Introduction to the Pudong(Shanghai) FEWS System

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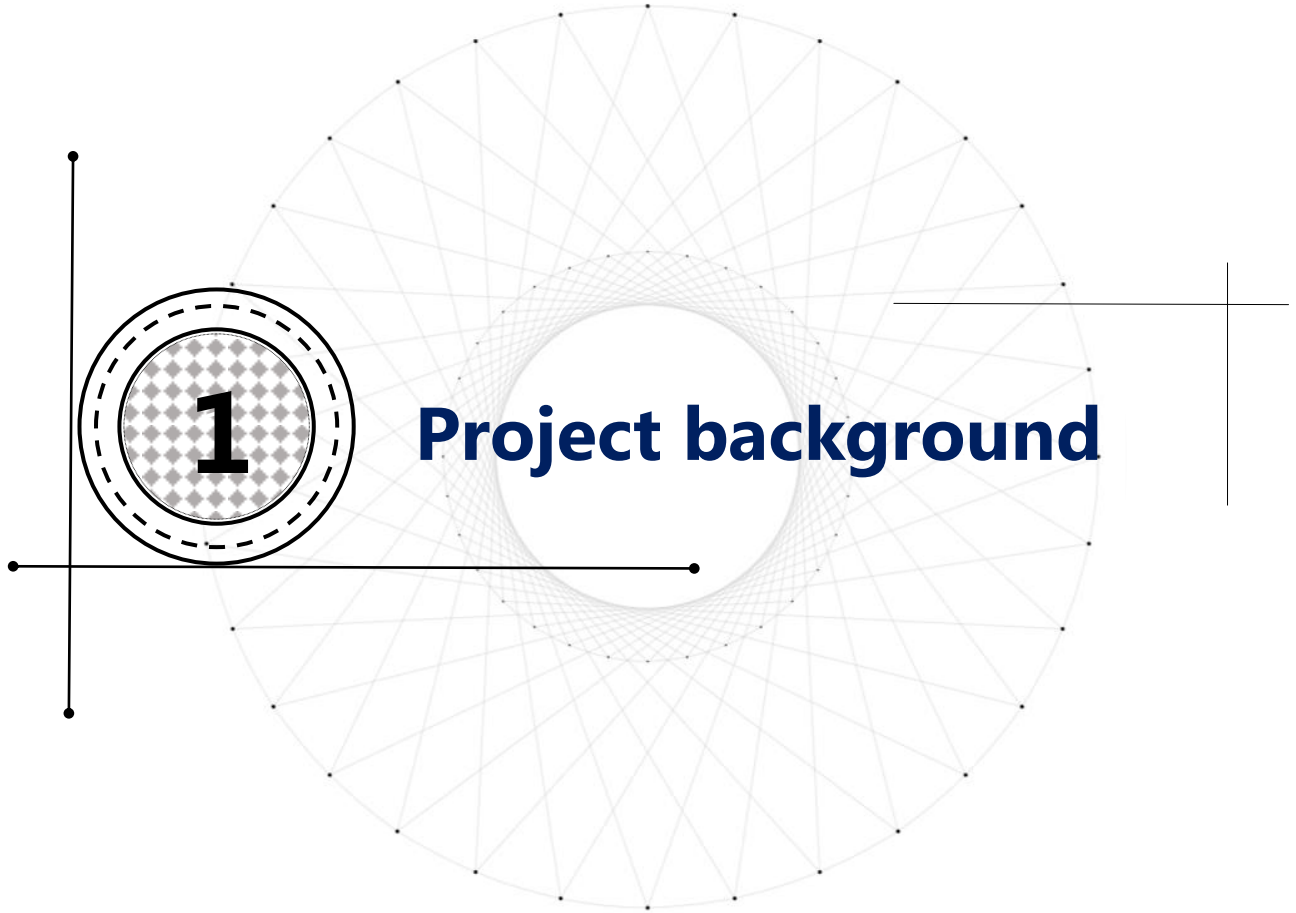
1 Project background

