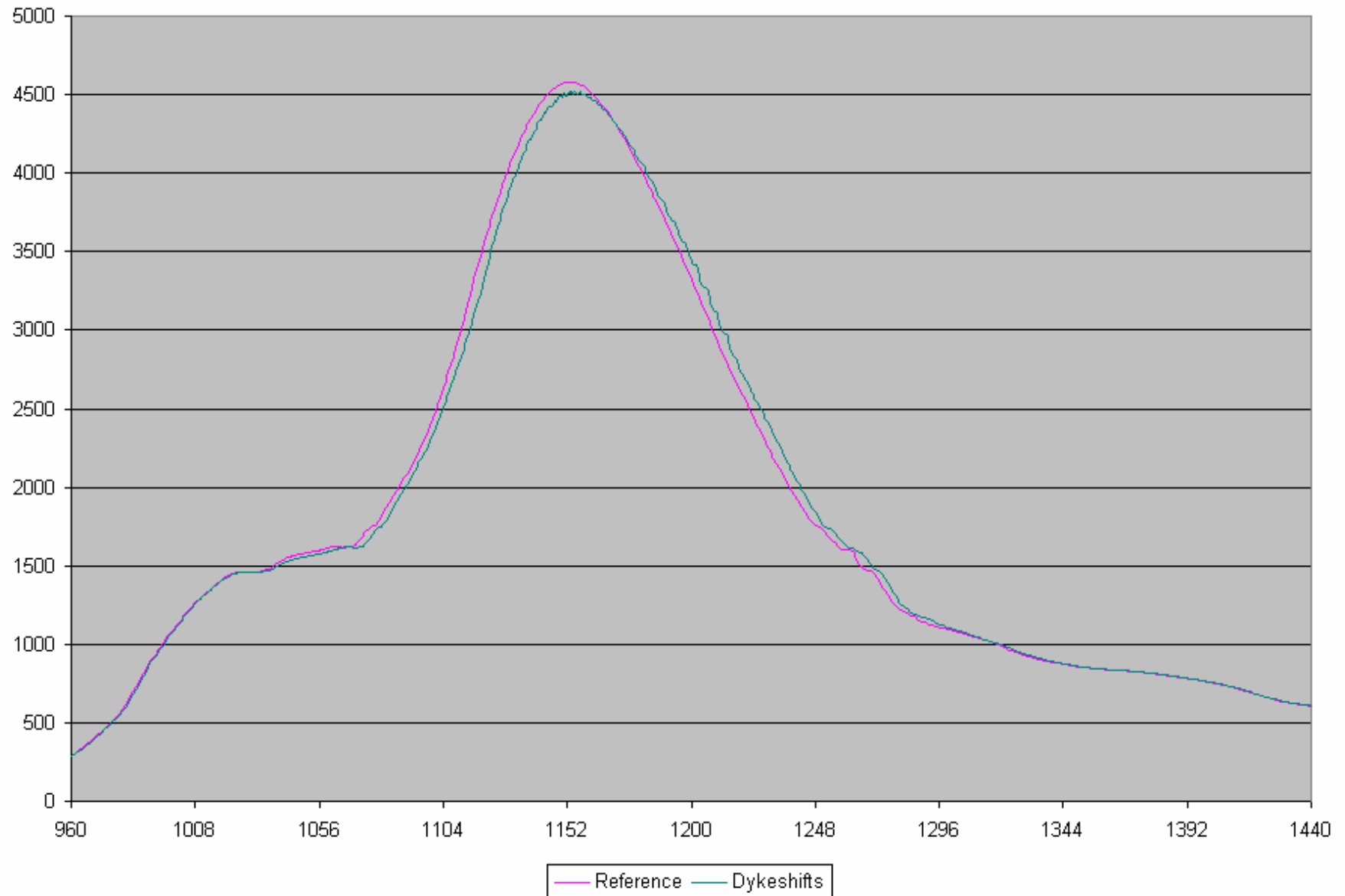
Station	Reference (m ³ /s)	Dykeshifts (m ³ /s)	Difference (m ³ /s)	%
Schoena	4750	4750	0	0.0
Dresden	4694	4694	0	0.0
Torgau	4579	4521	-58	-1.3
Lutherstadt-Wittenberg	4348	4182	-165	-3.8
Aken	4064	3896	-168	-4.1
Barby	4275	4121	-154	-3.6
Magdeburg	4302	4130	-172	-4.0
Tangermuende	4209	4042	-167	-4.0
Wittenberge	4360	4158	-202	-4.6
Doemitz	4370	4169	-201	-4.6
N.Darchau	4380	4180	-200	-4.6
Boitzenburg	4402	4200	-202	-4.6
Hohnstorf	4403	4201	-202	-4.6
Geesthacht	4397	4199	-198	-4.5

- Influence 1.3-4.6%, downstream Dresden (58-202 m³/s)



