

RRFS Exercise



17 November 2005

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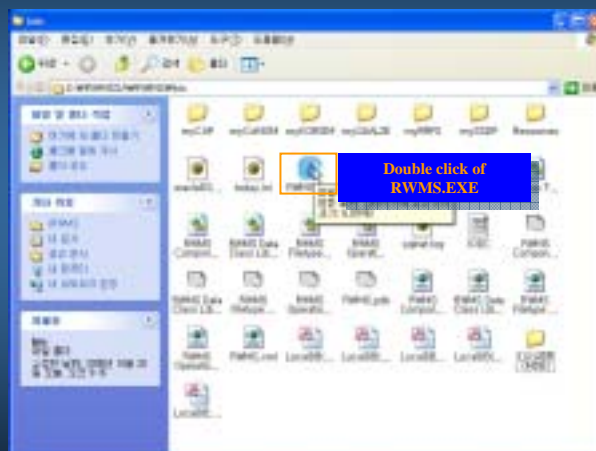
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Background

- ◎ **Runoff simulation with comparatively long-term accumulated and intensively measured rainfalls**
- ◎ **For water use and management, runoff simulation continues daily, weekly, every ten days, monthly and yearly**
- ◎ **Forecasting of water demand and supply in real-time or for a short period of time (within 10days in order to use efficiently limited water resources**

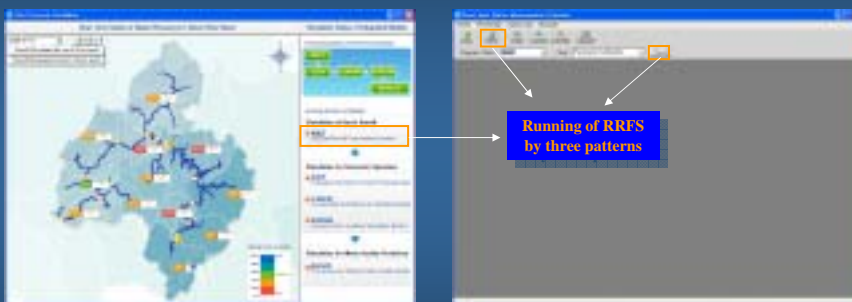
Running of RRFS (1)



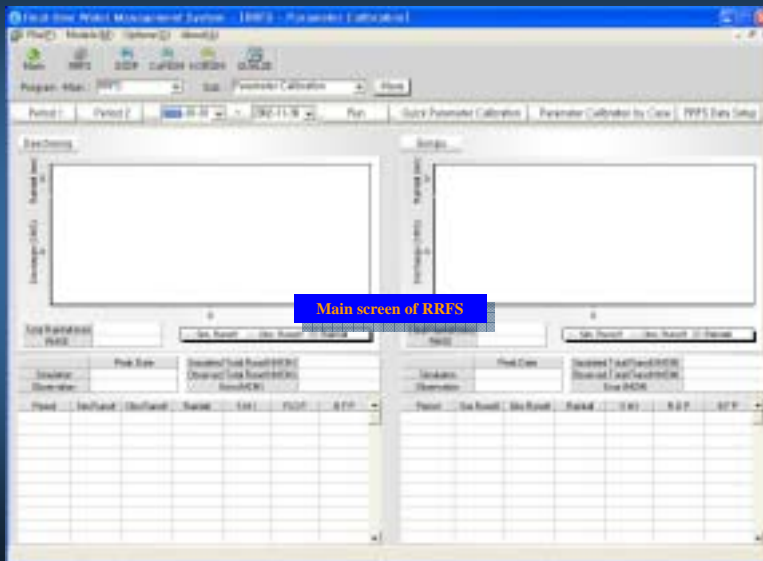
Running of RRFS (2)



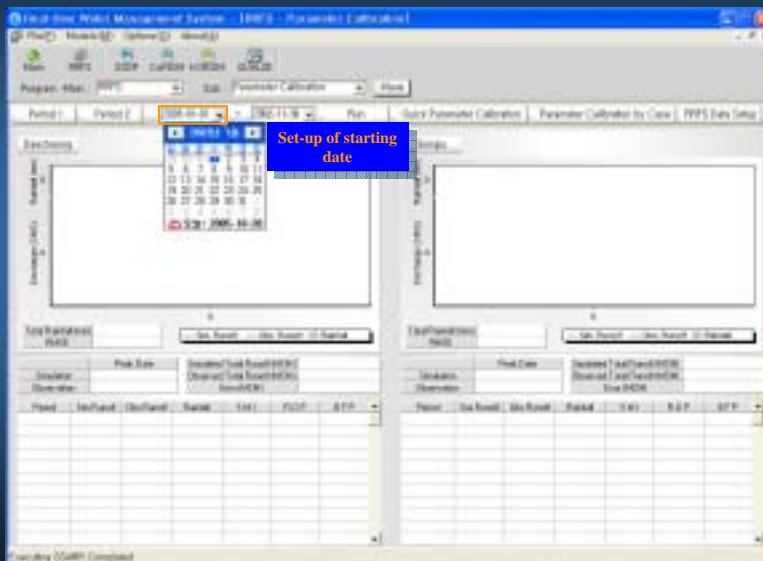
Running of RRFS (3)



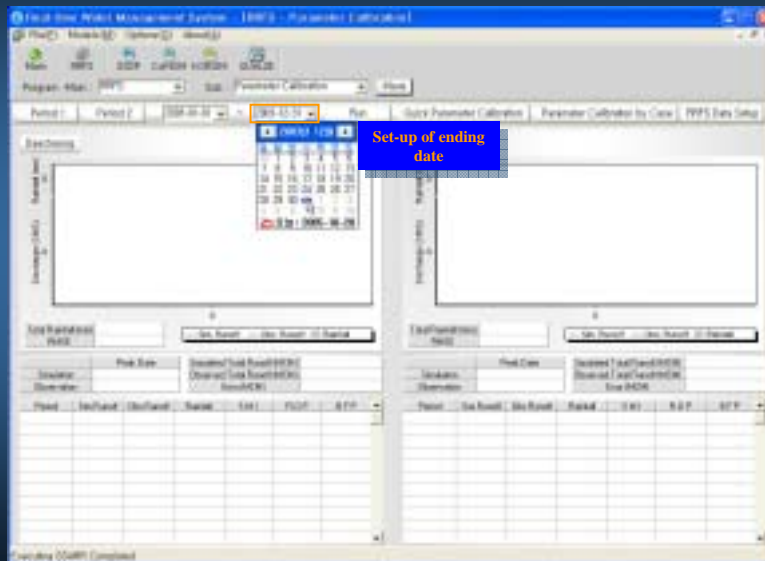
Running of RRFS (4)



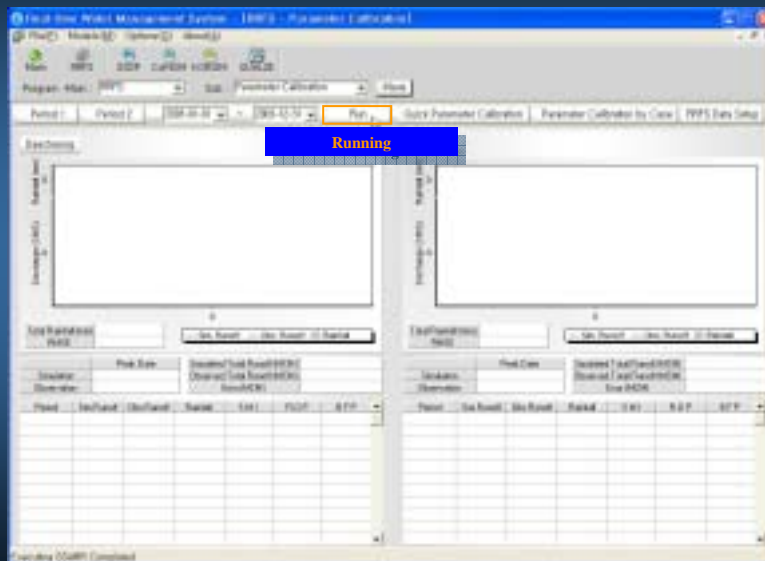
Estimation of runoff from historical data (1)



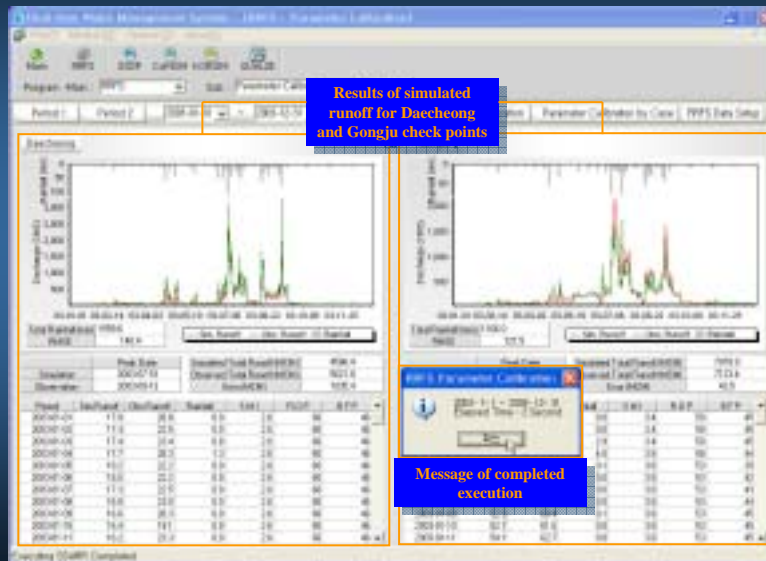
Estimation of runoff from historical data (2)



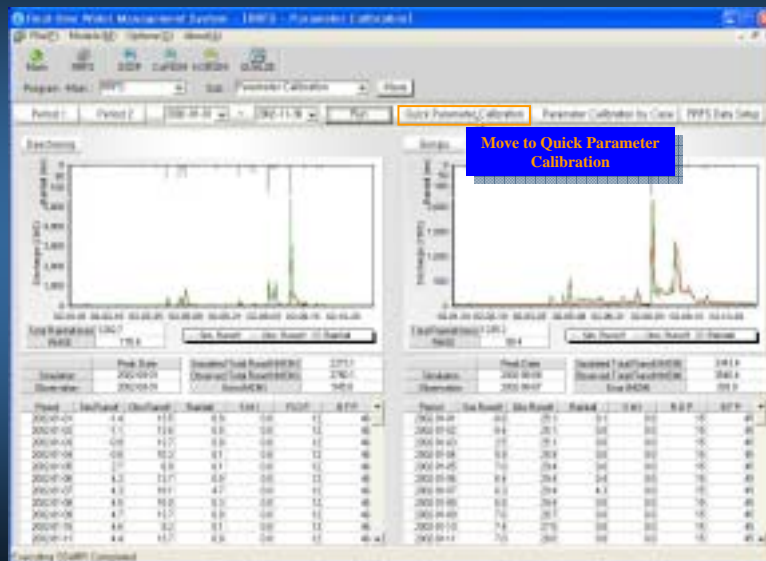
Estimation of runoff from historical data (3)



Estimation of runoff from historical data (4)



Quick parameter calibration (1)



Quick parameter calibration (2)