2 Objectives and the system design

3 Phase I deliverables

4 Client’s expectations beyond



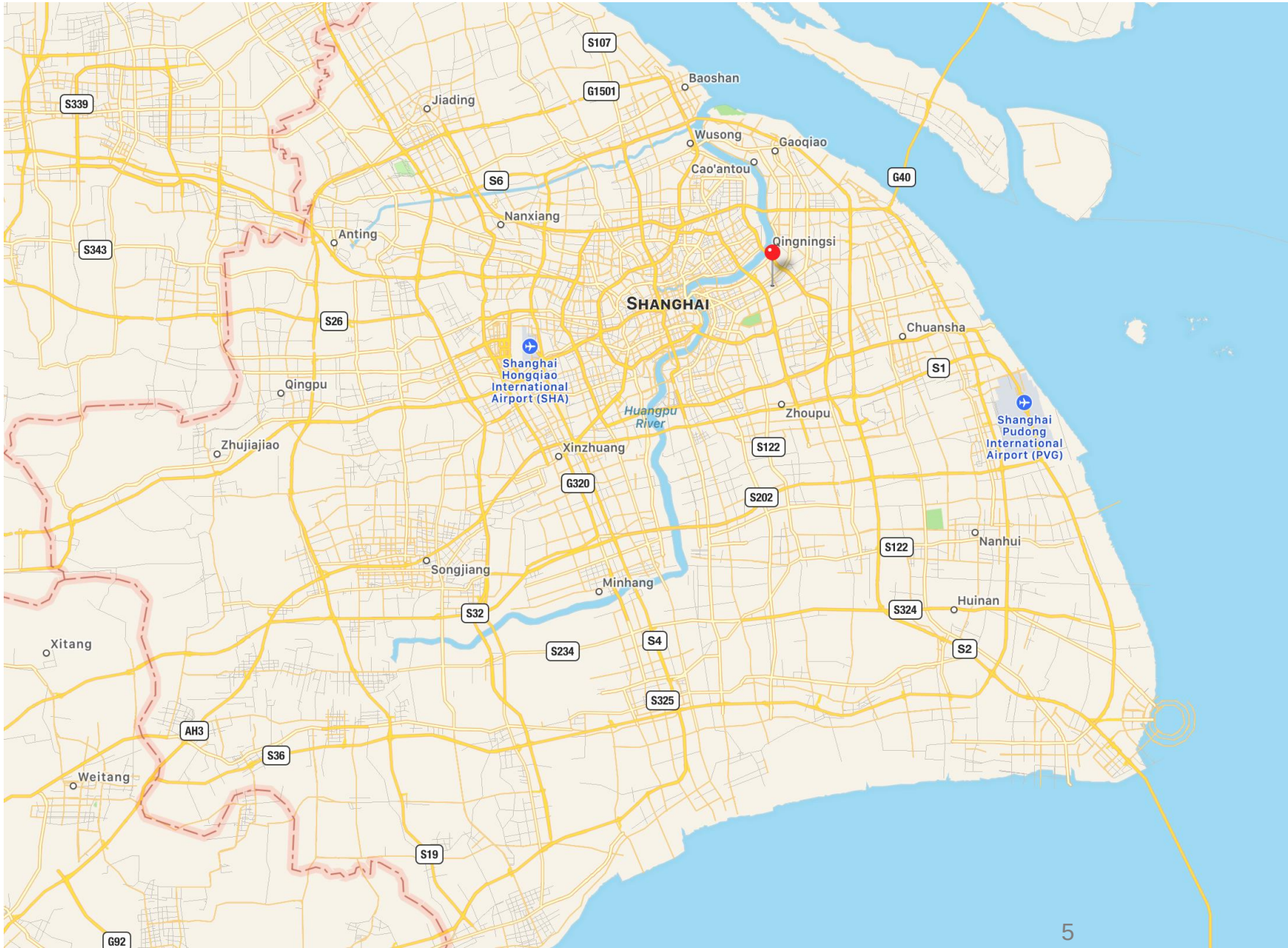
Project background

Project background

- The Project was supported by the Cooperation Framework between the South Holland Province and Pudong Municipal Government;
- Founded by Pudong Municipal Government and developed by Ewaters and Deltares cooperation;
- Expect to develop with 3 phases;