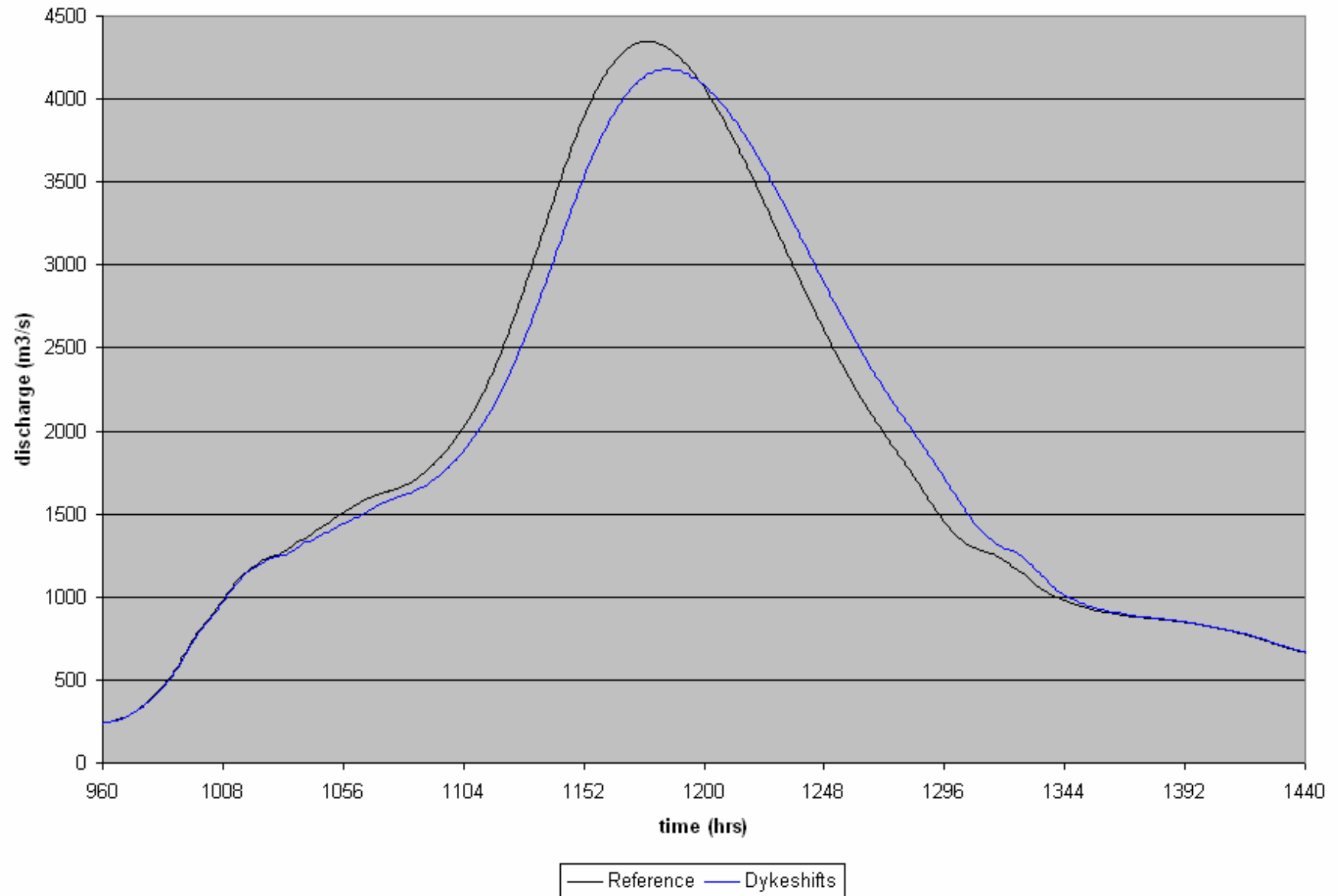
Torgau: dykeshifts

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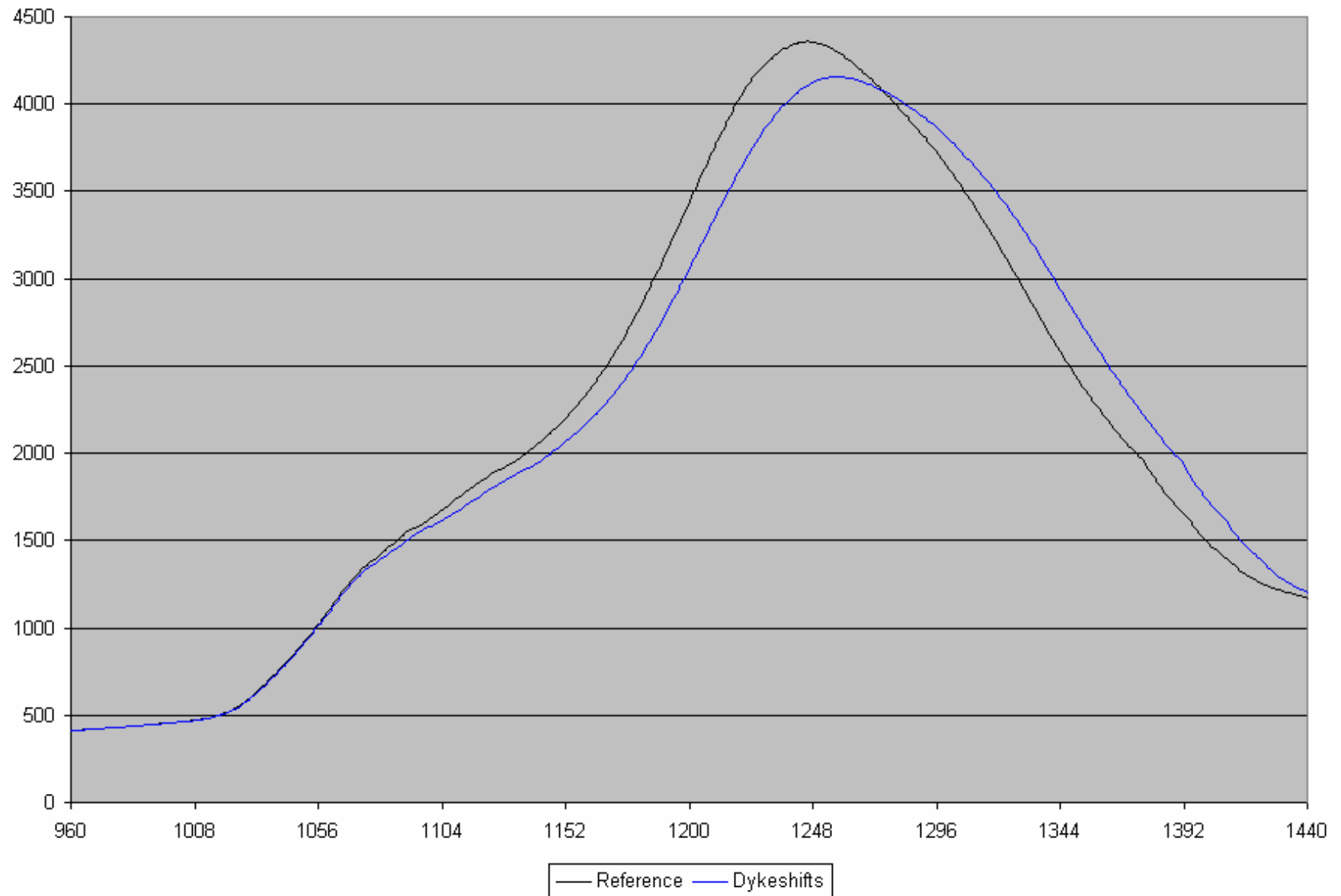
Lutherstadt-Wittenberg: dykeshifts