Screen of Quick Parameter Calibration

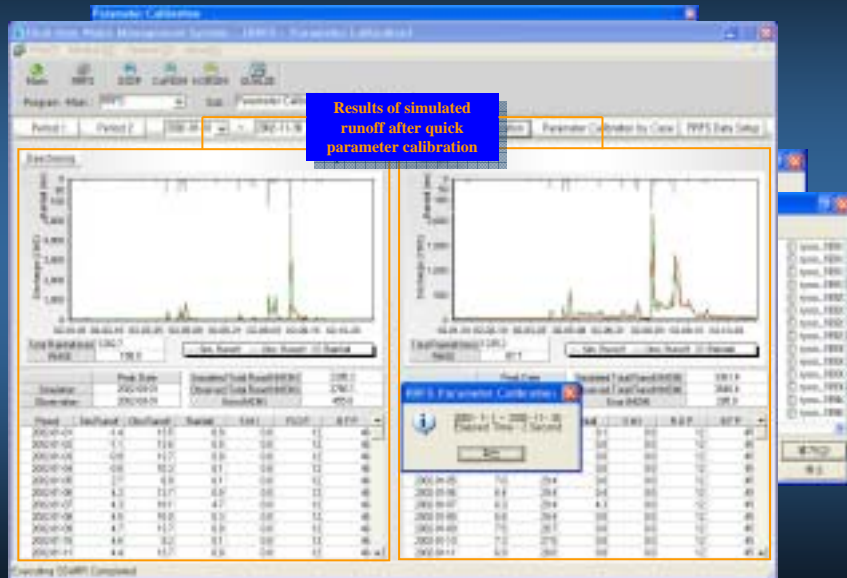
Parameter	Value	Unit
Q1	1.0	m³/s
Q2	1.0	m³/s
Q3	1.0	m³/s
Q4	1.0	m³/s
Q5	1.0	m³/s
Q6	1.0	m³/s
Q7	1.0	m³/s
Q8	1.0	m³/s
Q9	1.0	m³/s
Q10	1.0	m³/s
Q11	1.0	m³/s
Q12	1.0	m³/s
Q13	1.0	m³/s
Q14	1.0	m³/s
Q15	1.0	m³/s
Q16	1.0	m³/s
Q17	1.0	m³/s
Q18	1.0	m³/s
Q19	1.0	m³/s
Q20	1.0	m³/s
Q21	1.0	m³/s
Q22	1.0	m³/s
Q23	1.0	m³/s
Q24	1.0	m³/s
Q25	1.0	m³/s
Q26	1.0	m³/s
Q27	1.0	m³/s
Q28	1.0	m³/s
Q29	1.0	m³/s
Q30	1.0	m³/s
Q31	1.0	m³/s
Q32	1.0	m³/s
Q33	1.0	m³/s
Q34	1.0	m³/s
Q35	1.0	m³/s
Q36	1.0	m³/s
Q37	1.0	m³/s
Q38	1.0	m³/s
Q39	1.0	m³/s
Q40	1.0	m³/s
Q41	1.0	m³/s
Q42	1.0	m³/s
Q43	1.0	m³/s
Q44	1.0	m³/s
Q45	1.0	m³/s
Q46	1.0	m³/s
Q47	1.0	m³/s
Q48	1.0	m³/s
Q49	1.0	m³/s
Q50	1.0	m³/s
Q51	1.0	m³/s
Q52	1.0	m³/s
Q53	1.0	m³/s
Q54	1.0	m³/s
Q55	1.0	m³/s
Q56	1.0	m³/s
Q57	1.0	m³/s
Q58	1.0	m³/s
Q59	1.0	m³/s
Q60	1.0	m³/s
Q61	1.0	m³/s
Q62	1.0	m³/s
Q63	1.0	m³/s
Q64	1.0	m³/s
Q65	1.0	m³/s
Q66	1.0	m³/s
Q67	1.0	m³/s
Q68	1.0	m³/s
Q69	1.0	m³/s
Q70	1.0	m³/s
Q71	1.0	m³/s
Q72	1.0	m³/s
Q73	1.0	m³/s
Q74	1.0	m³/s
Q75	1.0	m³/s
Q76	1.0	m³/s
Q77	1.0	m³/s
Q78	1.0	m³/s
Q79	1.0	m³/s
Q80	1.0	m³/s
Q81	1.0	m³/s
Q82	1.0	m³/s
Q83	1.0	m³/s
Q84	1.0	m³/s
Q85	1.0	m³/s
Q86	1.0	m³/s
Q87	1.0	m³/s
Q88	1.0	m³/s
Q89	1.0	m³/s
Q90	1.0	m³/s
Q91	1.0	m³/s
Q92	1.0	m³/s
Q93	1.0	m³/s
Q94	1.0	m³/s
Q95	1.0	m³/s
Q96	1.0	m³/s
Q97	1.0	m³/s
Q98	1.0	m³/s
Q99	1.0	m³/s
Q100	1.0	m³/s

Quick parameter calibration (3)

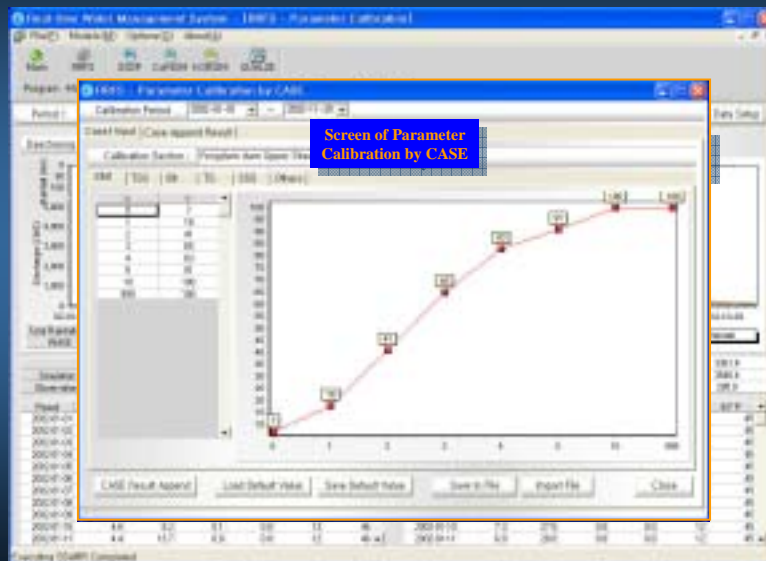
Modification of parameters and return ratio of water use

Parameter	Value	Unit
Q1	1.0	m³/s
Q2	1.0	m³/s
Q3	1.0	m³/s
Q4	1.0	m³/s
Q5	1.0	m³/s
Q6	1.0	m³/s
Q7	1.0	m³/s
Q8	1.0	m³/s
Q9	1.0	m³/s
Q10	1.0	m³/s
Q11	1.0	m³/s
Q12	1.0	m³/s
Q13	1.0	m³/s
Q14	1.0	m³/s
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Q26	1.0	m³/s
Q27	1.0	m³/s
Q28	1.0	m³/s
Q29	1.0	m³/s
Q30	1.0	m³/s
Q31	1.0	m³/s
Q32	1.0	m³/s
Q33	1.0	m³/s
Q34	1.0	m³/s
Q35	1.0	m³/s
Q36	1.0	m³/s
Q37	1.0	m³/s
Q38	1.0	m³/s
Q39	1.0	m³/s
Q40	1.0	m³/s
Q41	1.0	m³/s
Q42	1.0	m³/s
Q43	1.0	m³/s
Q44	1.0	m³/s
Q45	1.0	m³/s
Q46	1.0	m³/s
Q47	1.0	m³/s
Q48	1.0	m³/s
Q49	1.0	m³/s
Q50	1.0	m³/s
Q51	1.0	m³/s
Q52	1.0	m³/s
Q53	1.0	m³/s
Q54	1.0	m³/s
Q55	1.0	m³/s
Q56	1.0	m³/s
Q57	1.0	m³/s
Q58	1.0	m³/s
Q59	1.0	m³/s
Q60	1.0	m³/s
Q61	1.0	m³/s
Q62	1.0	m³/s
Q63	1.0	m³/s
Q64	1.0	m³/s
Q65	1.0	m³/s
Q66	1.0	m³/s
Q67	1.0	m³/s
Q68	1.0	m³/s
Q69	1.0	m³/s
Q70	1.0	m³/s
Q71	1.0	m³/s
Q72	1.0	m³/s
Q73	1.0	m³/s
Q74	1.0	m³/s
Q75	1.0	m³/s
Q76	1.0	m³/s
Q77	1.0	m³/s
Q78	1.0	m³/s
Q79	1.0	m³/s
Q80	1.0	m³/s
Q81	1.0	m³/s
Q82	1.0	m³/s
Q83	1.0	m³/s
Q84	1.0	m³/s
Q85	1.0	m³/s
Q86	1.0	m³/s
Q87	1.0	m³/s
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Q89	1.0	m³/s
Q90	1.0	m³/s
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Q92	1.0	m³/s
Q93	1.0	m³/s
Q94	1.0	m³/s
Q95	1.0	m³/s
Q96	1.0	m³/s
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Q98	1.0	m³/s
Q99	1.0	m³/s
Q100	1.0	m³/s

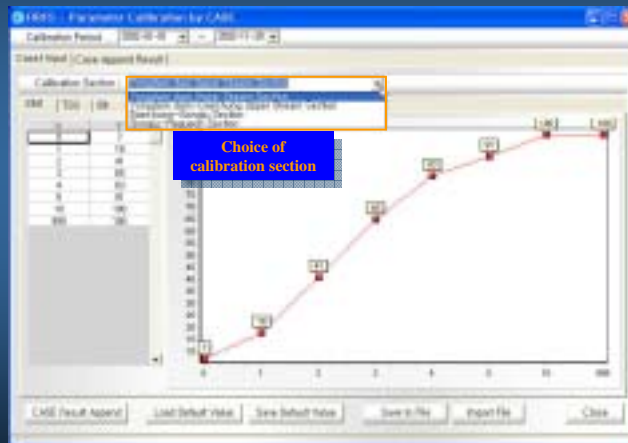
Quick parameter calibration (4)



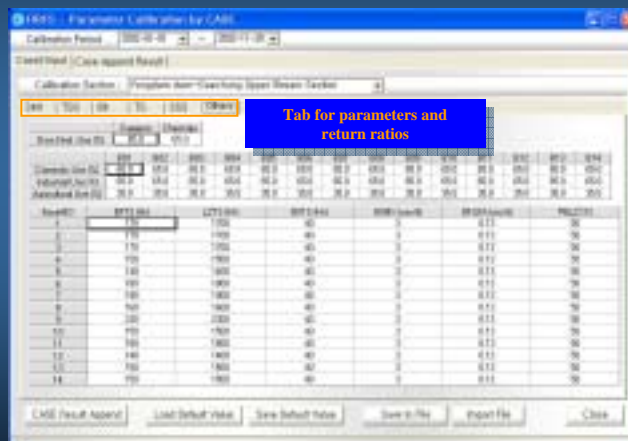
Parameter calibration by case (1)



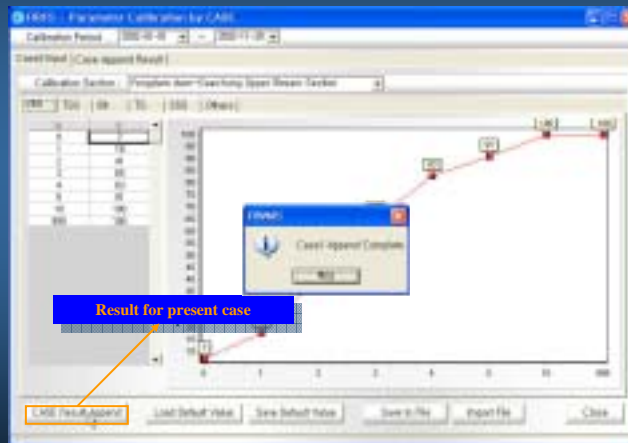
Parameter calibration by case (2)



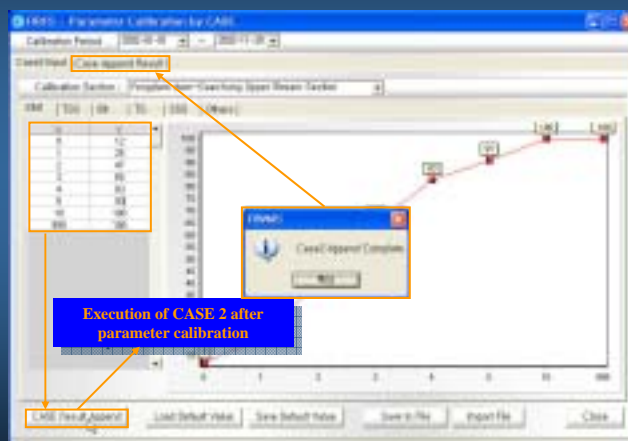
Parameter calibration by case (3)