- Phase I completed and in operation since July 2017.

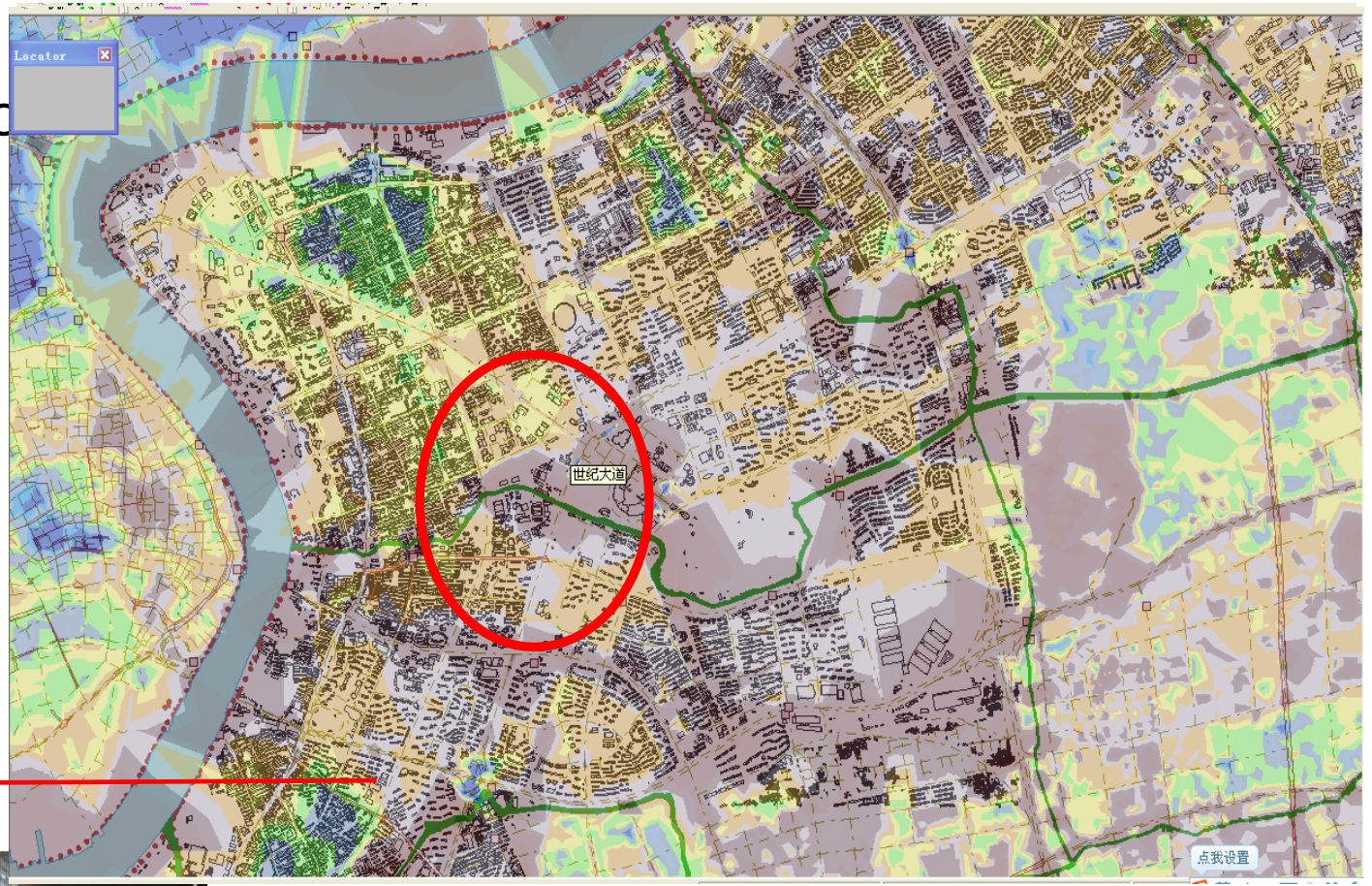
Project Site –Pudong New District/ Shanghai East Area

- 1400km2
- 6m people
- Under rapid development
- Terrain (3.0~4.5m)
- Costal line 46km
- Dense of River network



Challenge of flooding

- The flat terrain, locked by the majo Huangpu River and coastal line, leads to increasing threats in dealing with extreme weather conditions, storm surge, as well as the climate change.