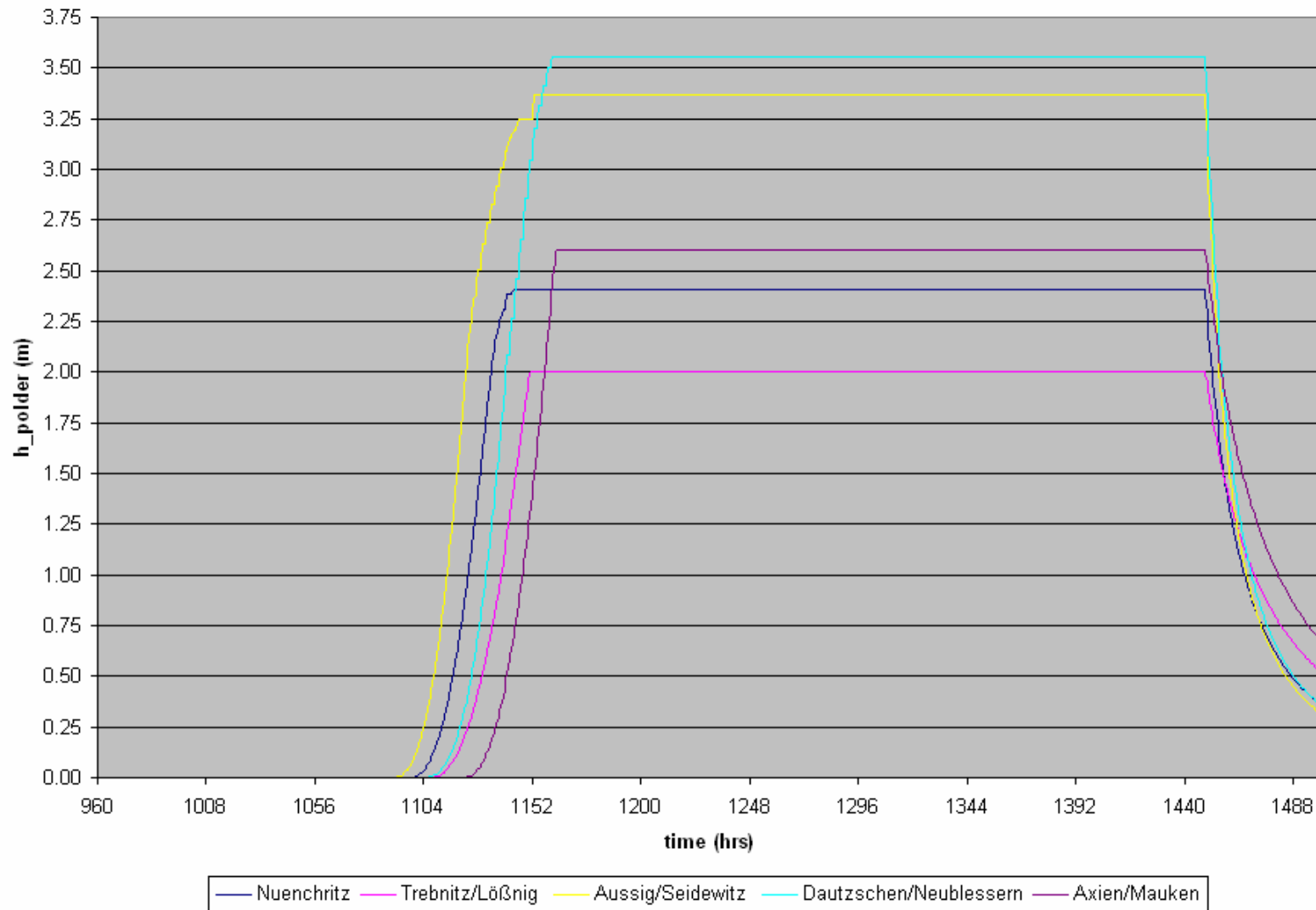
Wittenberge: dykeshifts

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Results: polder filling (2002 flood): optimisation in logical sequence





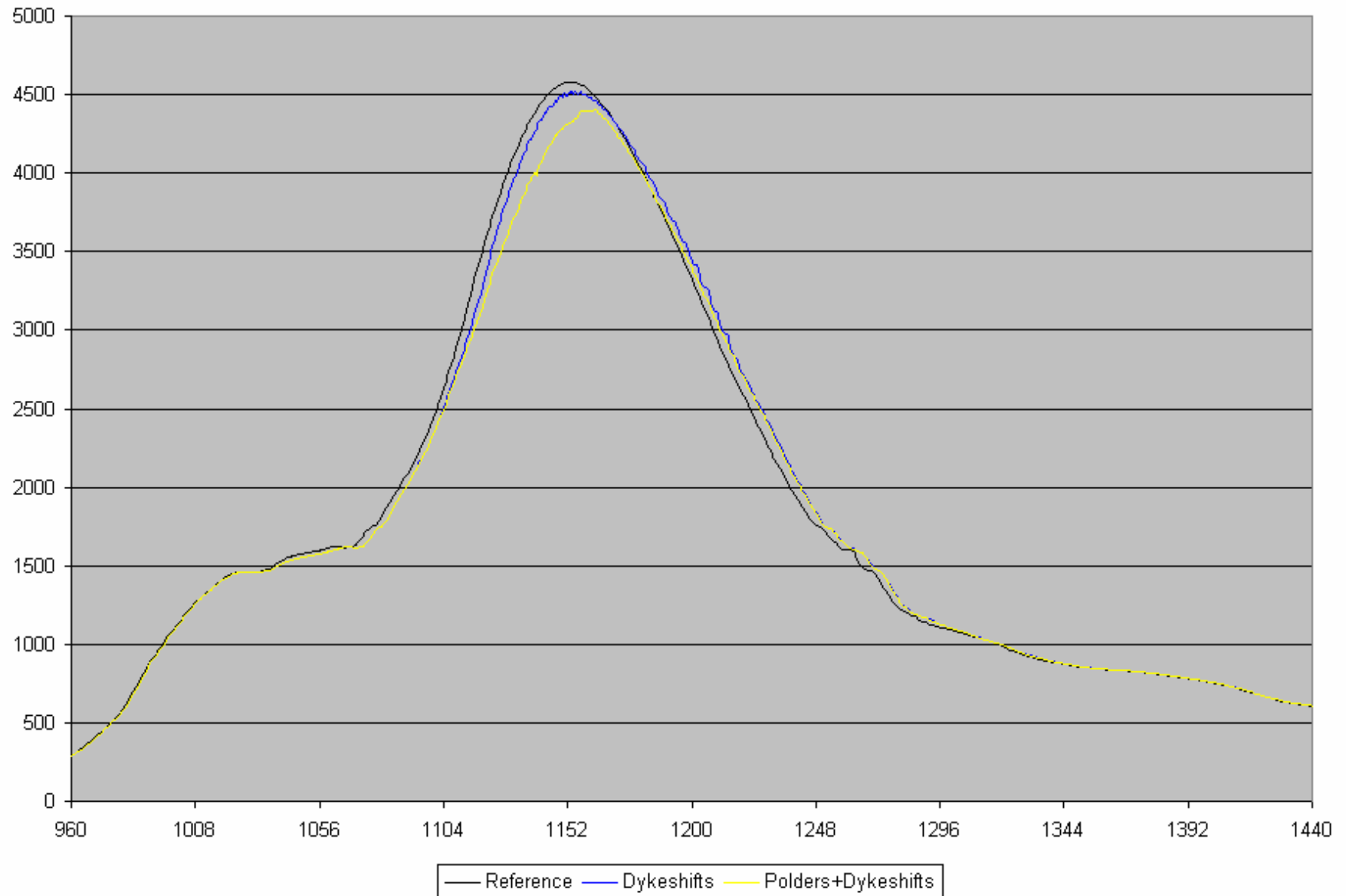
Results: Influence of IKSE polders & dykeshifts (2002)