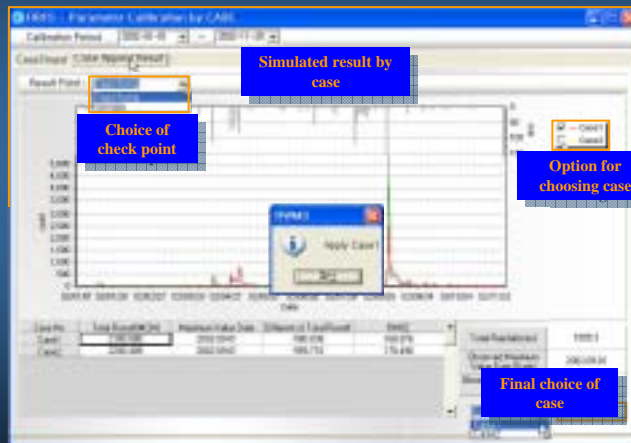
Parameter calibration by case (4)



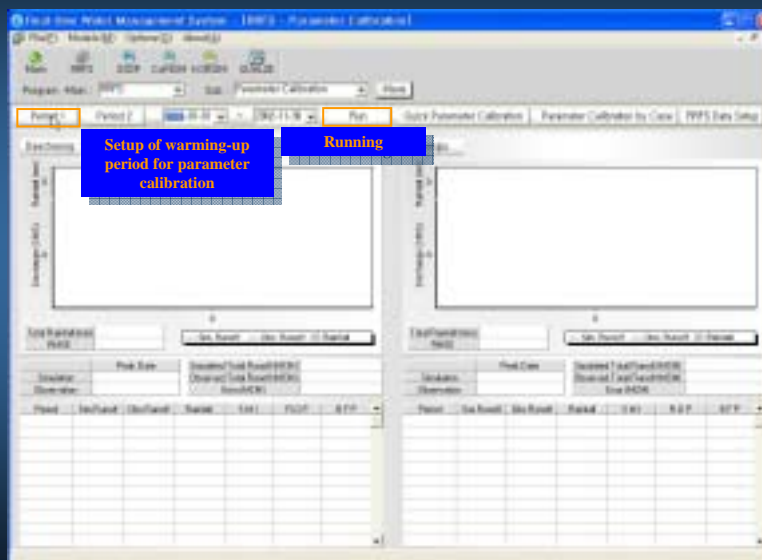
Parameter calibration by case (5)



Parameter calibration by case (6)

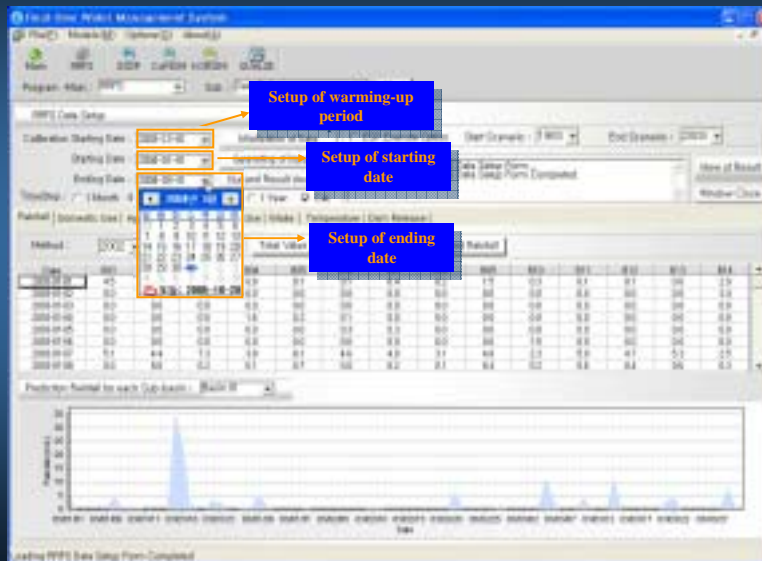


Parameter calibration by case (7)

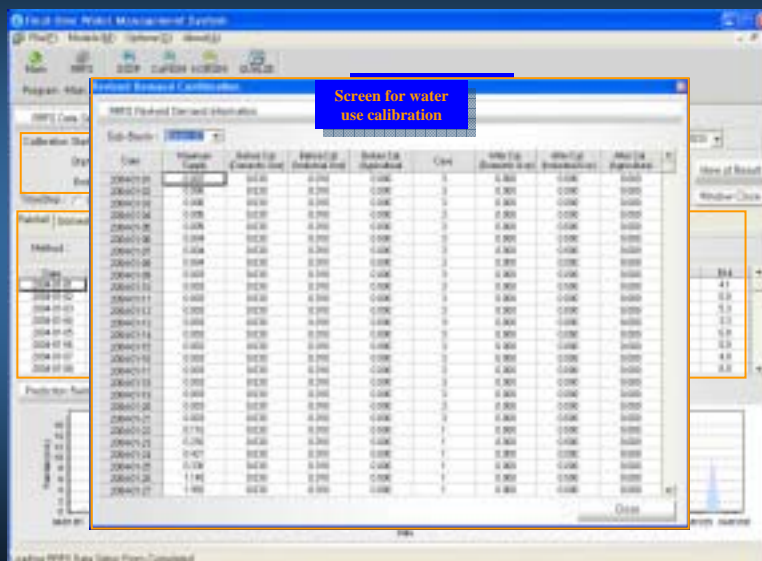


[illegible][illegible]

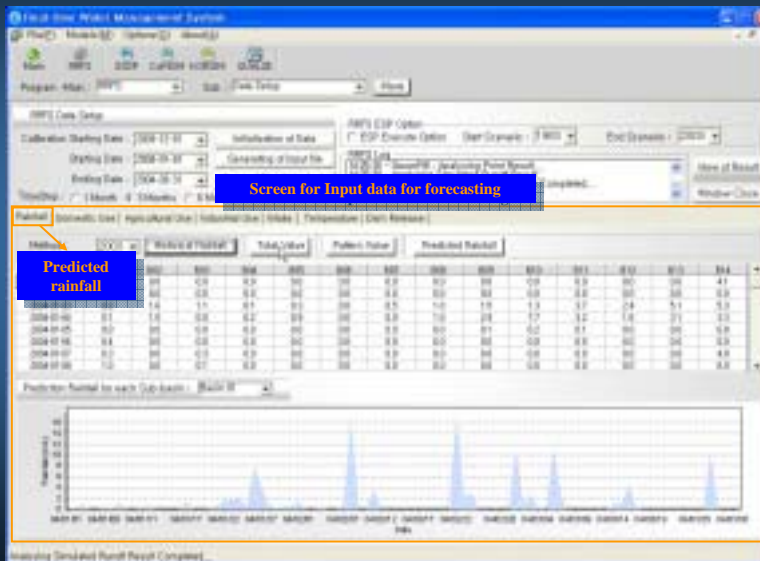
Running of runoff forecasting system (2)



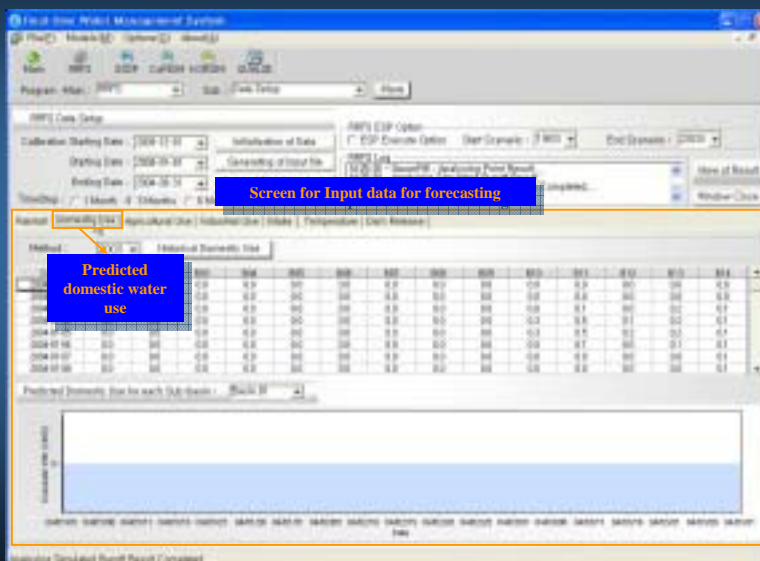
Running of runoff forecasting system (3)



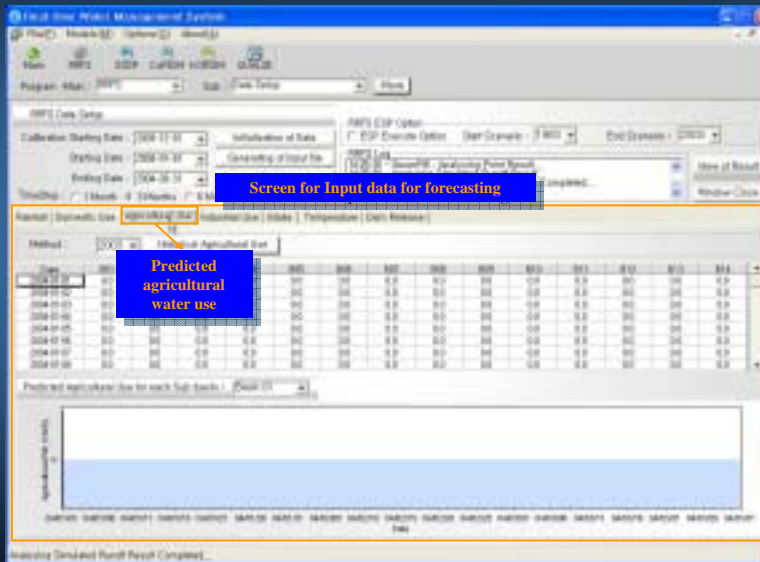
Setting input data for runoff forecasting (1)



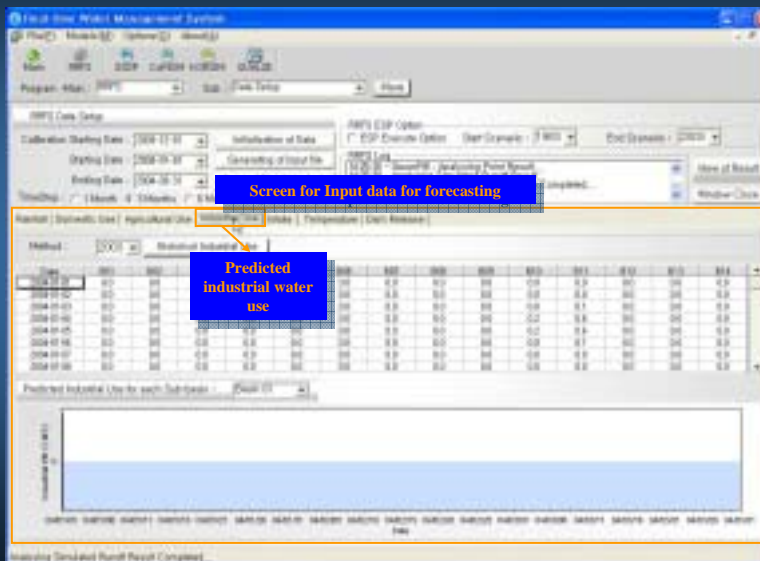
Setting input data for runoff forecasting (2)



