

CAHMDA-DAFOH Joint Seminar, September 6-12, 2014, Austin, TX

Operational Water Quality Forecasting by WQFS-NIER with Ensemble Kalman Filter

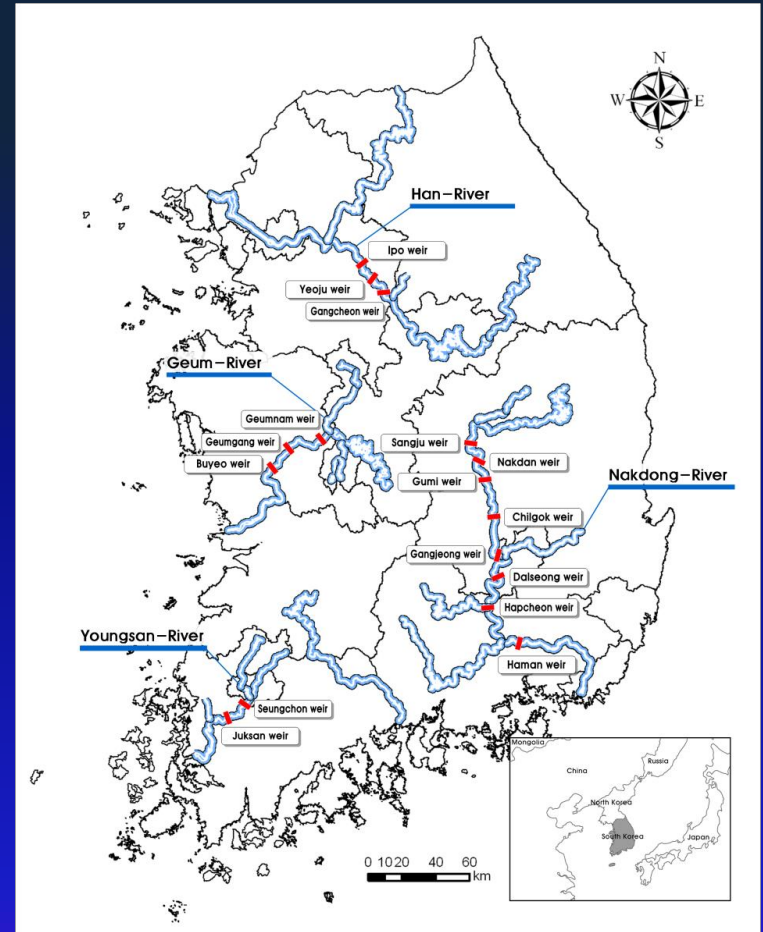
September 12, 2014 | Austin, Texas, USA

Changmin Shin, Kyunghyun Kim, Eun Hye Na, Joong-Hyuk Min, Sooyoung Park
National Institute of Environmental Research, Incheon, Korea