2 Objectives and the system design

Objectives – Data to knowledge for decision making

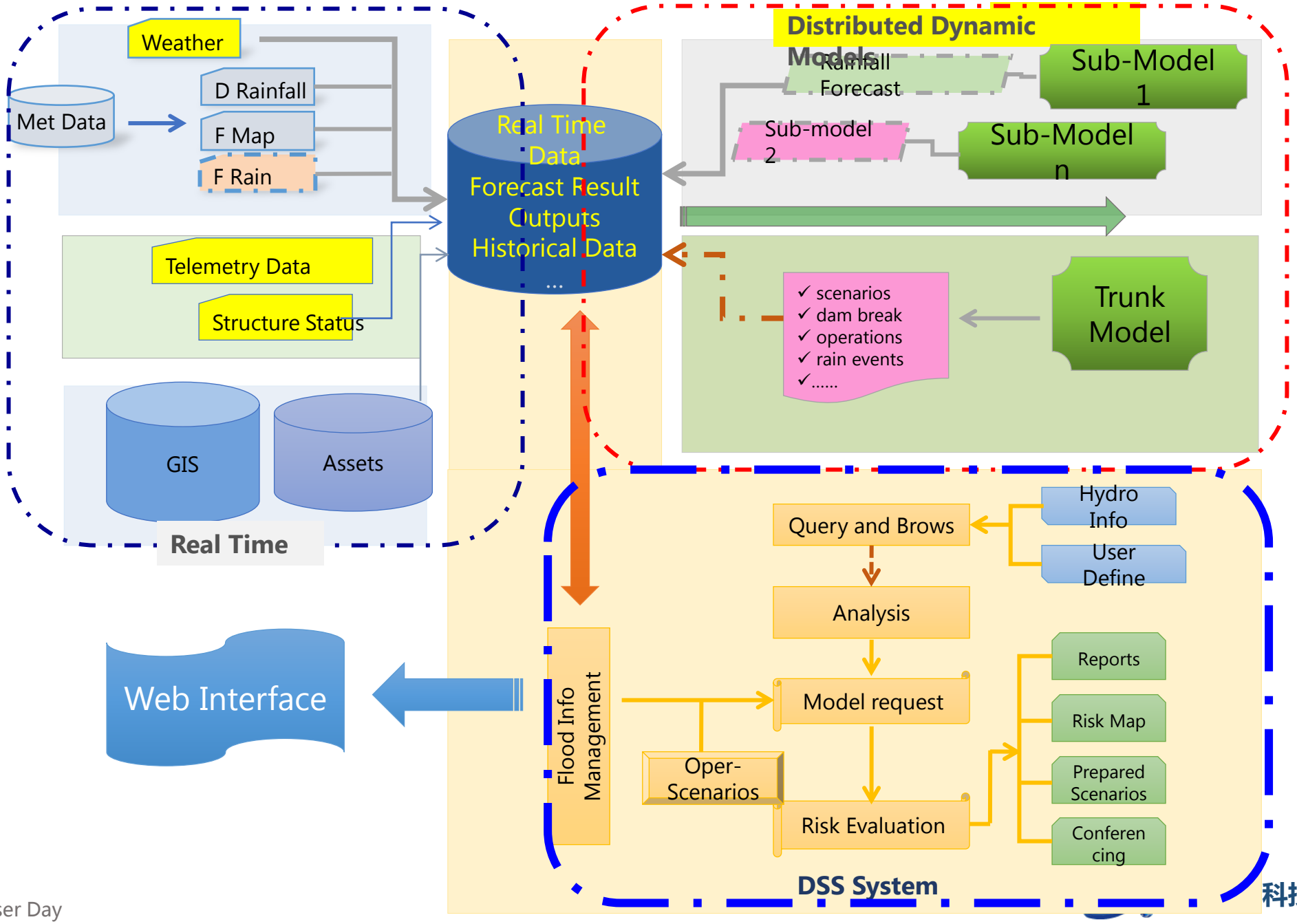
- Hot topics on Smart City/ Big data/Intelligent water Management in China
- Telemetry Systems are well developed, huge amount of data available
- The central CBD and a number towns were flooded twice in 2015, but struggled to use the data efficiently , and to help make good decisions
- Develop a good framework to integrate all available data and intelligent solutions
- Improve the quality of technical outputs for decision making