Station	Reference (m ³ /s)	All measures (m ³ /s)	Difference (m ³ /s)	%
Schoena	4750	4750	0	0.0
Dresden	4694	4694	0	0.0
Torgau	4579	4401	-178	-3.9
Lutherstadt-Wittenberg	4348	3879	-469	-10.8
Aken	4064	3641	-424	-10.4
Barby	4275	3868	-407	-9.5
Magdeburg	4302	3874	-428	-10.0
Tangermünde	4209	3797	-412	-9.8
Wittenberge	4360	3900	-460	-10.6
Doemitz	4370	3913	-457	-10.5
N.Darchau	4380	3924	-456	-10.4
Boitzenburg	4402	3947	-455	-10.3
Hohnstorf	4403	3950	-453	-10.3
Geesthacht	4397	3949	-448	-10.2



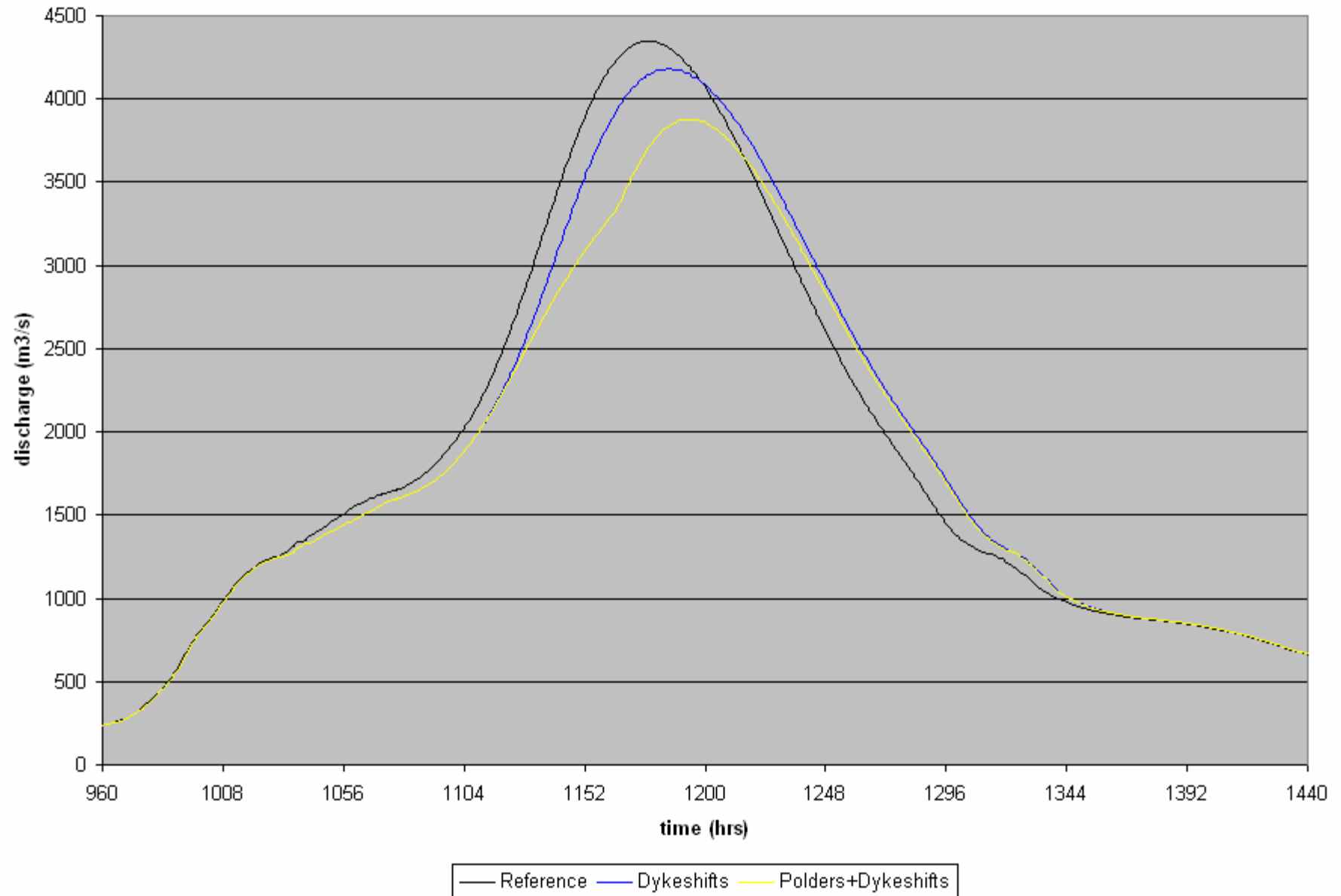
Torgau: polders + dykeshifts