2. Overview of Operational WQ Forecast (1)

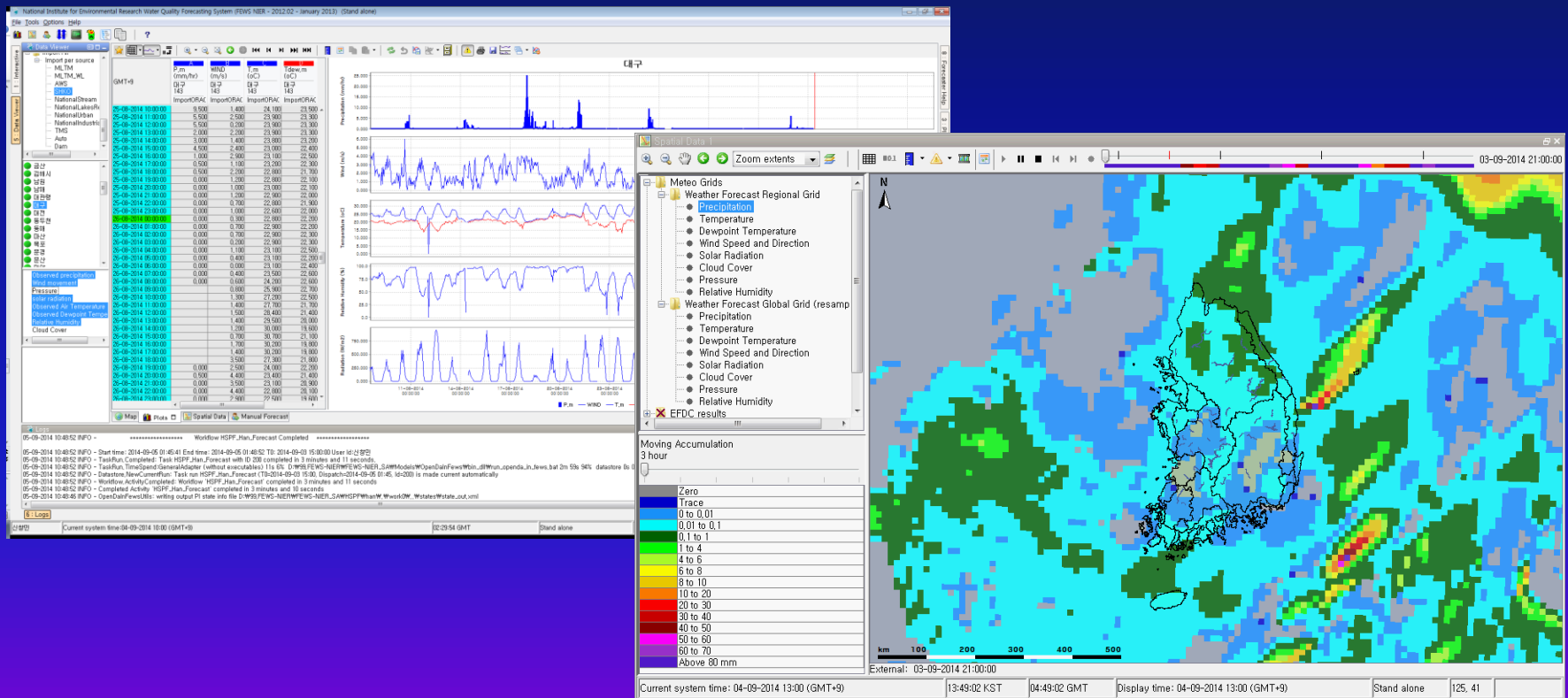
The outline of 7-days WQ forecast

- ❖ **Forecasting area:**
the representative upstream areas of **the 16 weirs** in the four major Rivers (Han, Nakdong, Geum, and Yougsan River basins)
- ❖ **Forecasting variables:**
water temp. and Chlorophyll-*a* level
- It will be extended to other WQ variables in the future (e.g., TOC & SS)