- Develop applications with FEWS was considered the right choice

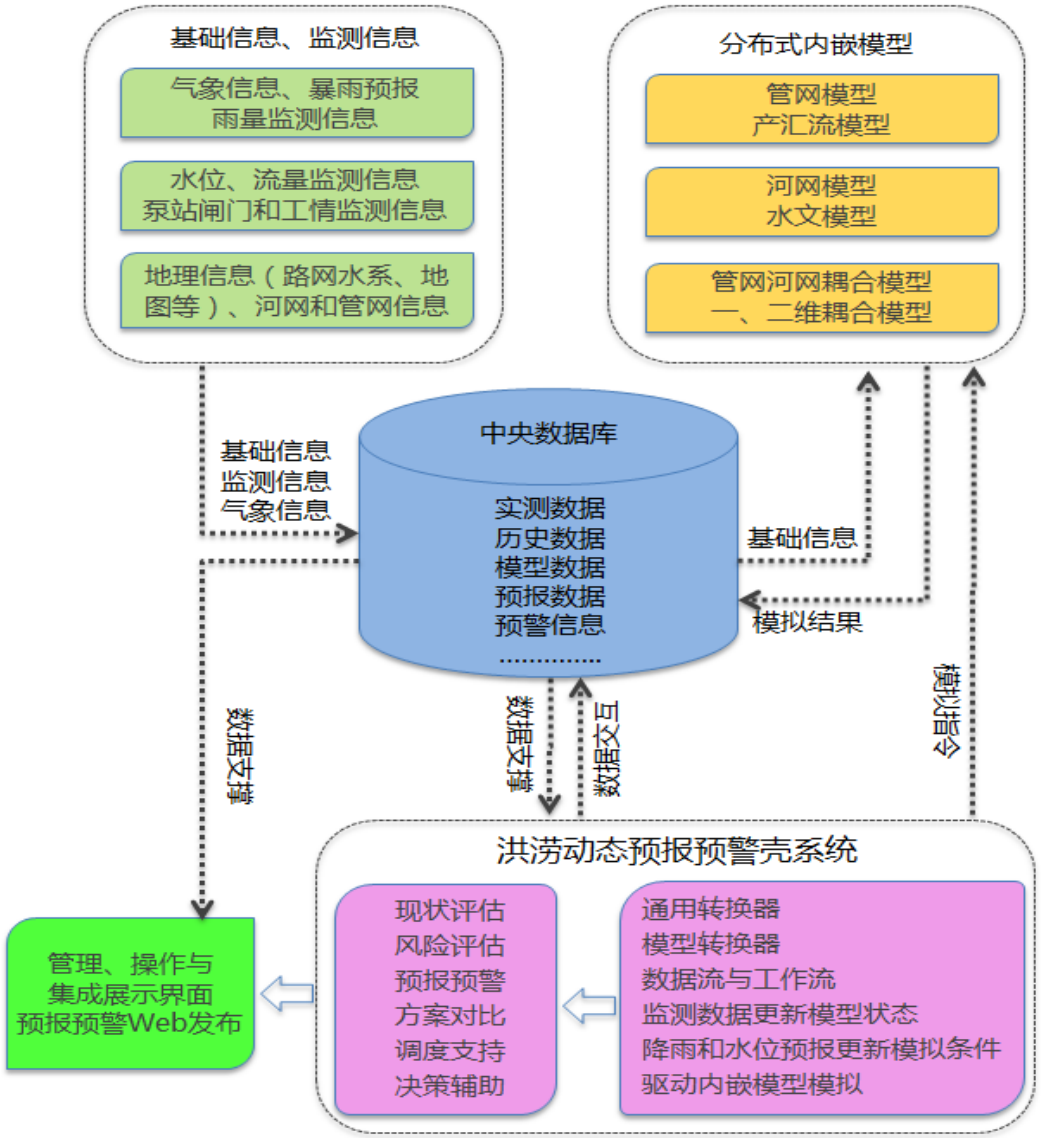
System Development Works

- Framework, functionality design
- Data Integration of meteorology, river& tide level, Pumps and gates
- Conversion and quality check
- Mike model conversion to Sobek
- Urban SW 1D+2D model development,
- Model calibration
- Development, operational testing
- Installation and training and support

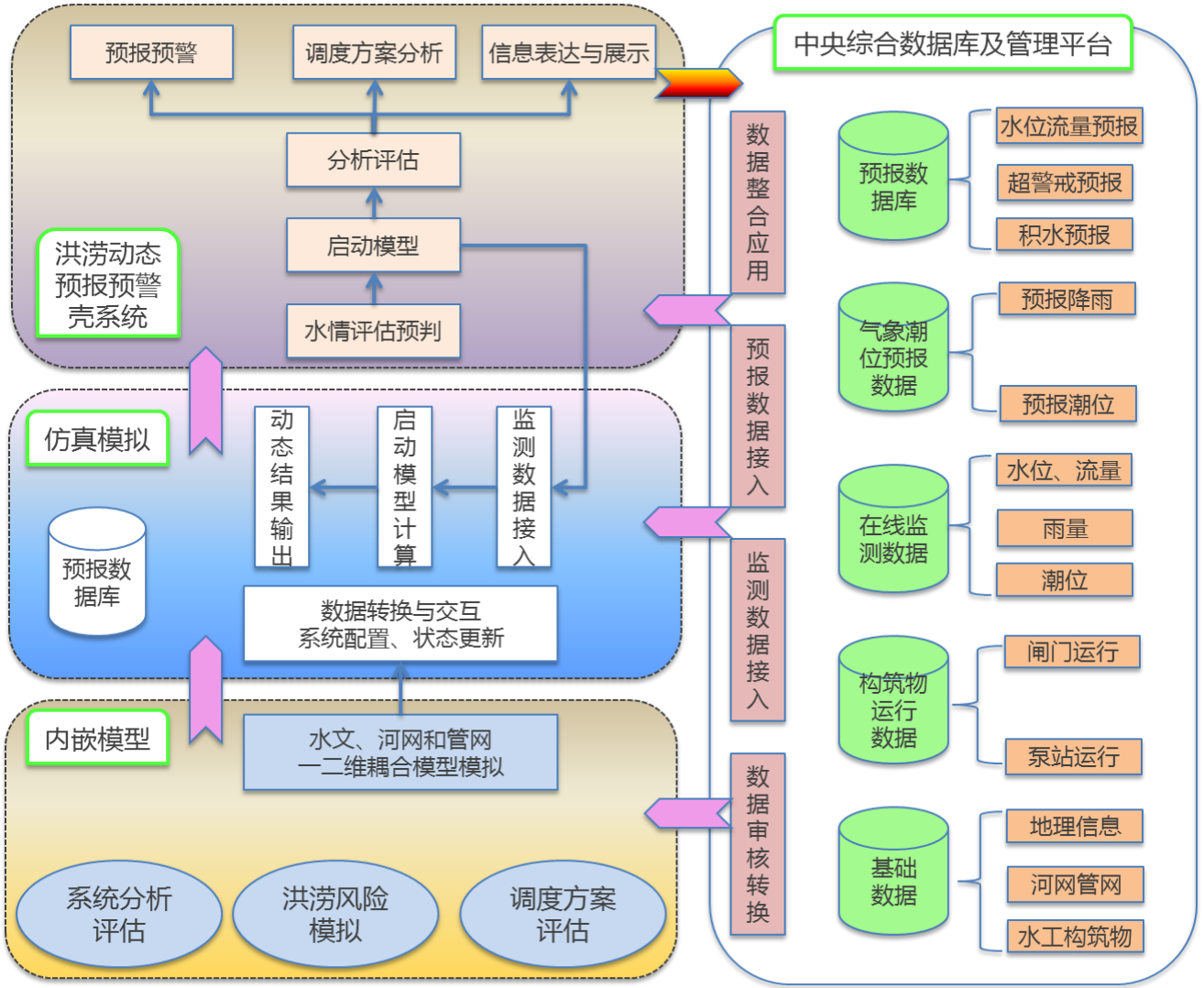
Pudong Urban FEWS System Conceptual Framework