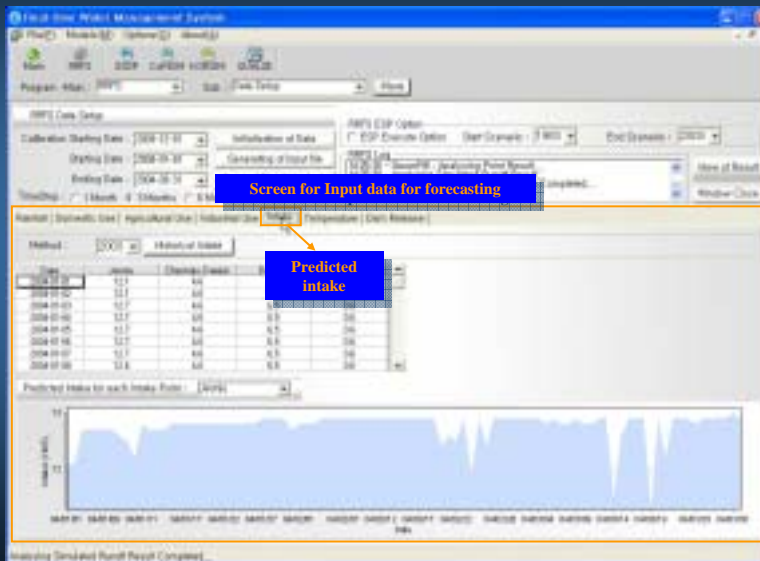
Setting input data for runoff forecasting (3)



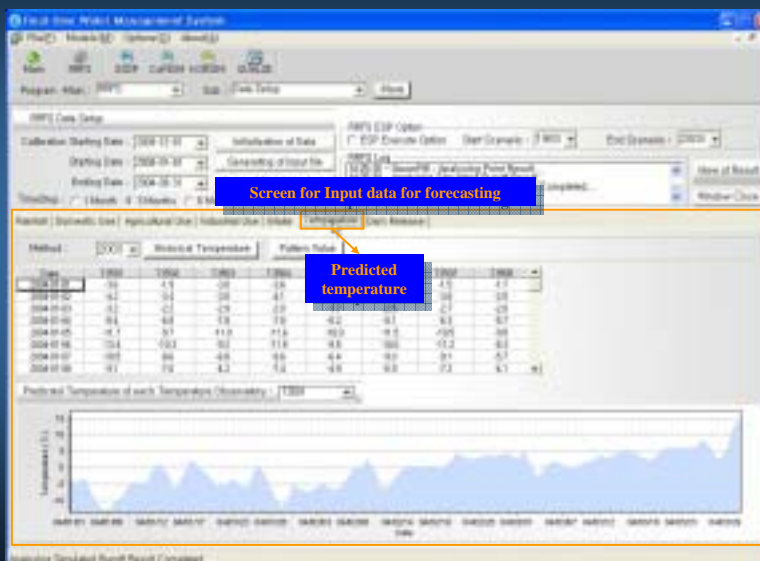
Setting input data for runoff forecasting (4)



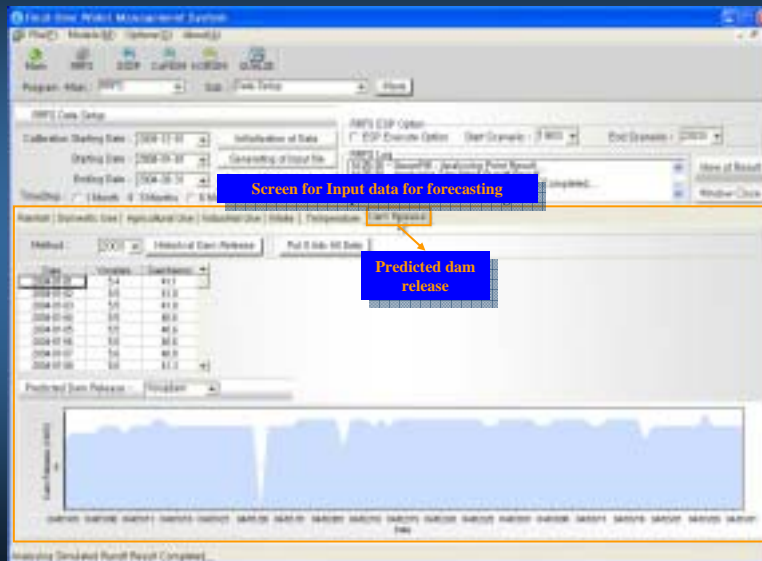
Setting input data for runoff forecasting (5)



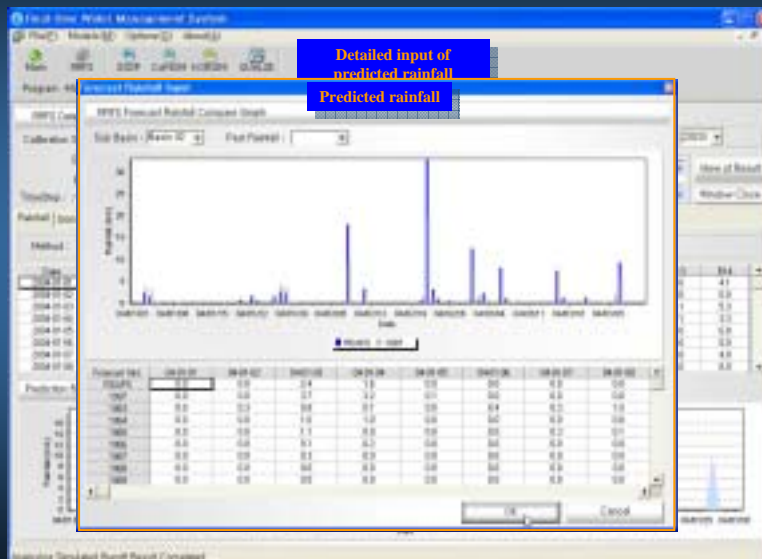
Setting input data for runoff forecasting (6)



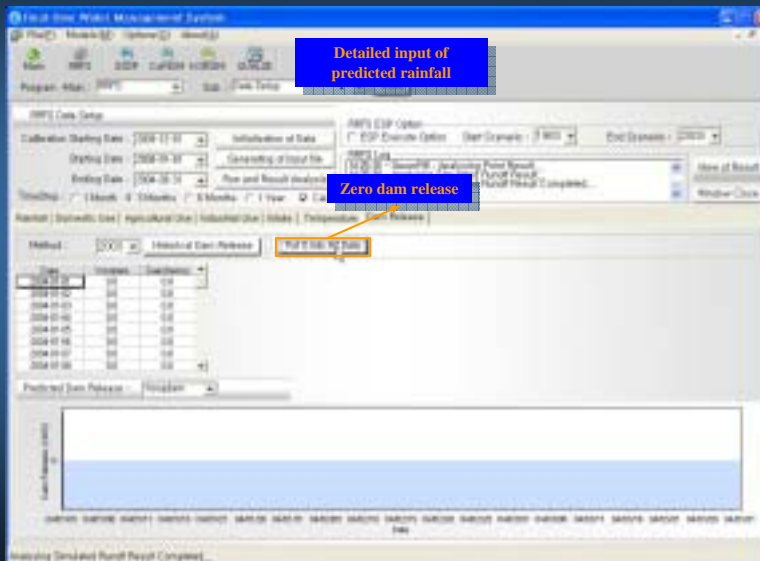
Setting input data for runoff forecasting (7)



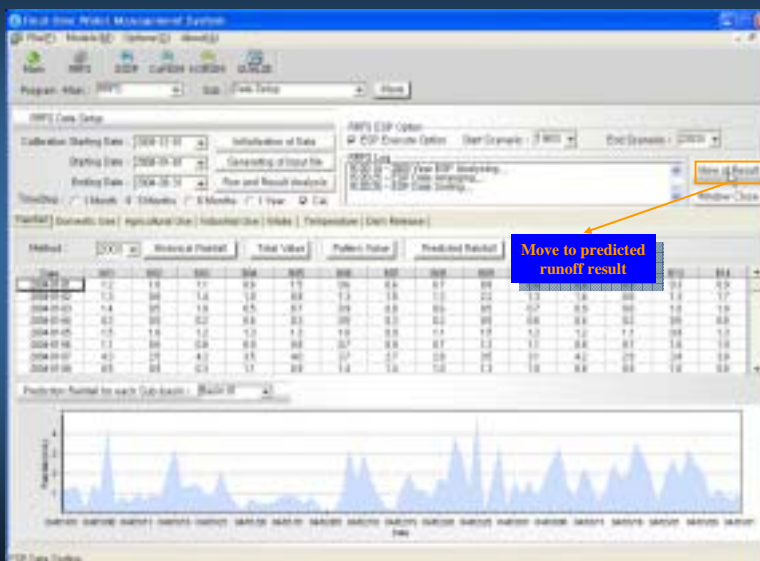
Setting input data for runoff forecasting (8)



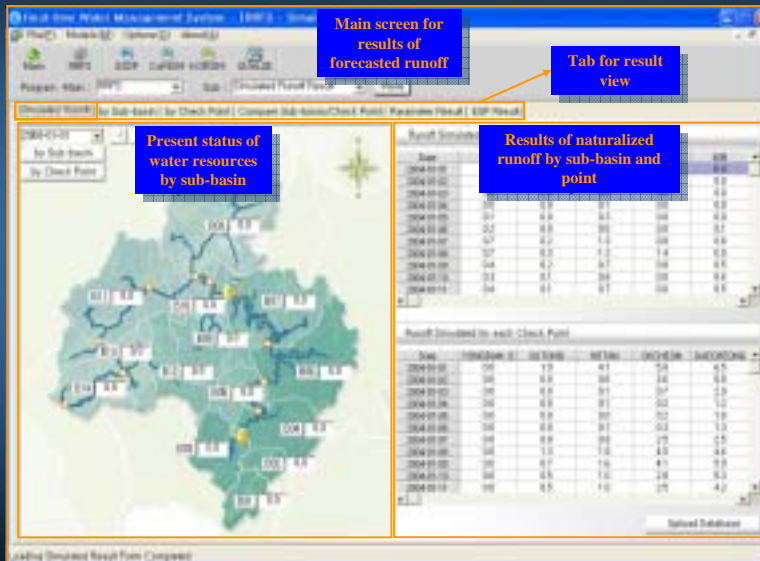
Setting input data for runoff forecasting (9)



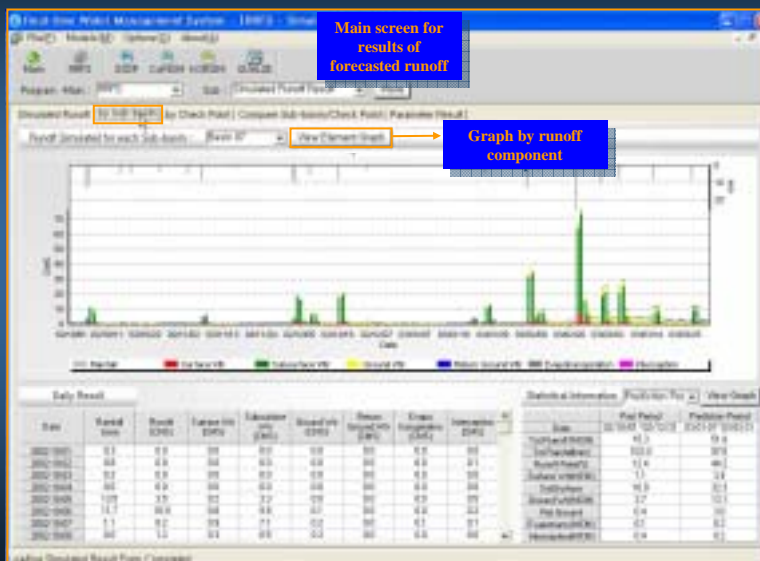
Setting input data for runoff forecasting (10)



Identification of forecasted runoff (1)