- ❖ **Forecasting model:**
a **HSPF-EFDC coupled model** developed for the four watersheds
- ❖ **Forecasting report:** A 7-days WQ forecast are officially announced on every Monday and Thursday and circulated to water management via a dedicated website (wqcast.nier.go.kr:8080).



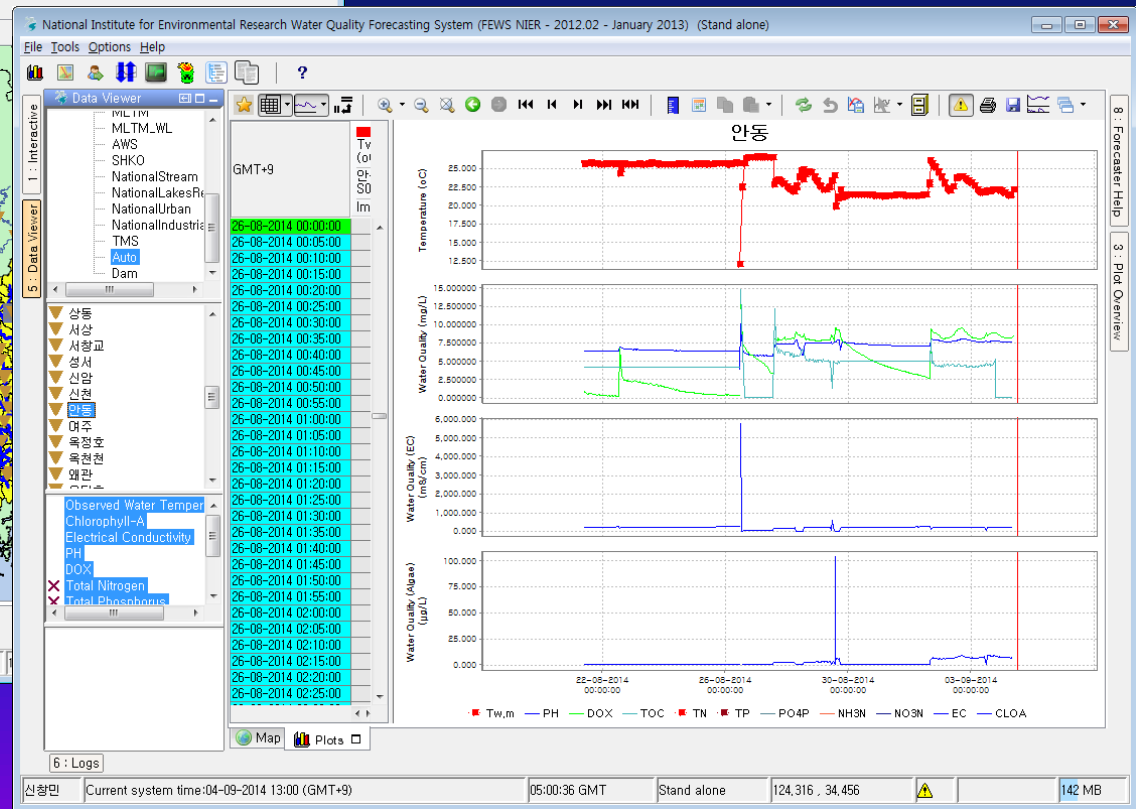
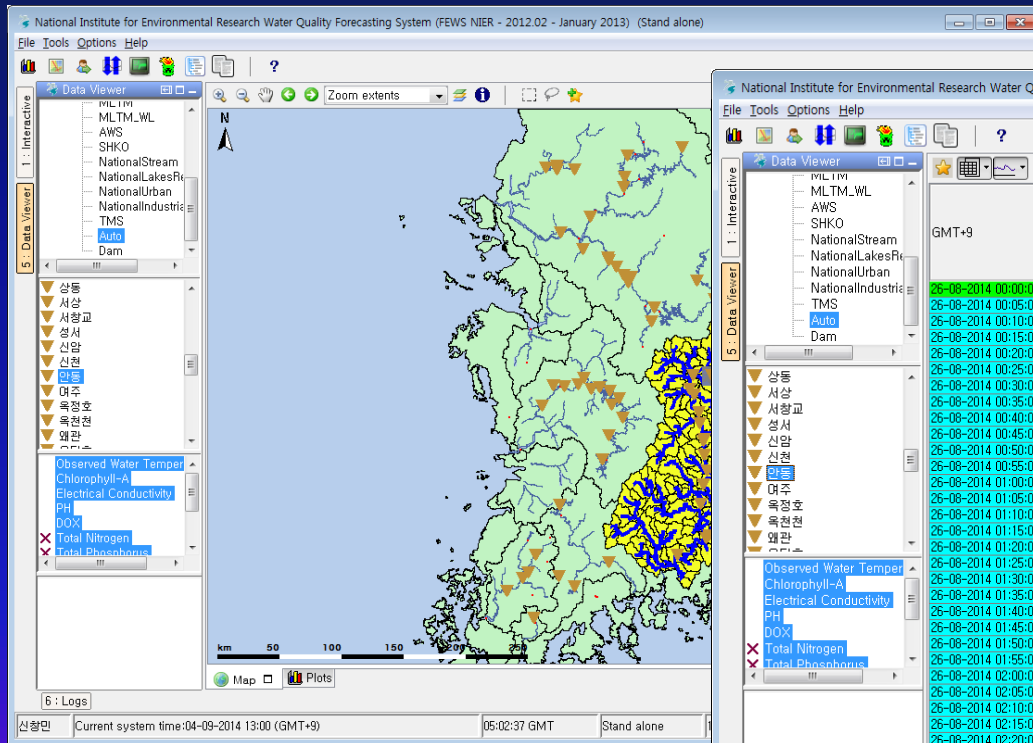
Water Quality Forecasting step (1) Data importing