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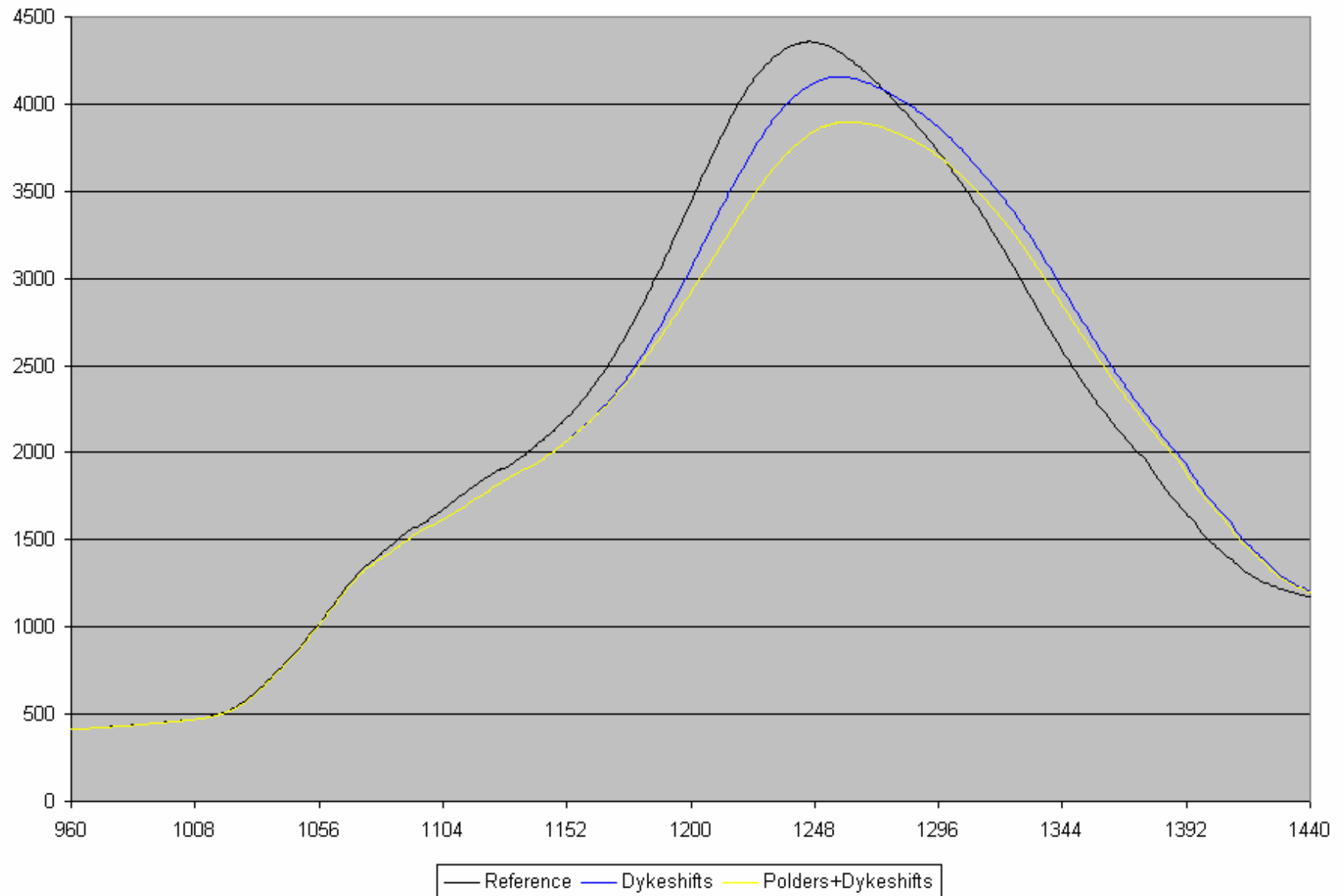
Lutherstadt-Wittenberg: polders + dykeshifts





Wittenberge: polders + dykeshifts

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2006 flood

- Simulation of effect of polders & dykeshifts in the 2006 flood is ongoing:
 - Data received from CHMI and BfG in the last weeks
 - 2006 setup made now
 - Timeschedule calculations: begin-May
- Most likely, the conclusions for the 2006 flood will be in line with the ELLA-BfG study (reduced effect of measures)