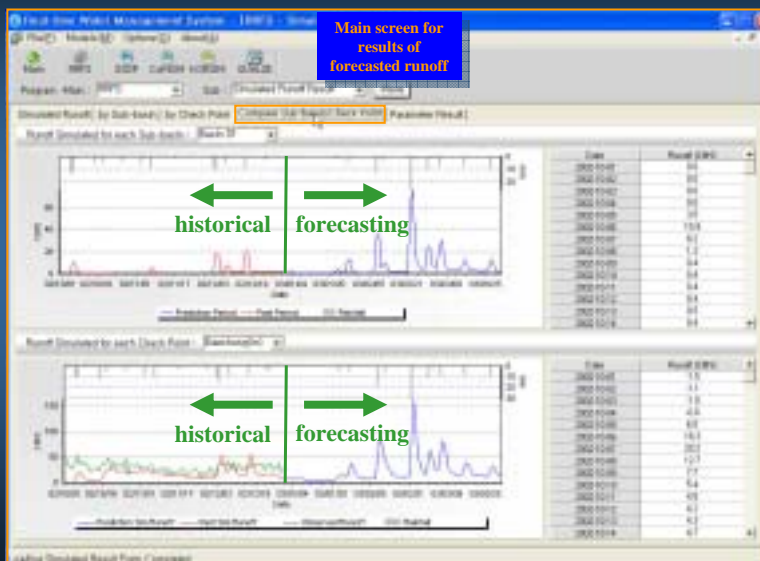
Identification of forecasted runoff (2)



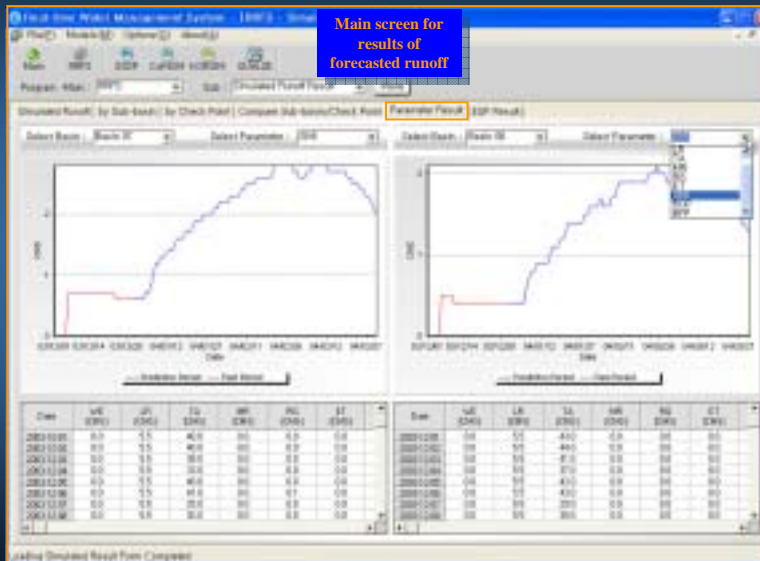
Identification of forecasted runoff (3)



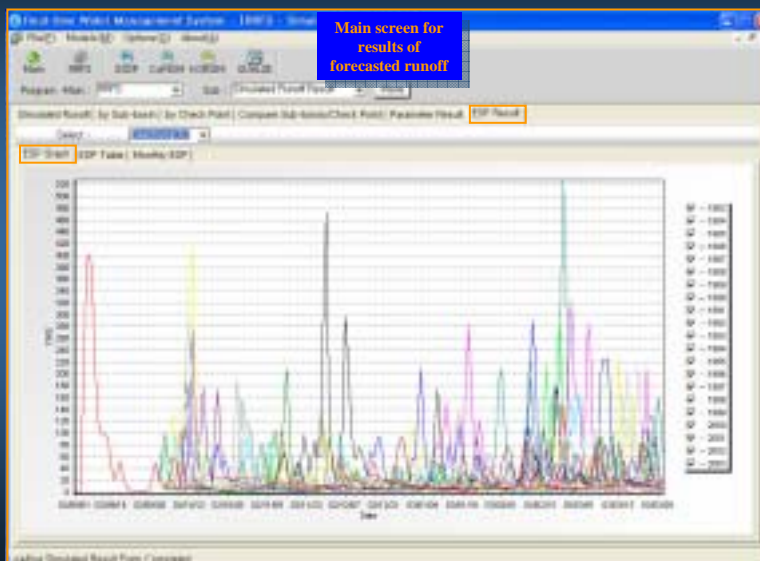
Identification of forecasted runoff (4)



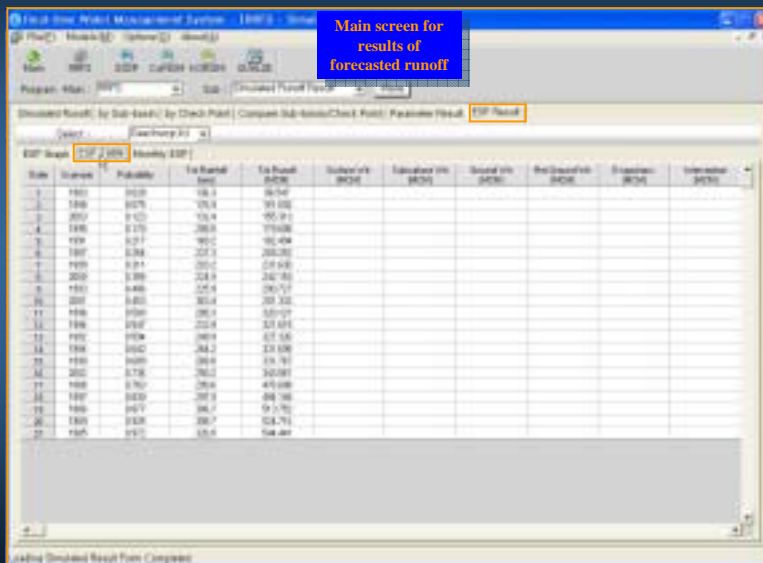
Identification of forecasted runoff (5)



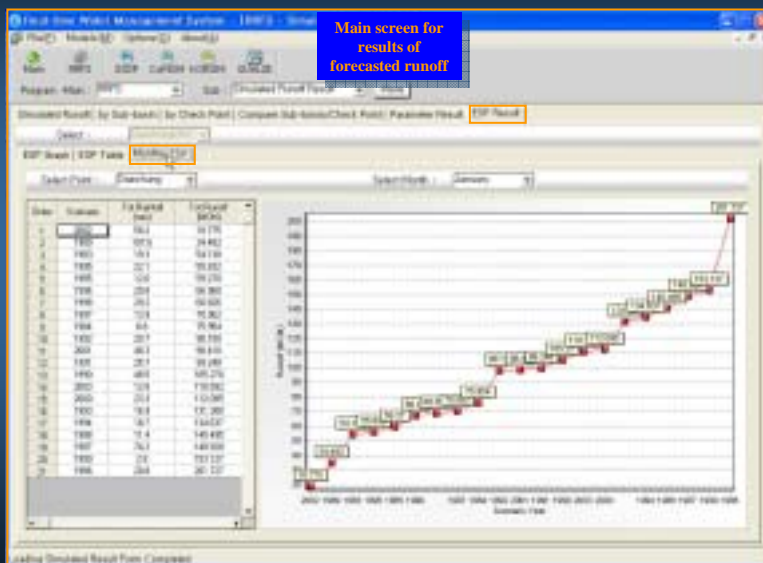
Identification of forecasted runoff (6)



Identification of forecasted runoff (7)



Identification of forecasted runoff (8)



Case study 1

◎ Parameter calibration with RRFS

◎ Objectives

- ◎ Obtaining an understanding of how parameter calibration can be achieved with RRFS
- ◎ Gaining in input preparation and output interpretation

◎ Problems

Parameter calibration is to performed for two observed runoff check points located at Daecheng dam and Gongju, respectively.

◎ Simulation periods (1-yr runoff simulation)

- ◎ Period 1 : 01. 12. 2003 – 31. 12. 2003
- ◎ Period 2 : 01. 01. 2004 – 31. 12. 2004

◎ Check point

- ◎ Daecheng dam

◎ Quick Parameter Calibration

◎ Modification of following parameter values

- ◎ SMI
- ◎ SSS
- ◎ BII
- ◎ TSS

◎ Return ratio of water use (for Daejeon & Cheongju points)

- ◎ Domestic & industrial water uses
- ◎ Agricultural water use

◎ Return ratio of water use (for each sub-basin)

- ◎ Domestic & industrial water uses
- ◎ Agricultural water use

4 sub-regions for parameter setting



1st Region

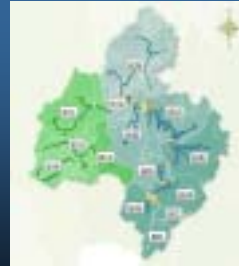


2nd Region

Daecheong dam

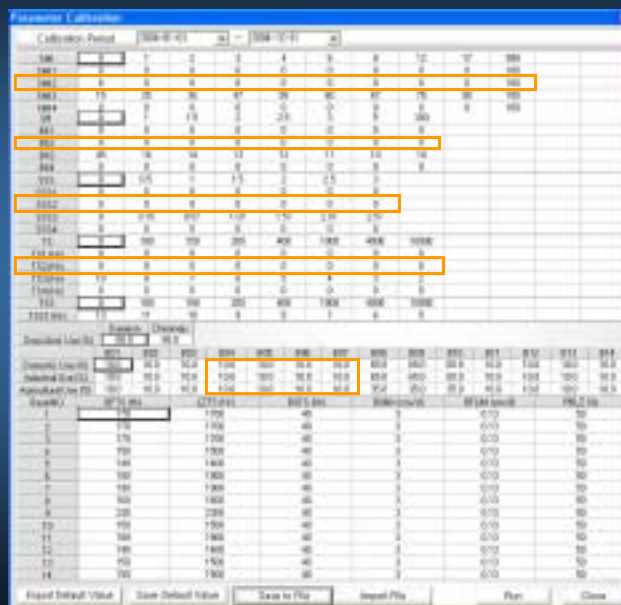


3rd Region

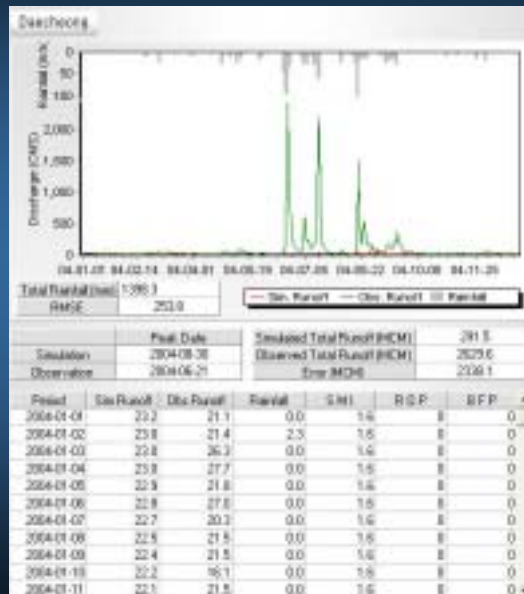


4th Region

Window for quick parameter calibration



Before parameter calibration

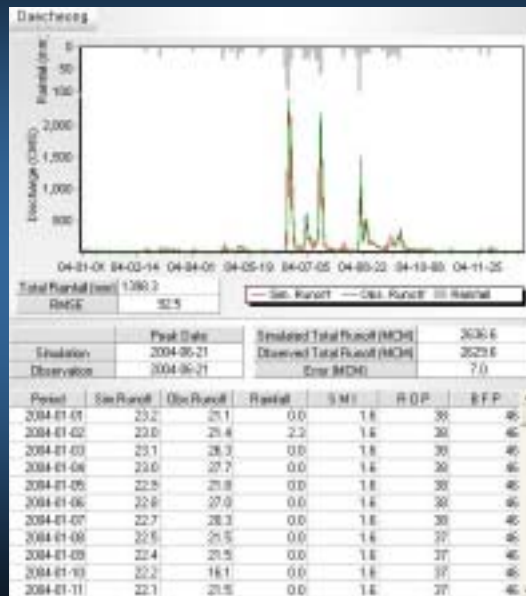


Case study 1

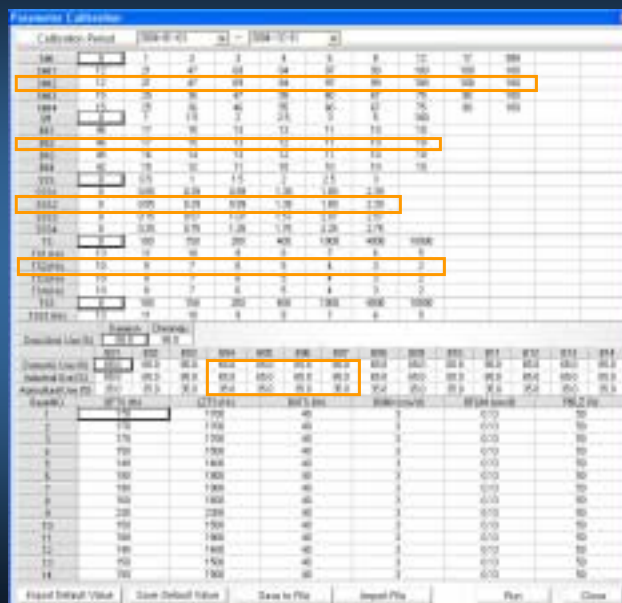
Output analysis

- Survey of results with graph
- Survey of results with table
- What is the total rainfall ?
- What is the date of peak runoff for observed and simulated runoffs?
- What is the simulated total runoff?
- What is the observed total runoff?
- What is your final error between observed and simulated runoffs?