系统设计



系统内部数据流设计

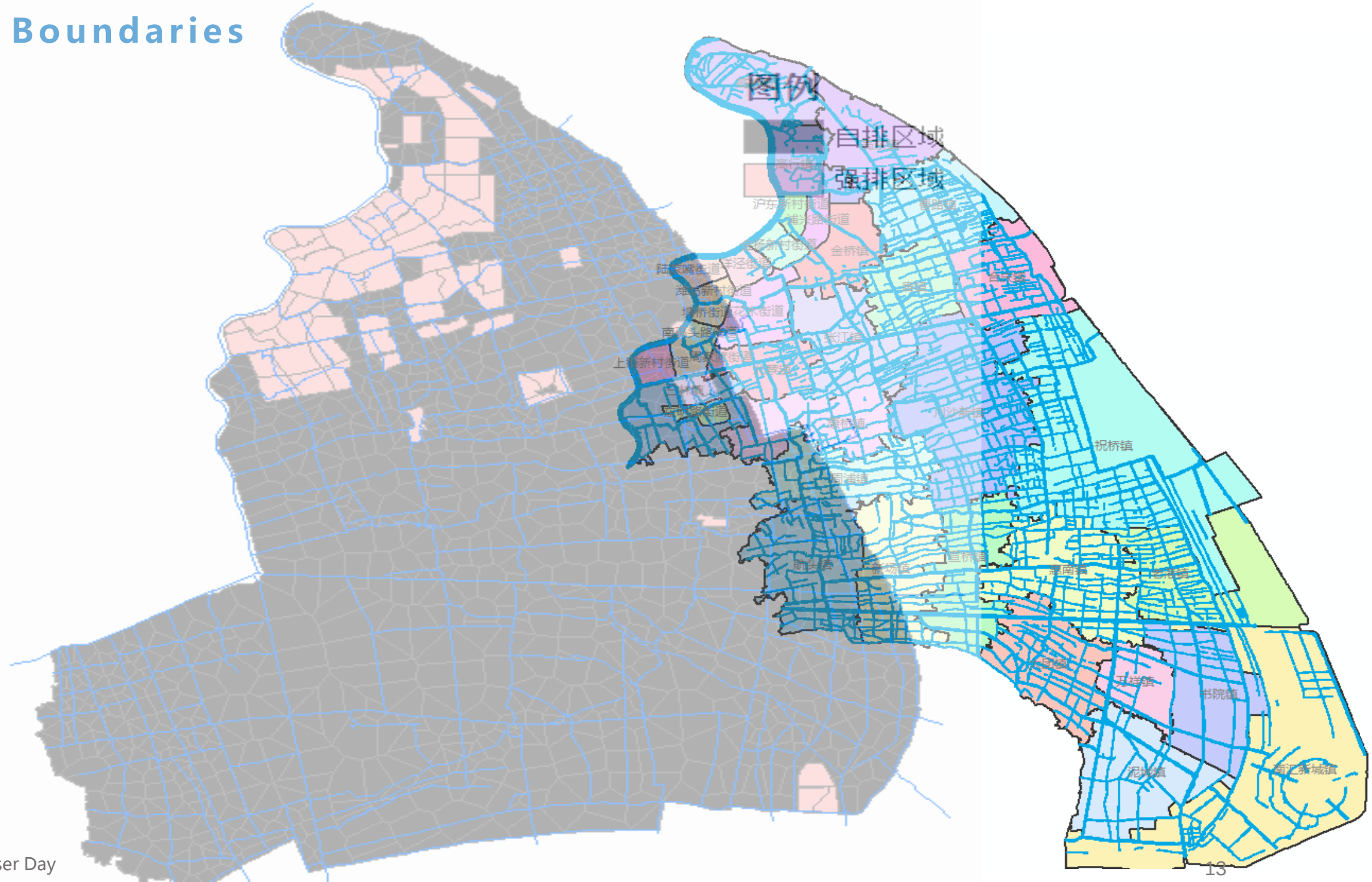


系统预报预警工作流设计

运行模式/Operational Modes

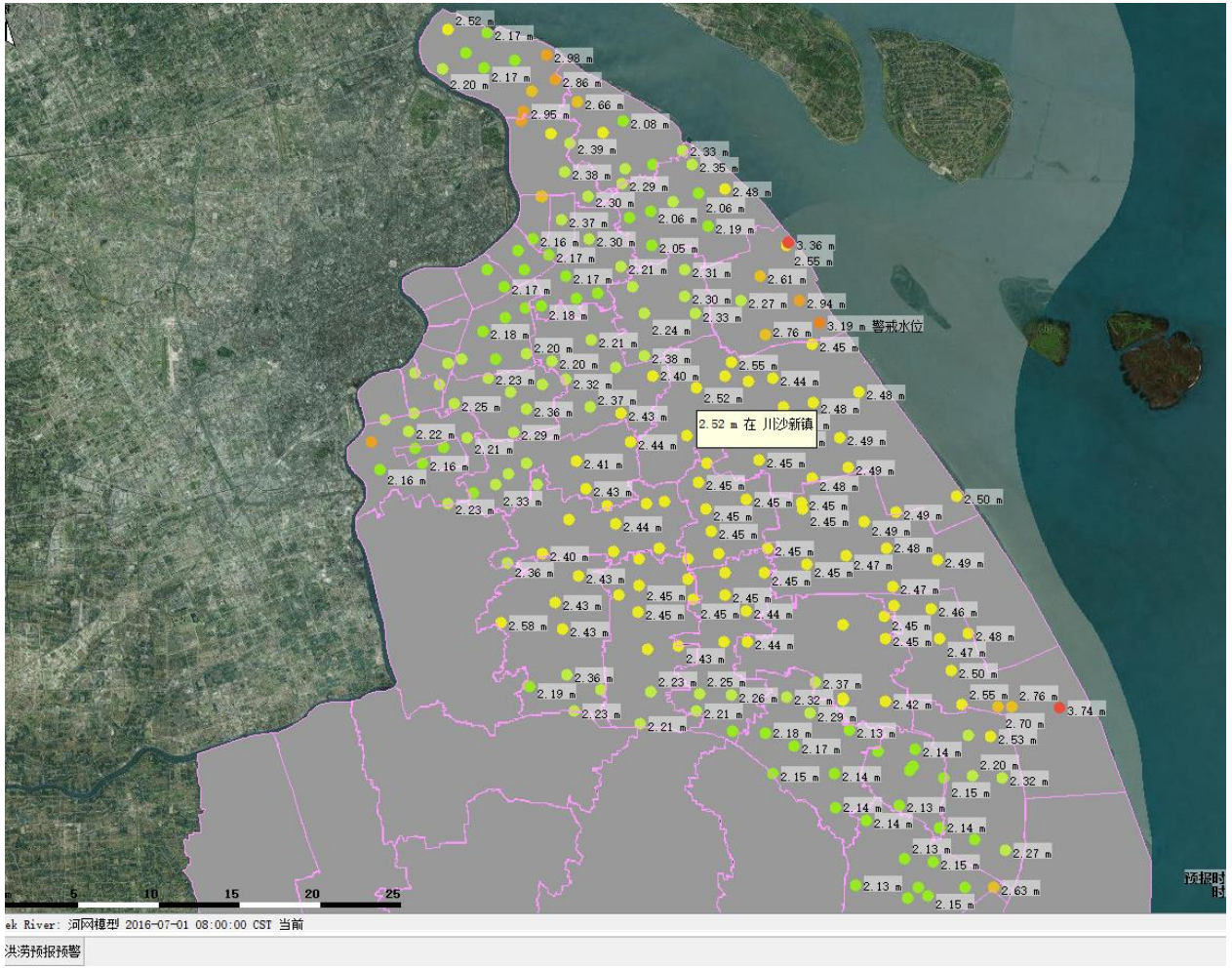
正常模式 Normal	信息查询、组合查询、统计、报表
	实时信息图表展示
	等值线等动态展示
	设施状态展示
警戒模式 Critical	降雨趋势和发展趋势预测
	风暴潮趋势和发展趋势预测
	目前趋势与预案比较
	目前趋势与历史事件比较
	可能发生的影响程度、范围和风险评估
应急模式 Emergency	准备和输出暴雨预报和模型需要的资料
	准备和输出泵站、水闸等状态和调度预案资料
	启动实时模拟
	读取和处理模型模型预报结果
	动态风险评估、展示；影响/淹没范围
	影响设施/单位和水深
	代表点/关注点预测积水/水位过程，积水深度