Conclusions polders & dykeshifts

- Without dykebreaks, peak discharge in 2002 would have been until 9.1% higher, with the largest increase at lower Elbe (Tangermünde)
- The planned dykeshifts reduce the peak discharge of the 2002 flood with 1.3-4.6% (58-202 m³/s)
- The polders and dykeshifts simulated here, reduce the peak discharge of the 2002 flood with 4-11% (178-469 m³/s)
- 2006 calculations are ongoing, but results similar to the ELLA-BfG study are expected (reduced effect of measures)



JRC IKSE studies

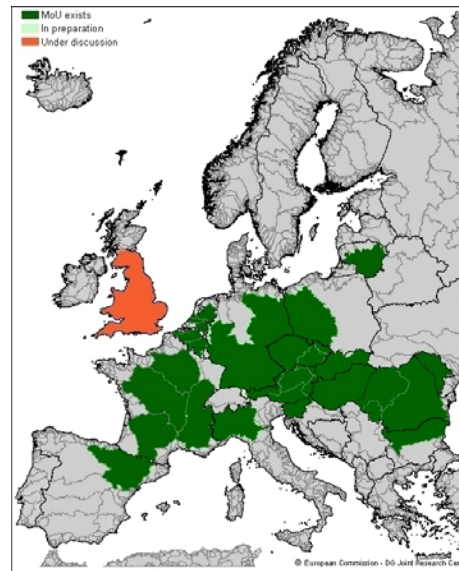
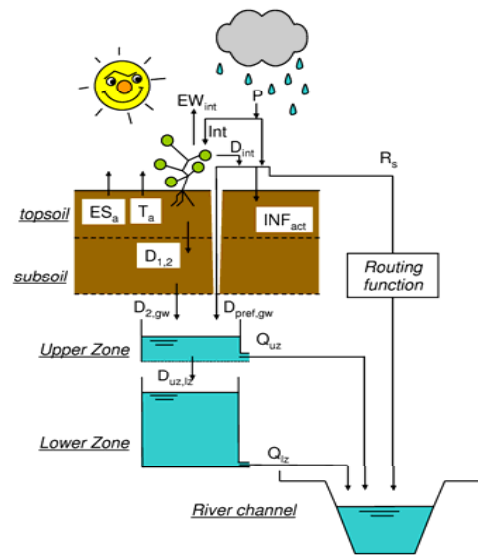
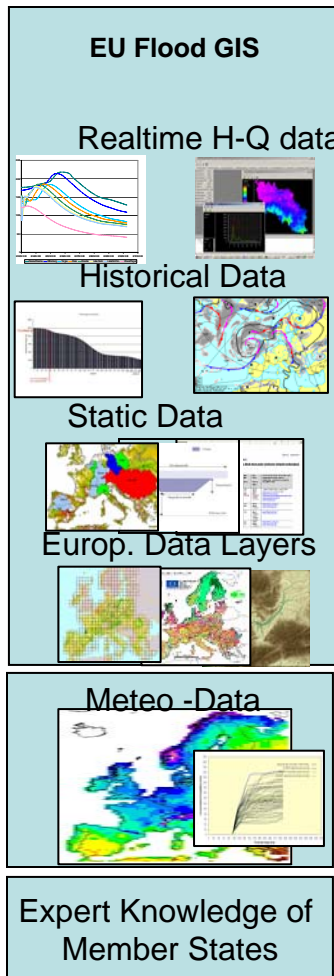
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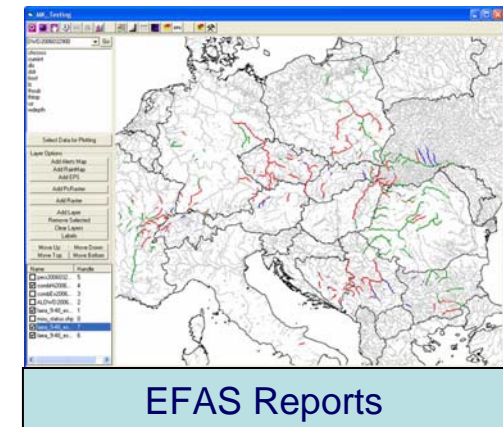
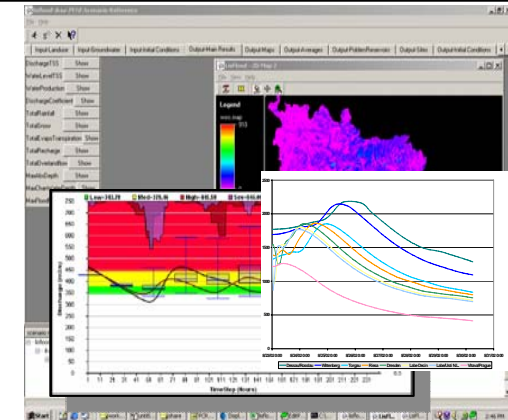
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Development of a European Flood Alert System (EFAS)