- ❖ Weather data : Observed and forecasted weather data
- ❖ Water quality monitoring data : Automatic and manual data
- ❖ TMS data : point source(sewage and wastewater treatment plant)
- ❖ Flow and lever data : dam and rivers



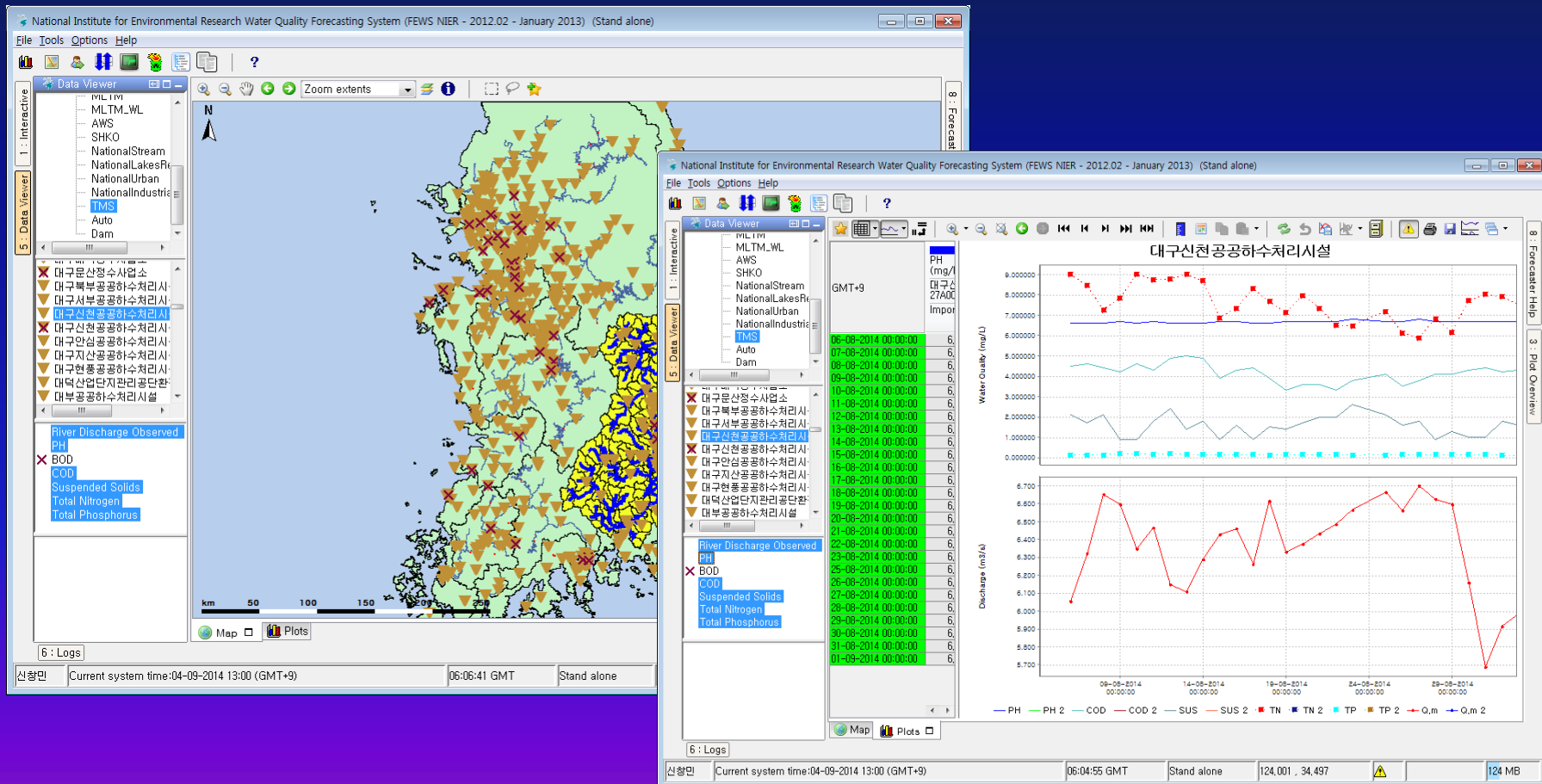
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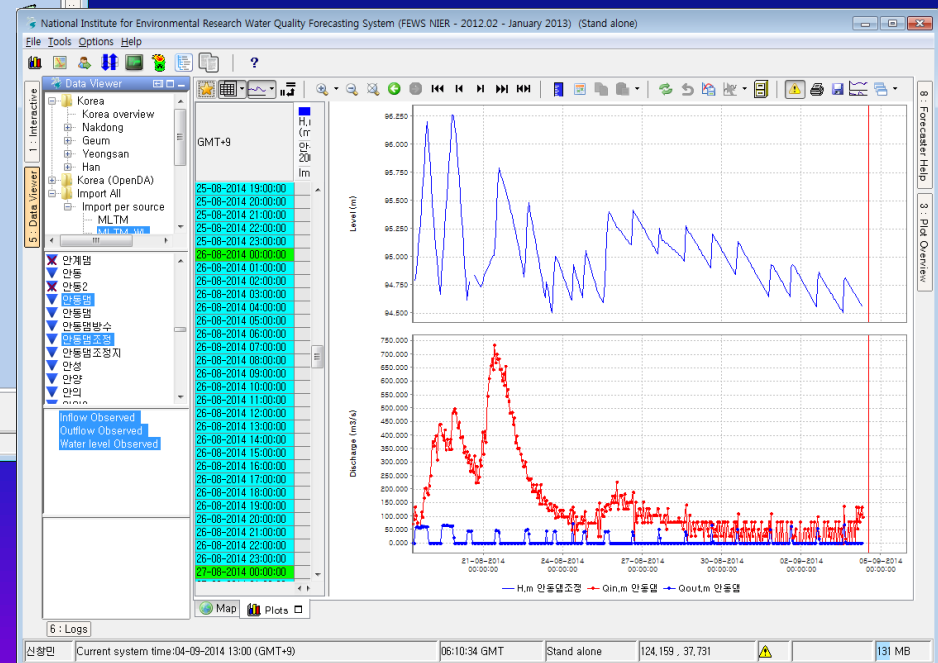
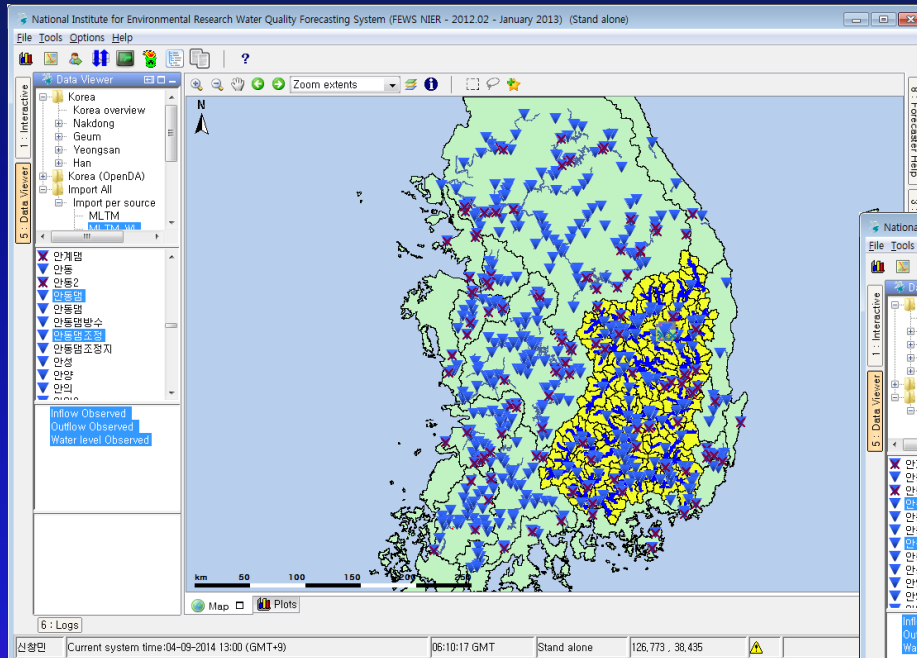