Results of parameter calibration



Modified parameter values



Case study 2

◎ **Runoff forecasting with RRFS**

◎ **Objectives**

- ◎ Obtaining an understanding of how the runoff forecast can be achieved with RRFS
- ◎ Gaining in input preparation and output interpretation

◎ **Problems**

Runoff forecasting is to performed for sub-basins and points.

◎ **Period setting for runoff forecasting**

- ◎ Calibration starting period : 01 December 2004
- ◎ Starting date : 01 January 2005
- ◎ Ending date : 31 March 2005

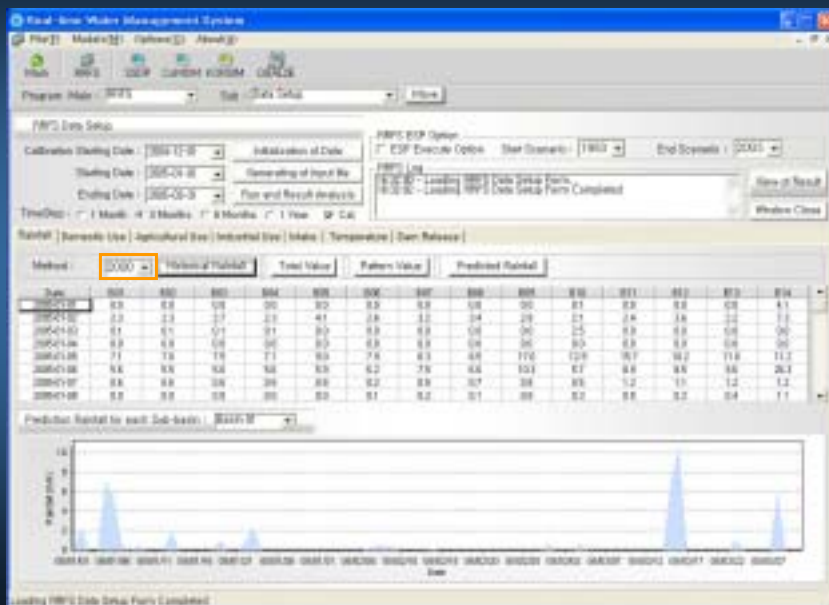
◎ **Output analysis**

- ◎ Survey of results with graph
- ◎ Survey of results with table
- ◎ Comparison various hydrological results between historical and forecasted periods
 - ◎ Total runoff
 - ◎ Total rainfall
 - ◎ Runoff Ratio (%)
 - ◎ Runoff components
- ◎ Forecasted runoff results by sub-basin
- ◎ Forecasted runoff results by points
- ◎ Survey of parameter variation during forecasting period
- ◎ Comparison of runoff results along rainfall distribution
- ◎ Comparison of runoff results along dam release

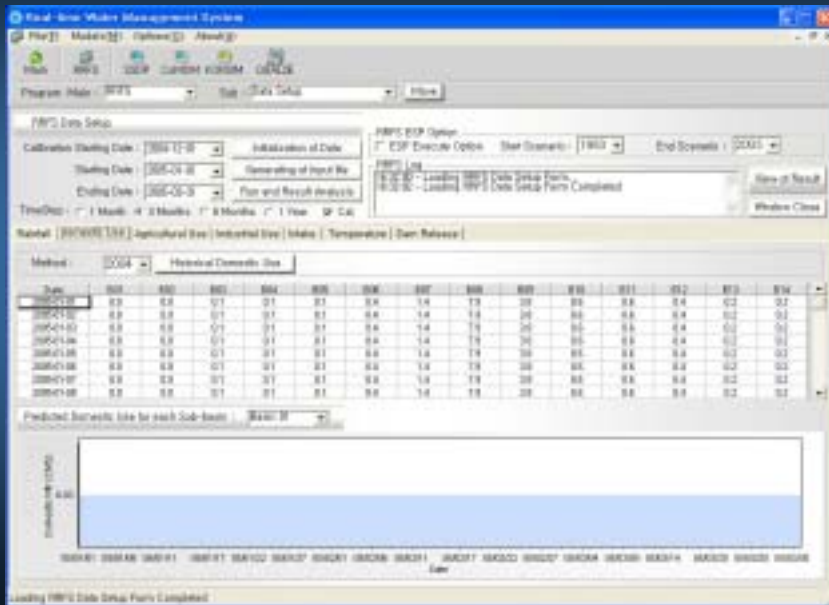
RRFS Data setup – Case 2-1

- Rainfall data
 - Historical rainfall : 2000 year
- Water use
 - Historical domestic water : 2004 year
 - Historical industrial water : 2004 year
 - Historical agricultural water : 2004 year
- Intake
 - Historical intake : 2004 year
- Temperature
 - Historical temperature : 2004 year
- Dam release
 - Historical dam release : 2004 year

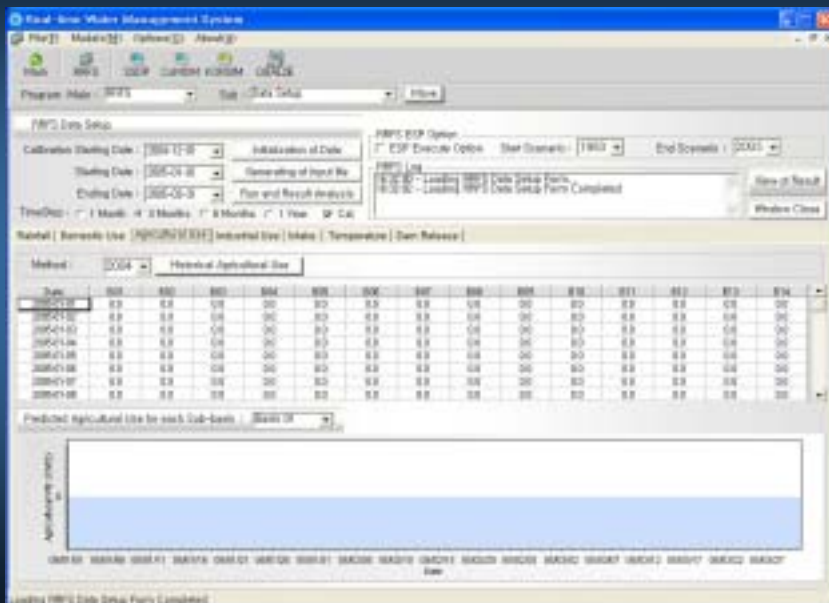
Input data for Case 2-1 (1)



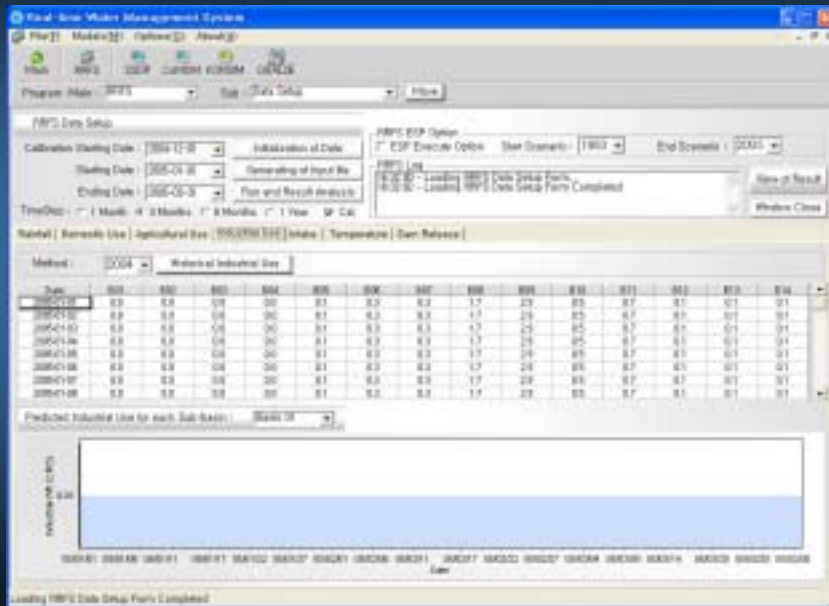
Input data for Case 2-1 (2)



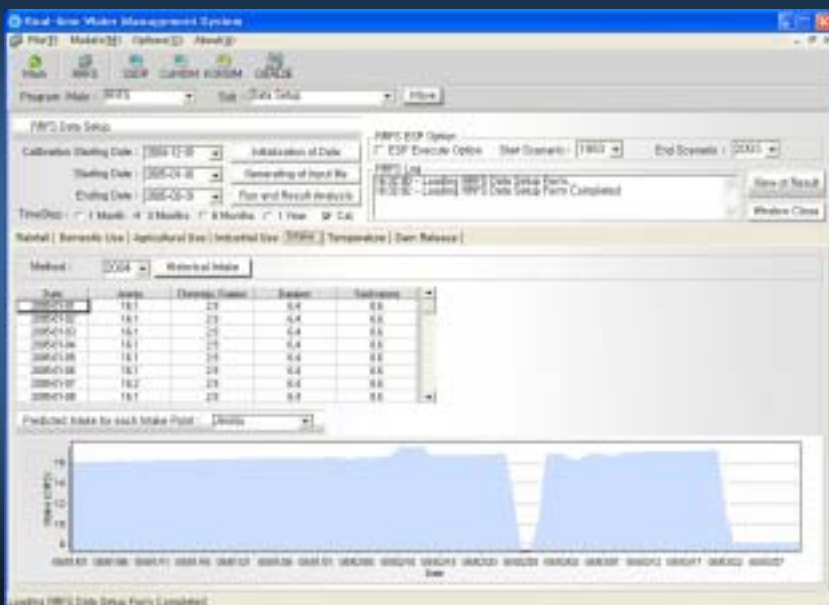
Input data for Case 2-1 (3)