System Boundaries

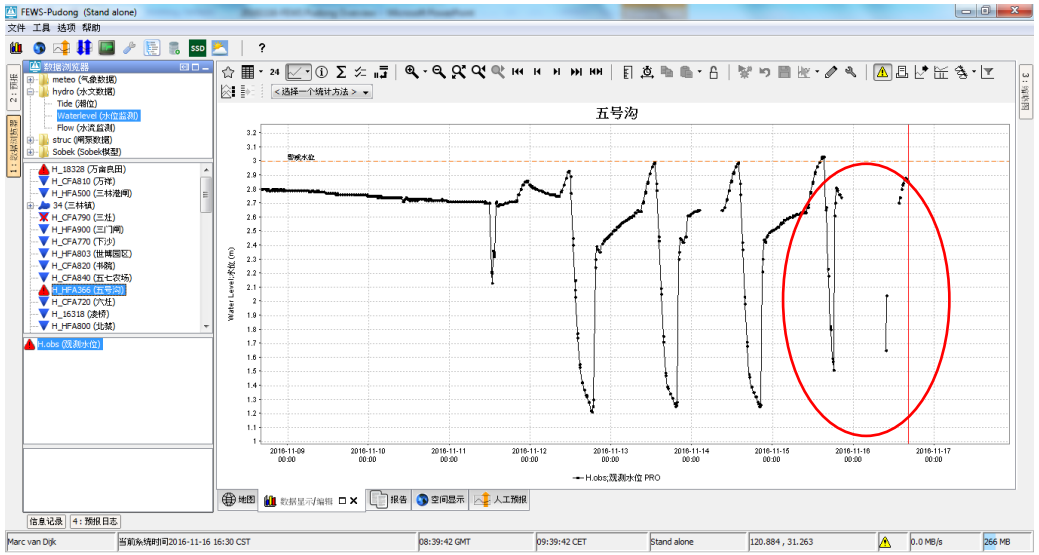


Integration of real time measured data

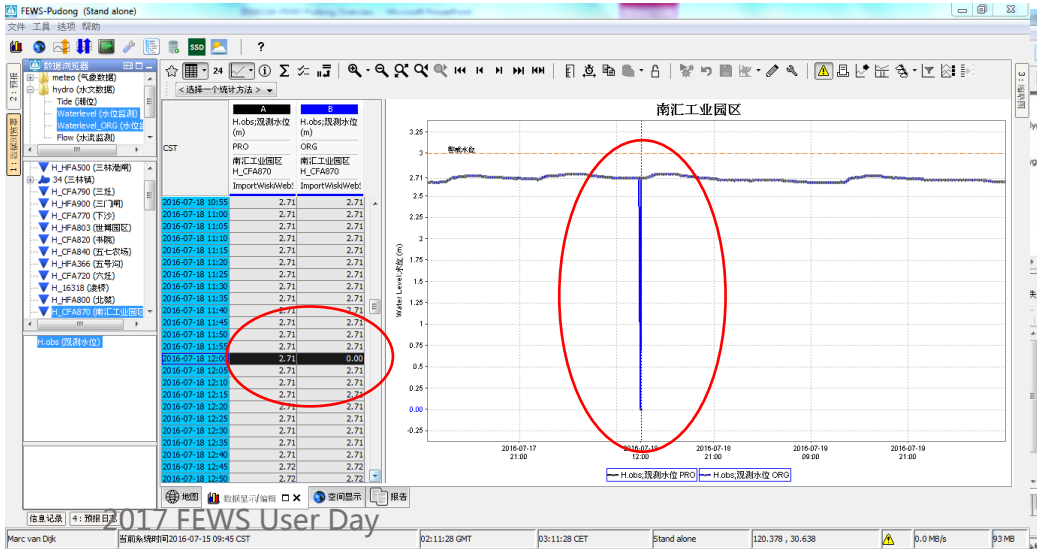
- 120+ Rain gauges
- 15 Wind stations
- 18 tidal sites
- 56 river level site、
- 14 flow sites
- 300+sites of interests

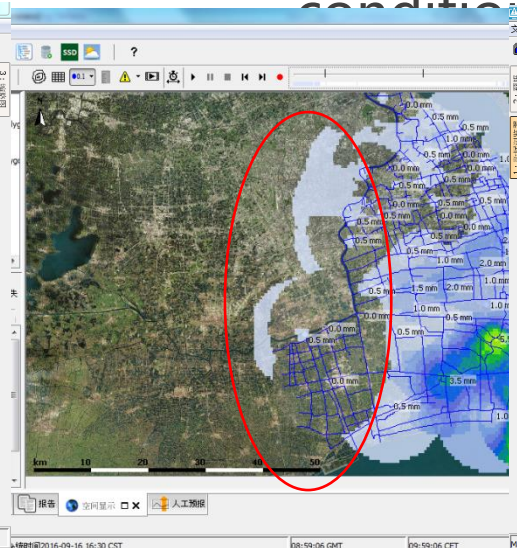


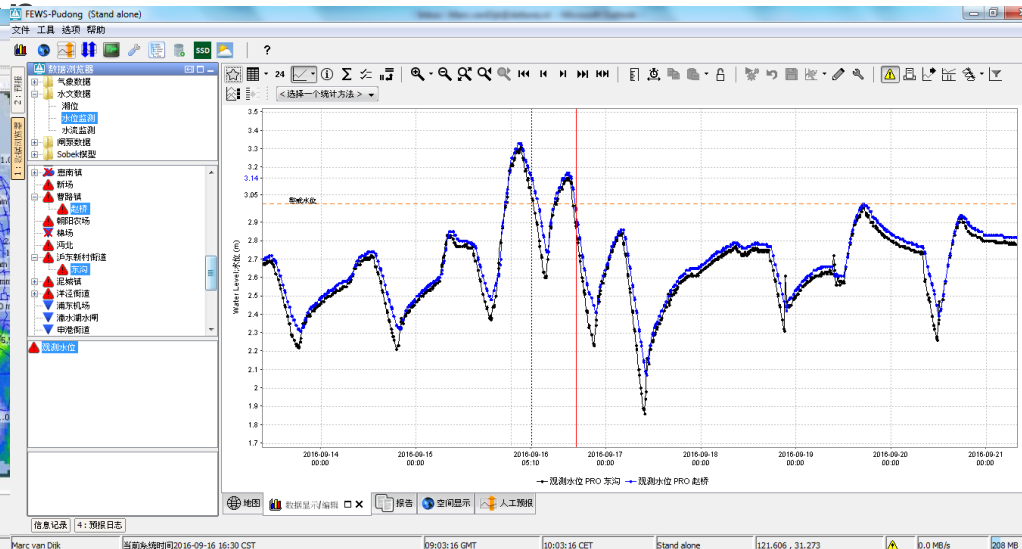
Date process model



- Missing data
- Suspected data
- Data flag
- Better data for model upgrade of initial condition