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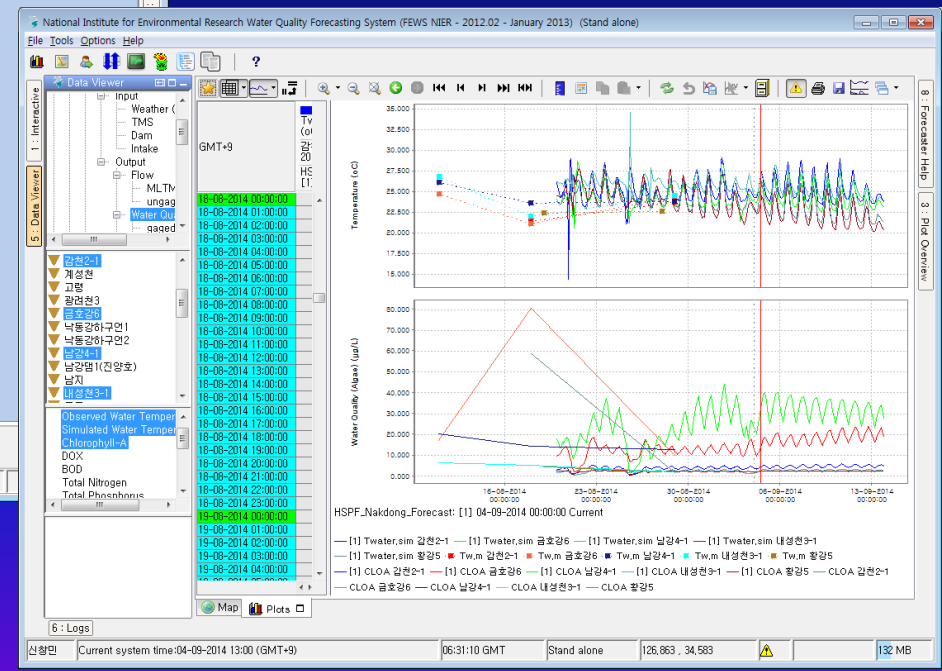
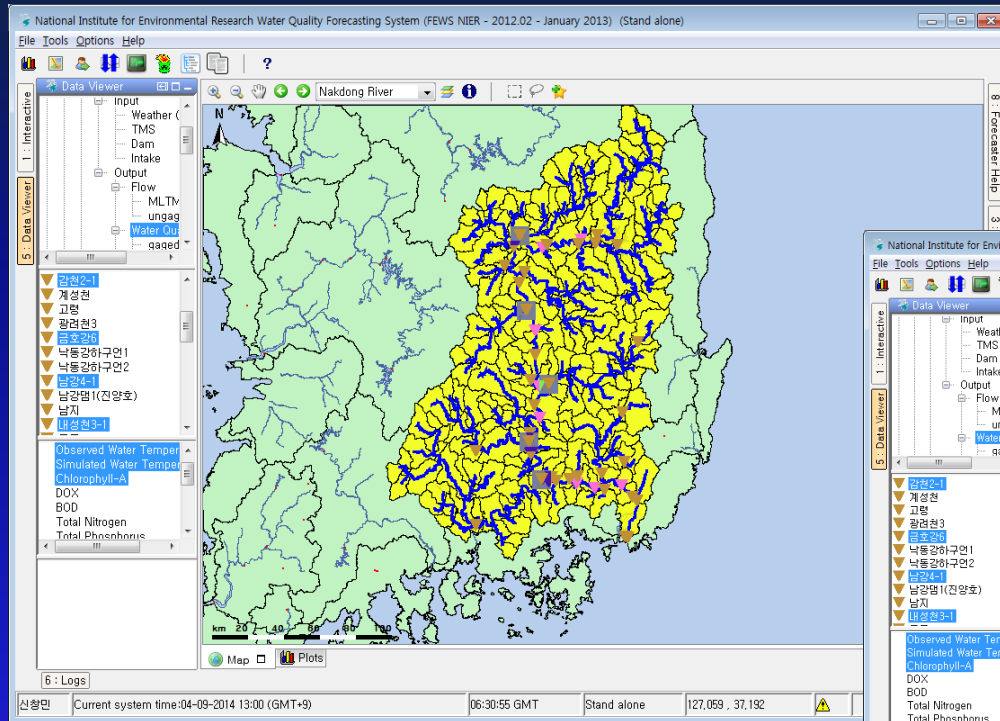
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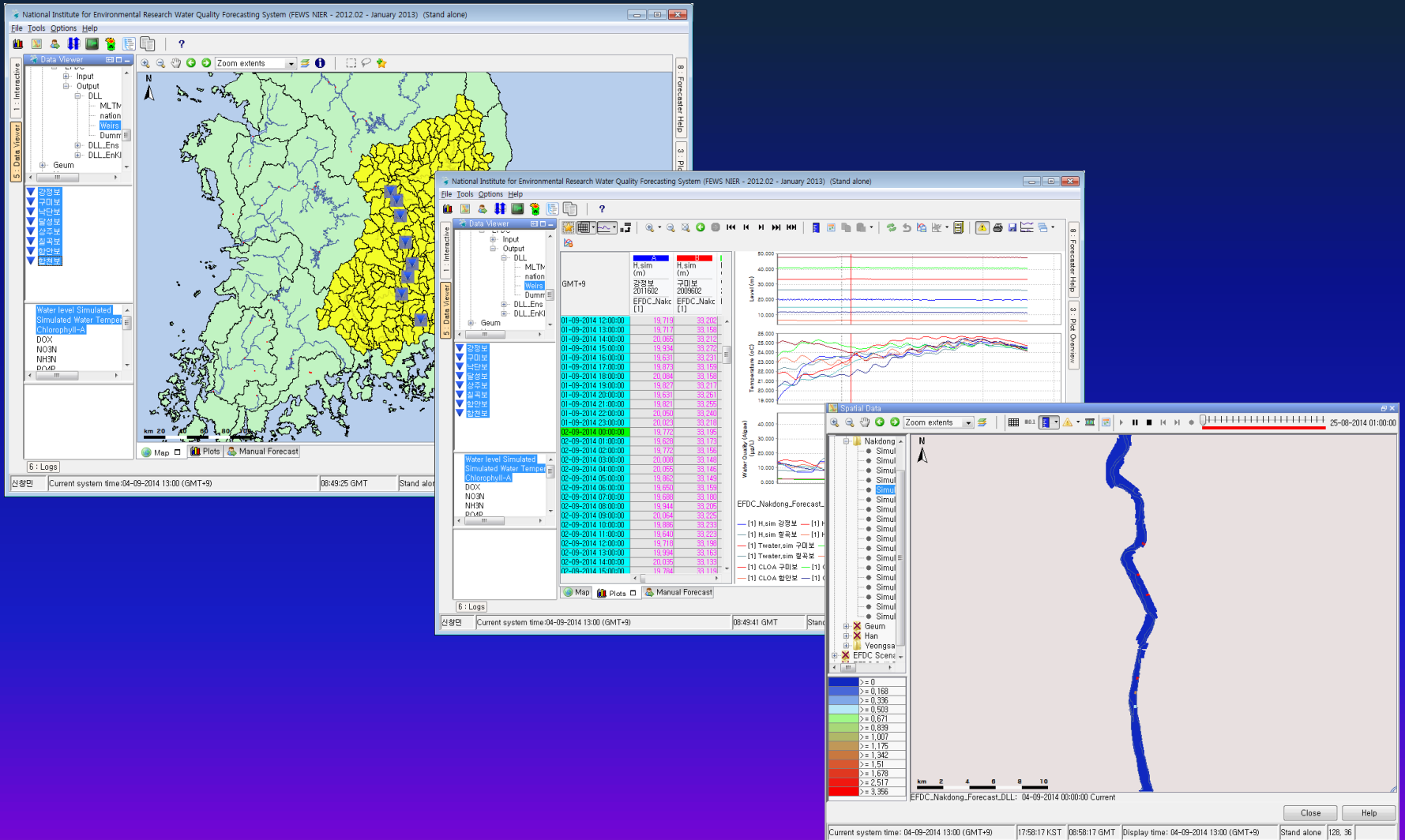