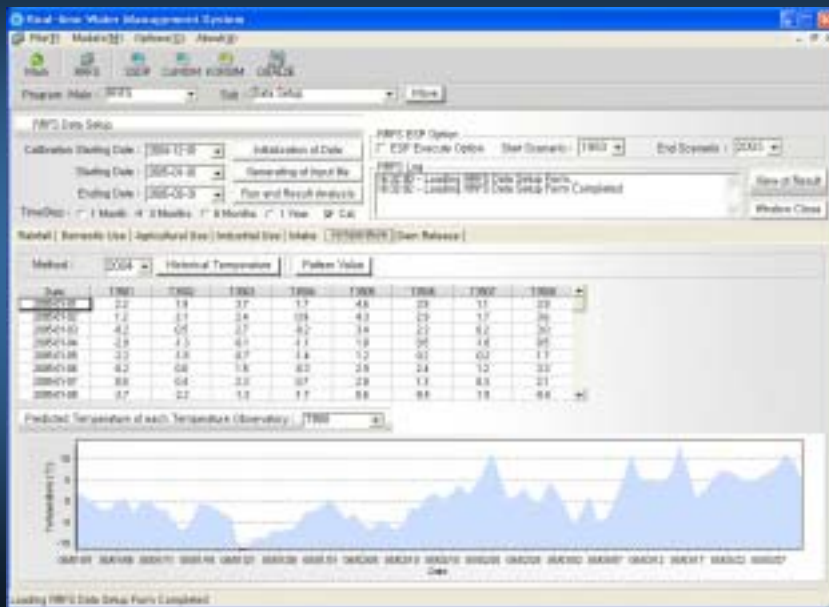
Input data for Case 2-1 (4)



Input data for Case 2-1 (5)



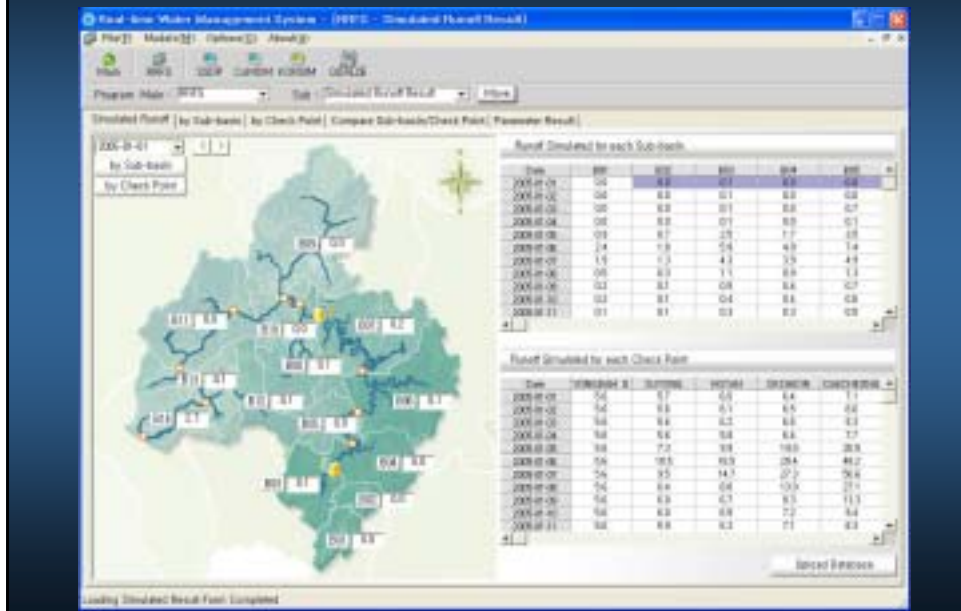
Input data for Case 2-1 (6)



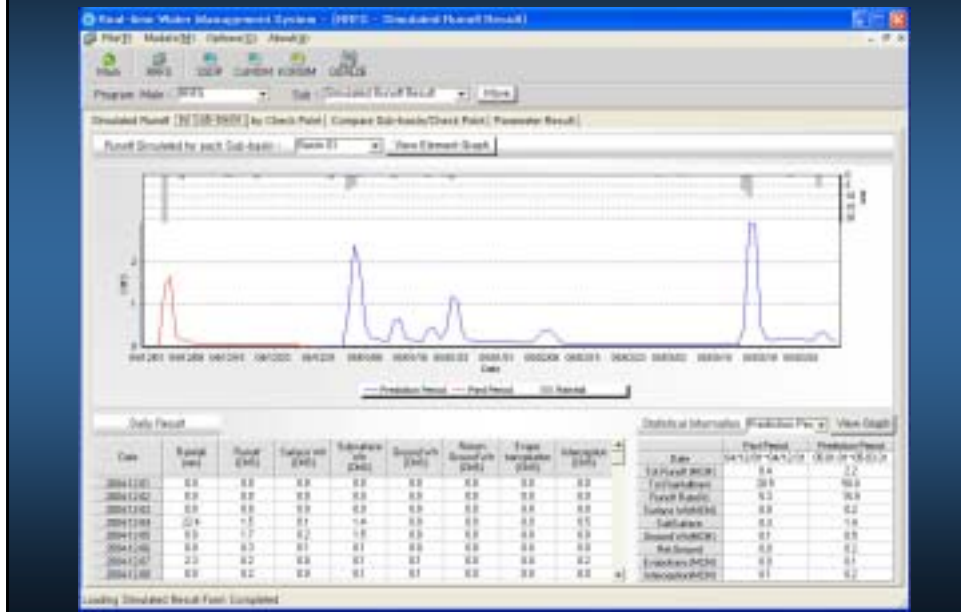
Input data for Case 2-1 (7)



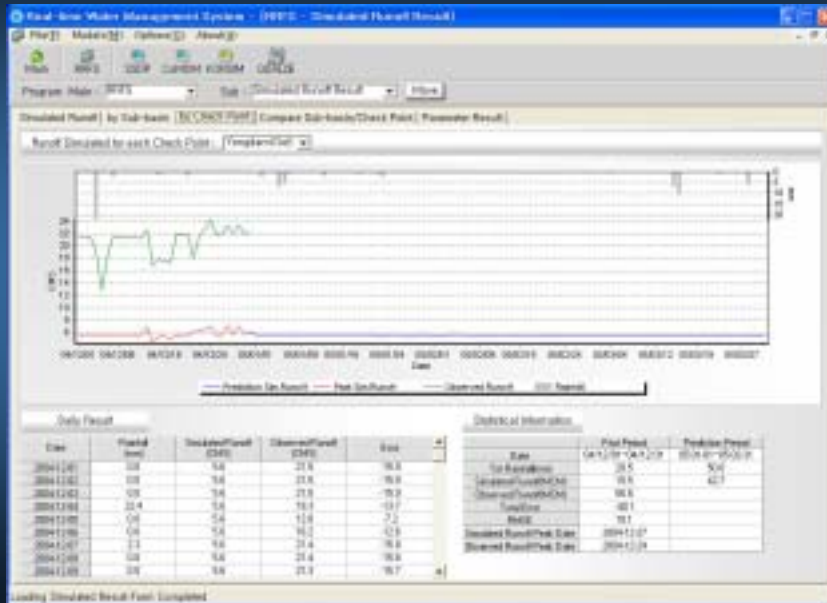
Forecasted results for Case 2-1 (1)



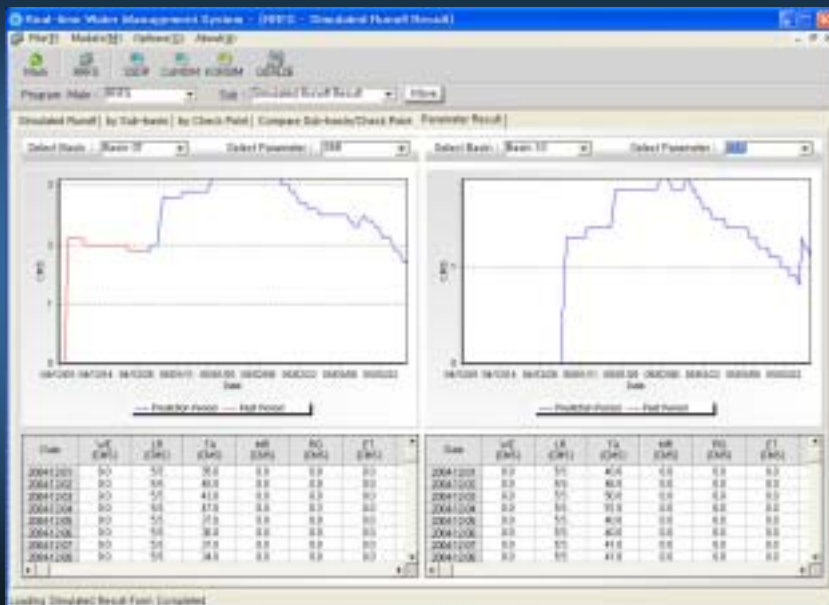
Forecasted results for Case 2-1 (2)



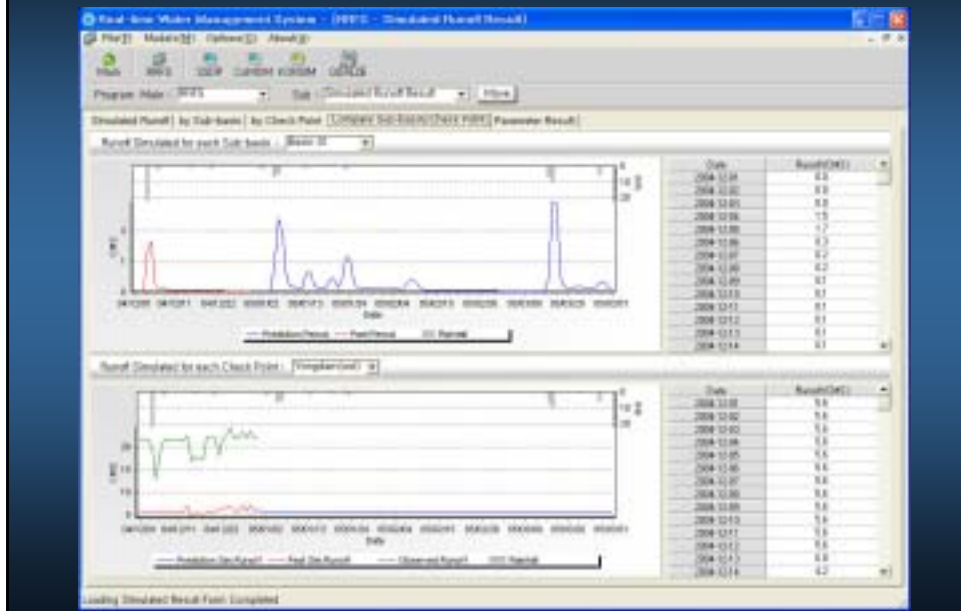
Forecasted results for Case 2-1 (3)



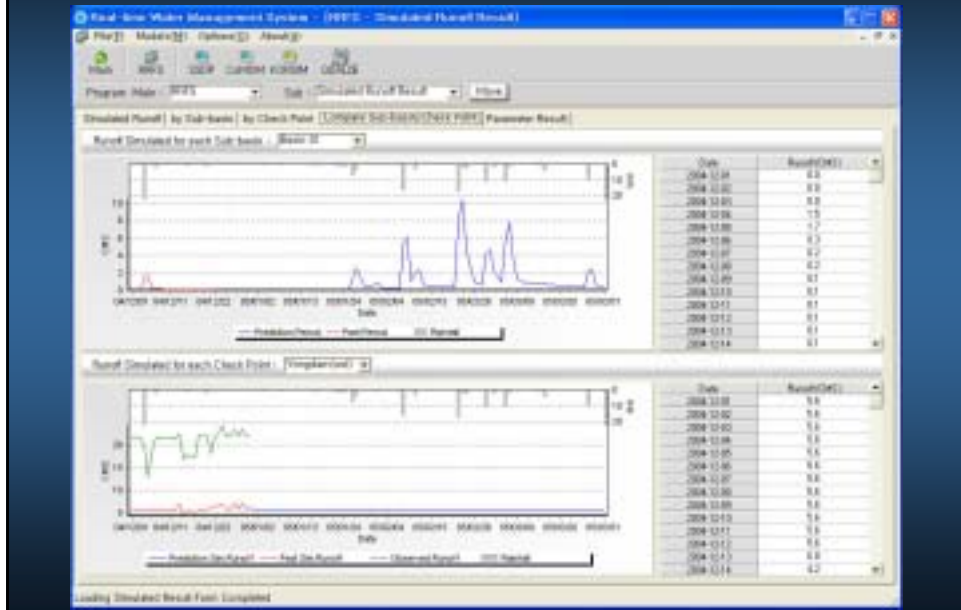
Forecasted results for Case 2-1 (4)