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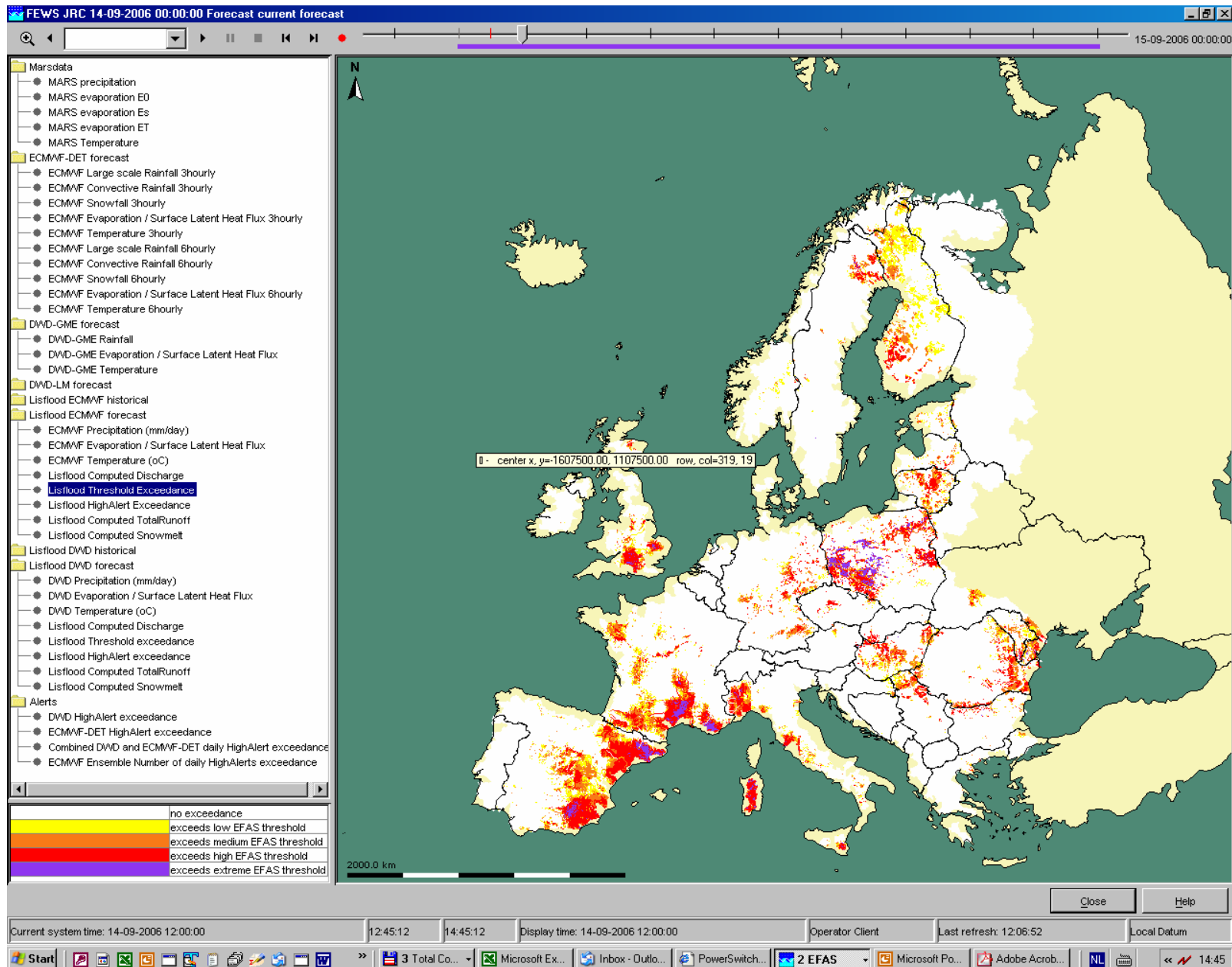
EFAS solely provides early flood alerts to the National Services. These National Services are and keep the responsibility to alert the public and trigger civil protection mechanisms



EFAS Reports



EFAS exceedance of critical flood threshold (deterministic forecasts) (run 2x daily)





Recent developments EFAS for Elbe

- Since last IKSE presentation Dec 2006:
 - New calibration ongoing including 1990-2006
 - Until now 1990-2002 data used
 - Successful EFAS alerts for
 - Rhine (DE,NL)
 - Rhone/Seine/Loire (FR)
 - Danube tributaries (RO)
 - Ebro (ES)
 - No false alarms

Discussions on EFAS operational

- With DG ENV, DG JRC and ECMWF on financial aspects
- ECMWF could cover the IT infrastructure
- SMHU (SK) offers the operational running



Conclusions EFAS-Elbe

- Use of high resolution national data versus Synop stations significantly improves simulation and forecasting results
- New 1&5km EFAS versions significantly better than 'old' EFAS 5km forecasts
- EFAS has proven to give early flood warnings 6-8 days in advance (snowmelt 2006 floods) to 2-5 days in advance (rainfall driven floods)



Way forward

- IKSE studies (3.1 & 3.2)
 - Calculations finished incl 2006: Early May 2007
 - Report envisaged: End May 2007
- Elbe-EFAS:
 - Realtime testing during several months
 - Test the added value of 1km vs 5km model
 - Q updating via GRDC ETN-R project