Water Quality Forecasting step (2) HSPF simulating

❖ The HSPF model provides the flow and WQ forecasting data of major tributaries as the boundary conditions of EFDC model.

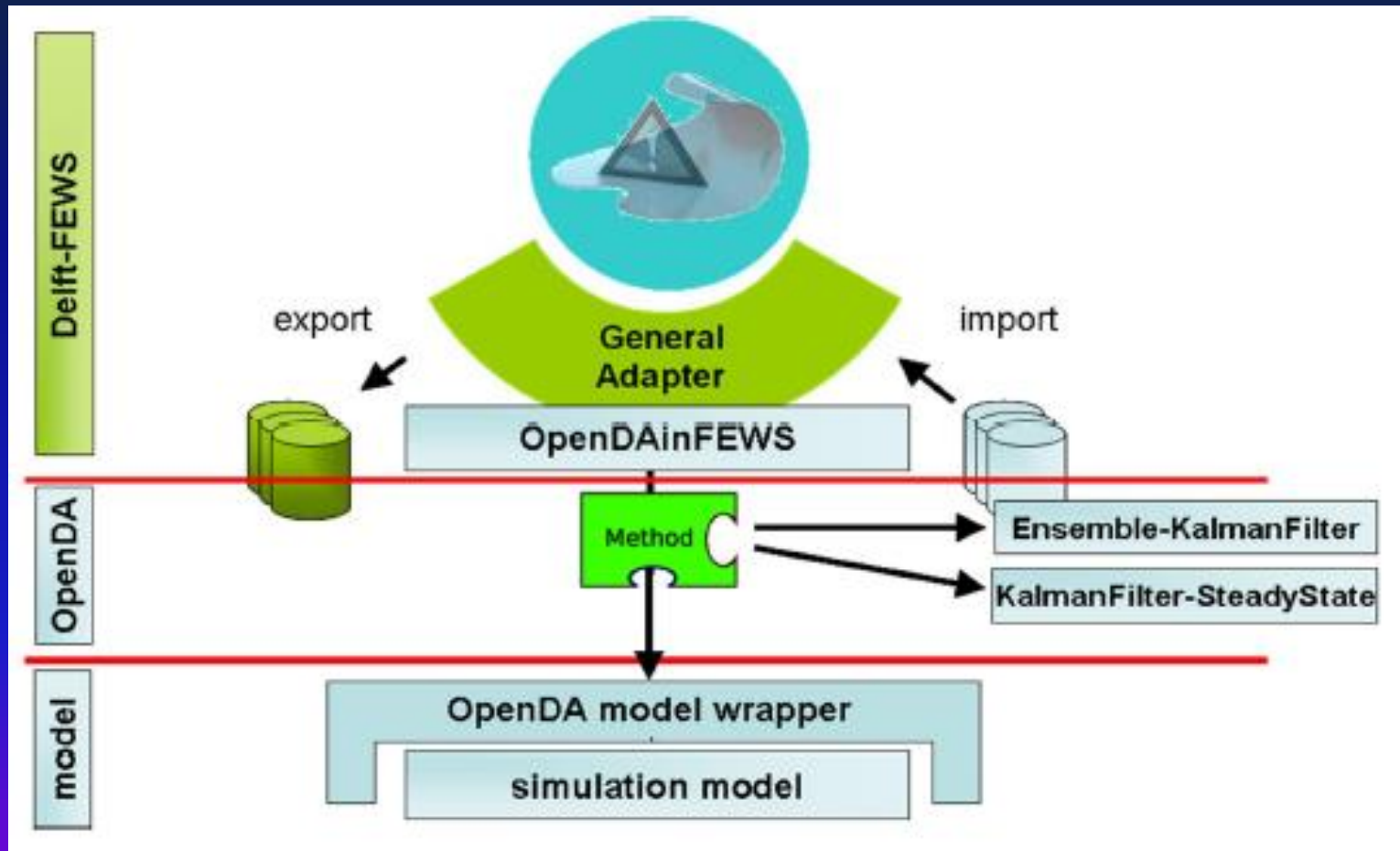


Water Quality Forecasting step (3) EFDC simulating



EnKF for EFDC in WQFS-NIER

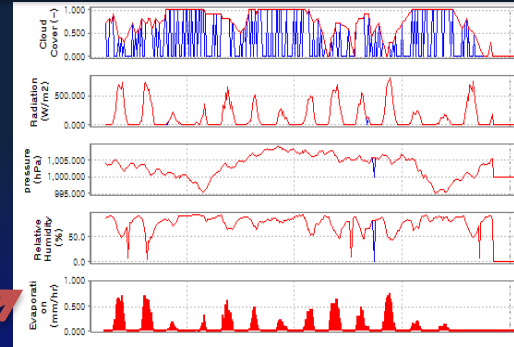
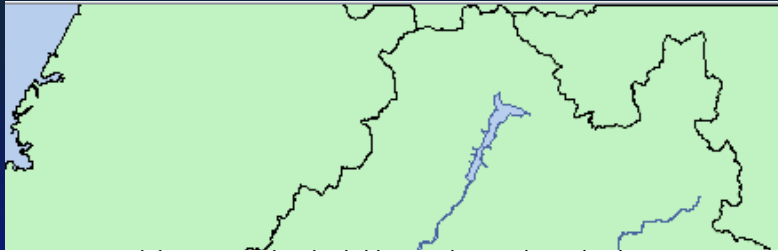
❖ General Adapter with OpenDA implementation



EnKF for EFDC in FEWS-NIER

✓ Meteorological boundary items

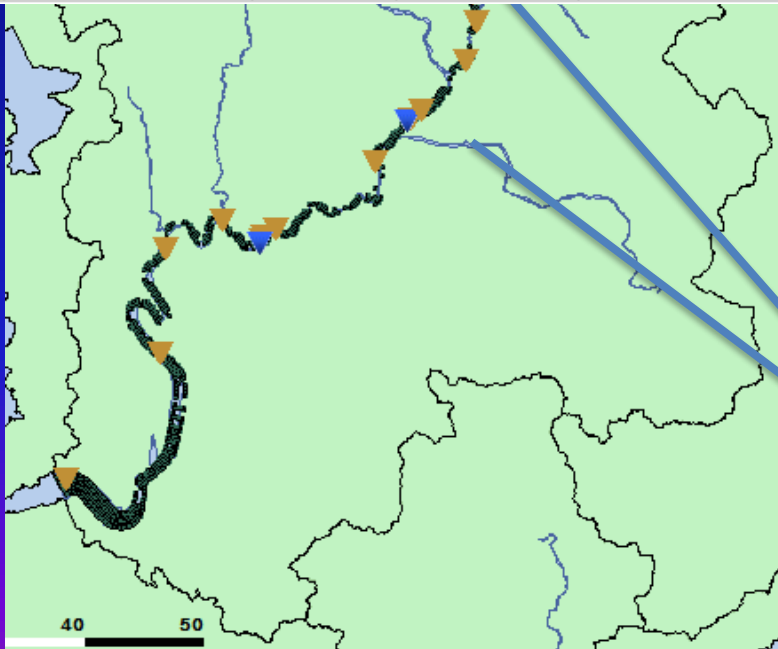
❖ Model Noise



eModelConfig

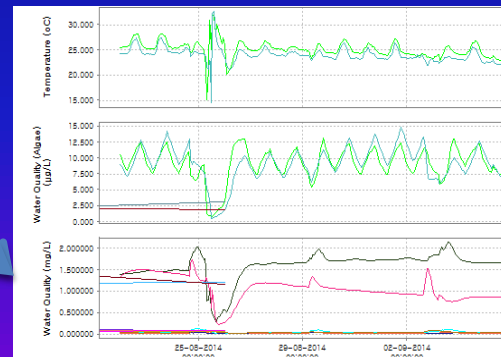
timeSeries (3)