Forecasted results for Case 2-1 (5)



Forecasted results for Case 2-1 (6)



RRFS Data setup – Case 2-2

Rainfall data

Total value : 150mm

Water use

Historical domestic water : 2004 year

Historical industrial water : 2004 year

Historical agricultural water : 2004 year

Intake

Historical intake : 2004 year

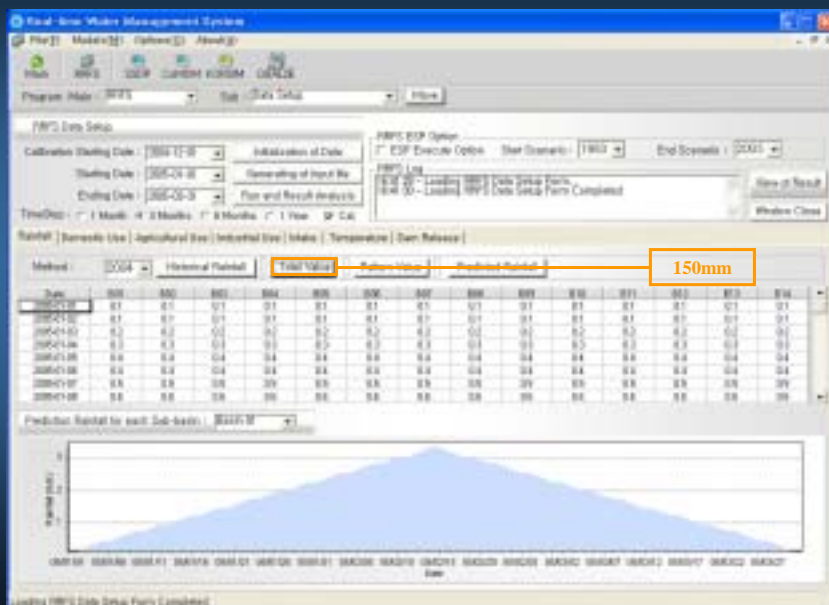
Temperature

Historical temperature : 2004 year

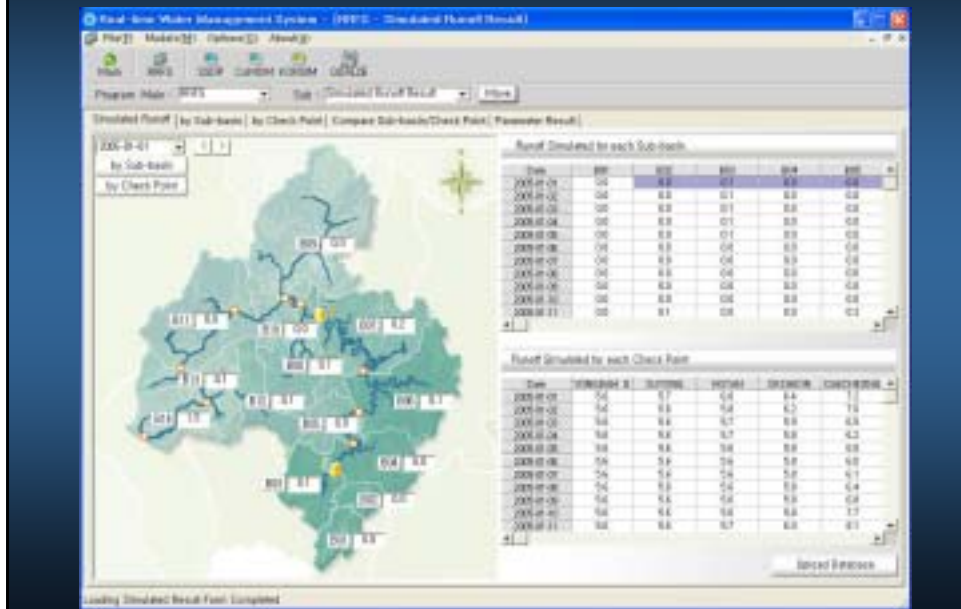
Dam release

Historical dam release : 2004 year

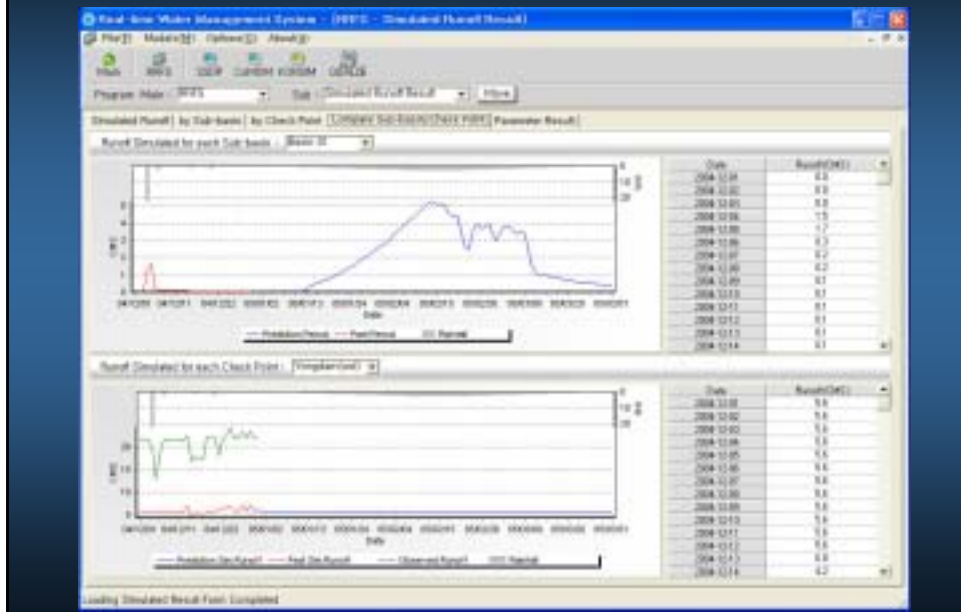
Input data for Case 2-2



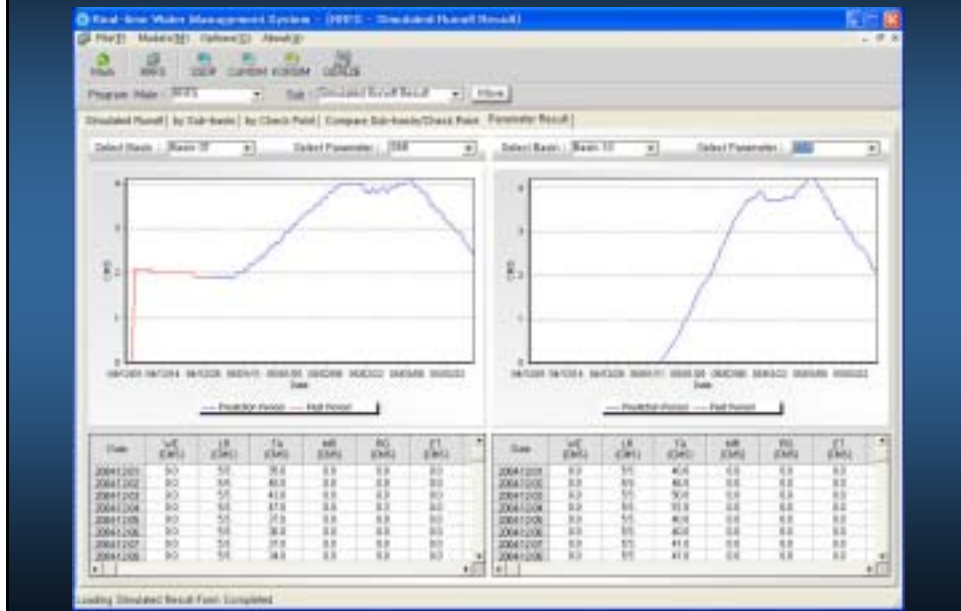
Forecasted results for Case 2-2 (1)



Forecasted results for Case 2-2 (2)



Forecasted results for Case 2-2 (3)



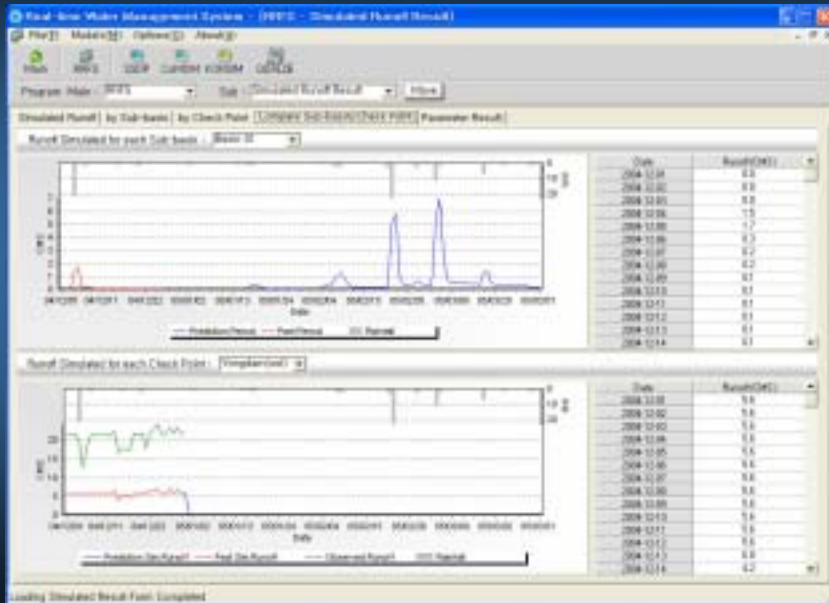
RRFS Data setup – Case 2-3

- Rainfall data
 - Historical rainfall : 2000 year
- Water use
 - Historical domestic water : 2004 year
 - Historical industrial water : 2004 year
 - Historical agricultural water : 2004 year
- Intake
 - Historical intake : 2004 year
- Temperature
 - Historical temperature : 2004 year
- Dam release
 - Dam release : 0

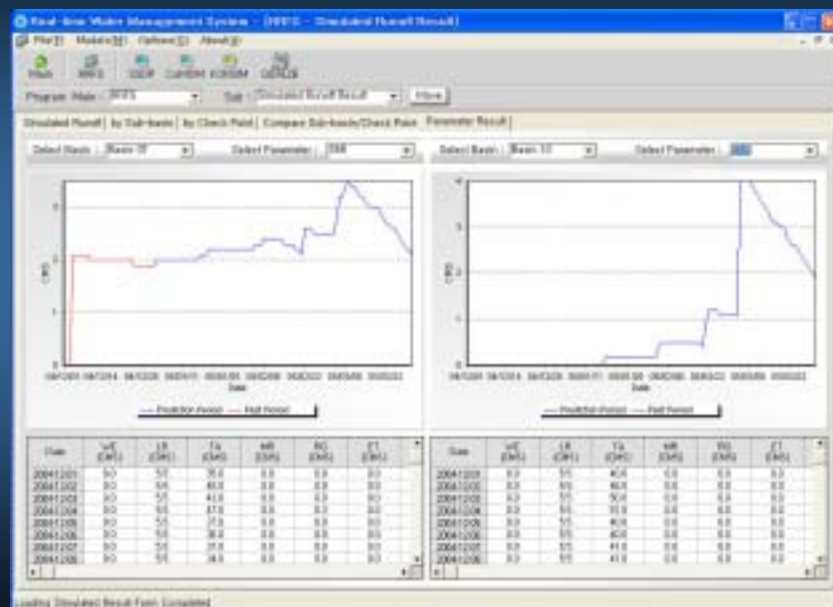
Input data for Case 2-3

Forecasted results for Case 2-3 (1)

Forecasted results for Case 2-3 (2)



Forecasted results for Case 2-3 (3)



Thank you!