	= id	= location	= quantity	= standardDeviation	= timeCorrelationScale	= timeCorrelationScaleUnit
1	PhosphateNoise1	4	Phosphate	0,1	72,0	hours
2	PhosphateNoise2	6	Phosphate	0,1	72,0	hours
3	GlobalRadiationNoise1	1	GlobalRadiation	200	24,0	hours



✓ Tributaries boundary items from HSPF model

— CC — [2] CC — RAD — [2] RAD — PRES — [2] PRES — RH — [2] RH — [1] PET
 [2] PET [2] P.f [2] T.f



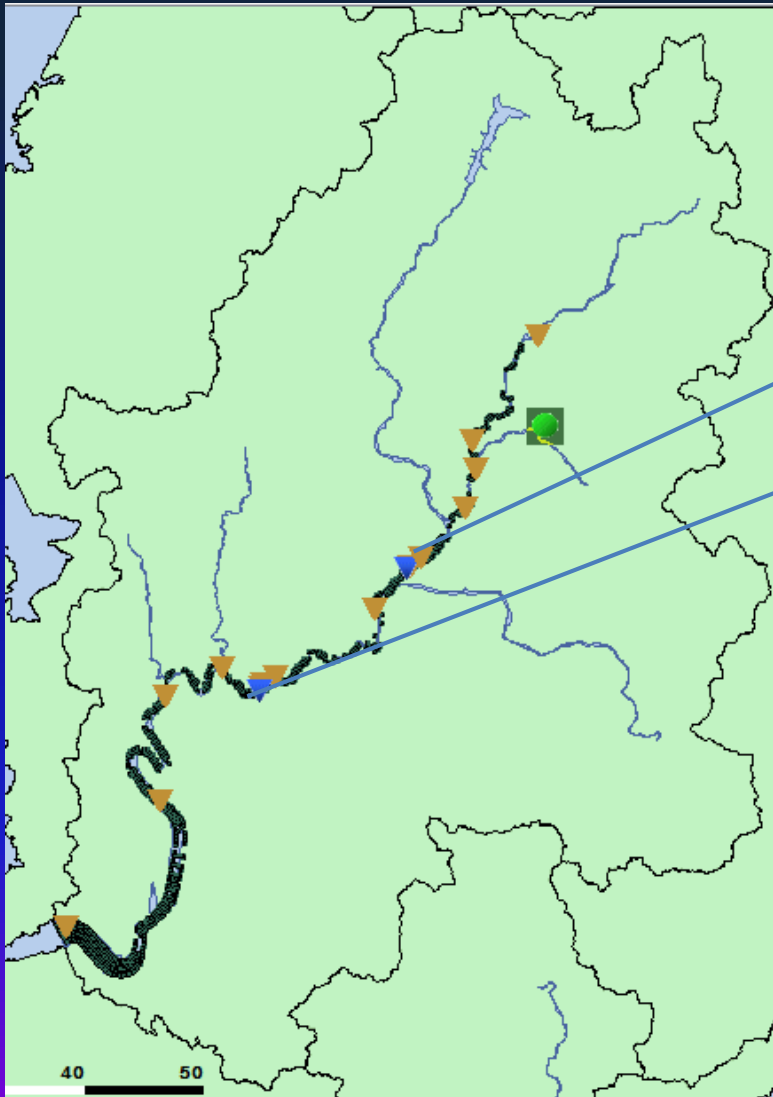
EFDC_Yeongsan_UpdateStates_DLL: [1] 06-09-2014 00:00:00 Current
 EFDC_Yeongsan_Forecast_DLL: [2] 06-09-2014 00:00:00 Current

[1] Twater.sim 지석천4 — [1] Twater.sim 황룡강3-1 — [2] Twater.sim 지석천4
 [2] Twater.sim 황룡강3-1 — [1] CLOA 지석천4 — [1] CLOA 황룡강3-1 — [2] CLOA 지석천4
 [2] CLOA 황룡강3-1 — [1] NH3N 지석천4 — [1] NH3N 황룡강3-1 — [1] NH3N 지석천4
 [1] NH3N 황룡강3-1 — [2] PO4P 지석천4 — [2] PO4P 황룡강3-1 — [2] NH3N 지석천4
 [2] NH3N 황룡강3-1 — [2] NO3N 지석천4 — [2] NO3N 황룡강3-1 — [2] NH3N 지석천4
 [2] NO3N 황룡강3-1 — [2] NH3N 지석천4 — [2] NH3N 황룡강3-1 — [2] PO4P 지석천4 — [2] PO4P 황룡강3-1

EnKF for EFDC in FEWS-NIER

❖ Observation Noise

✓ PDF : set standard deviation 0.001



uncertaintyType	ProbabilityDistributionFunction	
probabilityDistributionFunction (2)		
	id	isActive
	1	107, AlgalDiatom true
	2	104, AlgalDiatom true
		normal
		normal
		mean 0
		stdv 0,001
		stdvlsFactor false
		normal
		mean 0
		stdv 0,001
		stdvlsFactor false

***Thank you for the attention!
Questions or Comments?***

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***Water Quality Control Center
National Institute of Environmental Research***