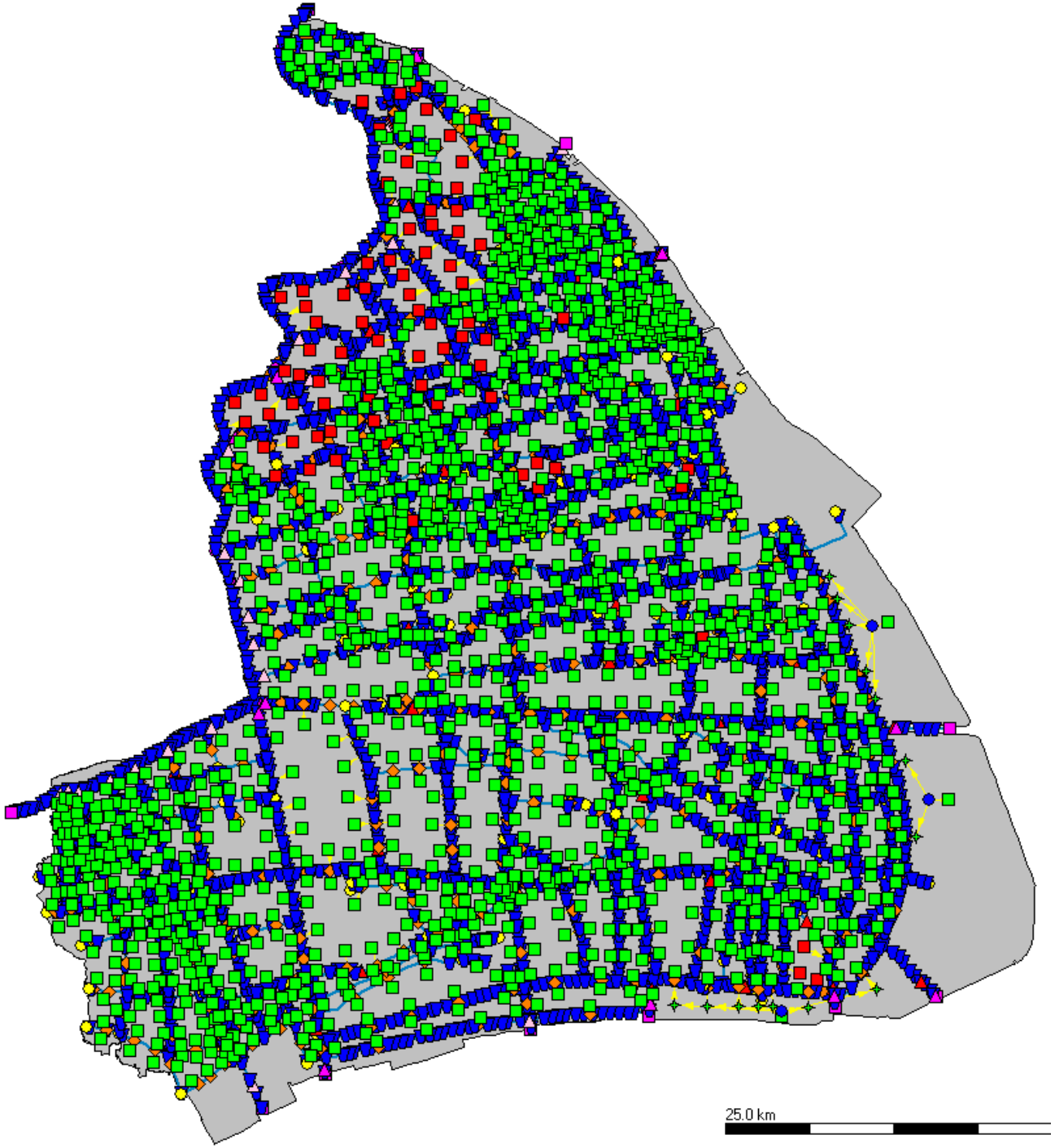






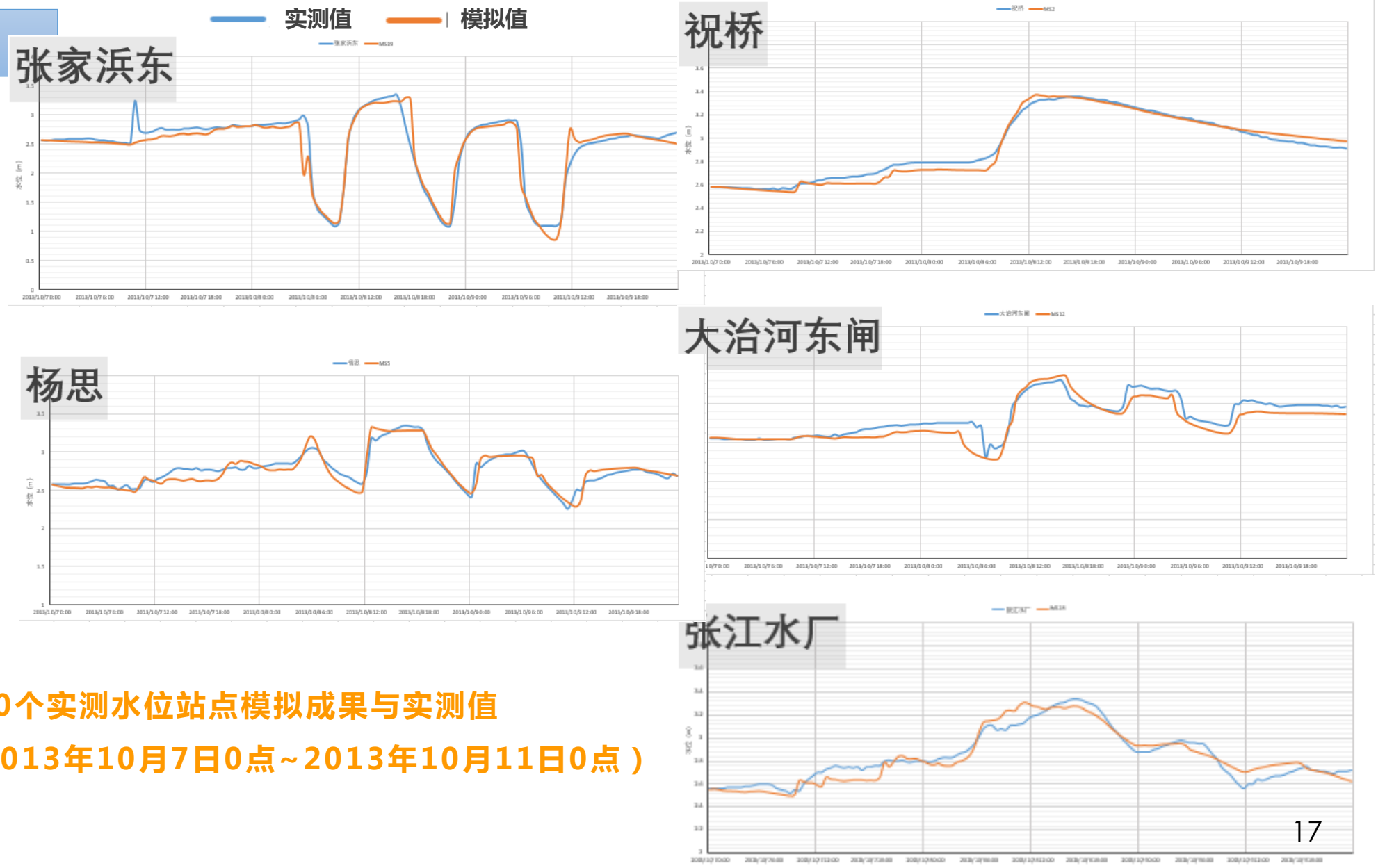
Sobek 1D River model

- Whole Pudong plus fengxian and mir together(2200km^2)
- 884 Rivers with 8173 cross sections
- 1673 catchments including 77 pumps sub ;
- 58 pumps and gates
- 59 rainfall stations
- 13 tide sites



Calibration

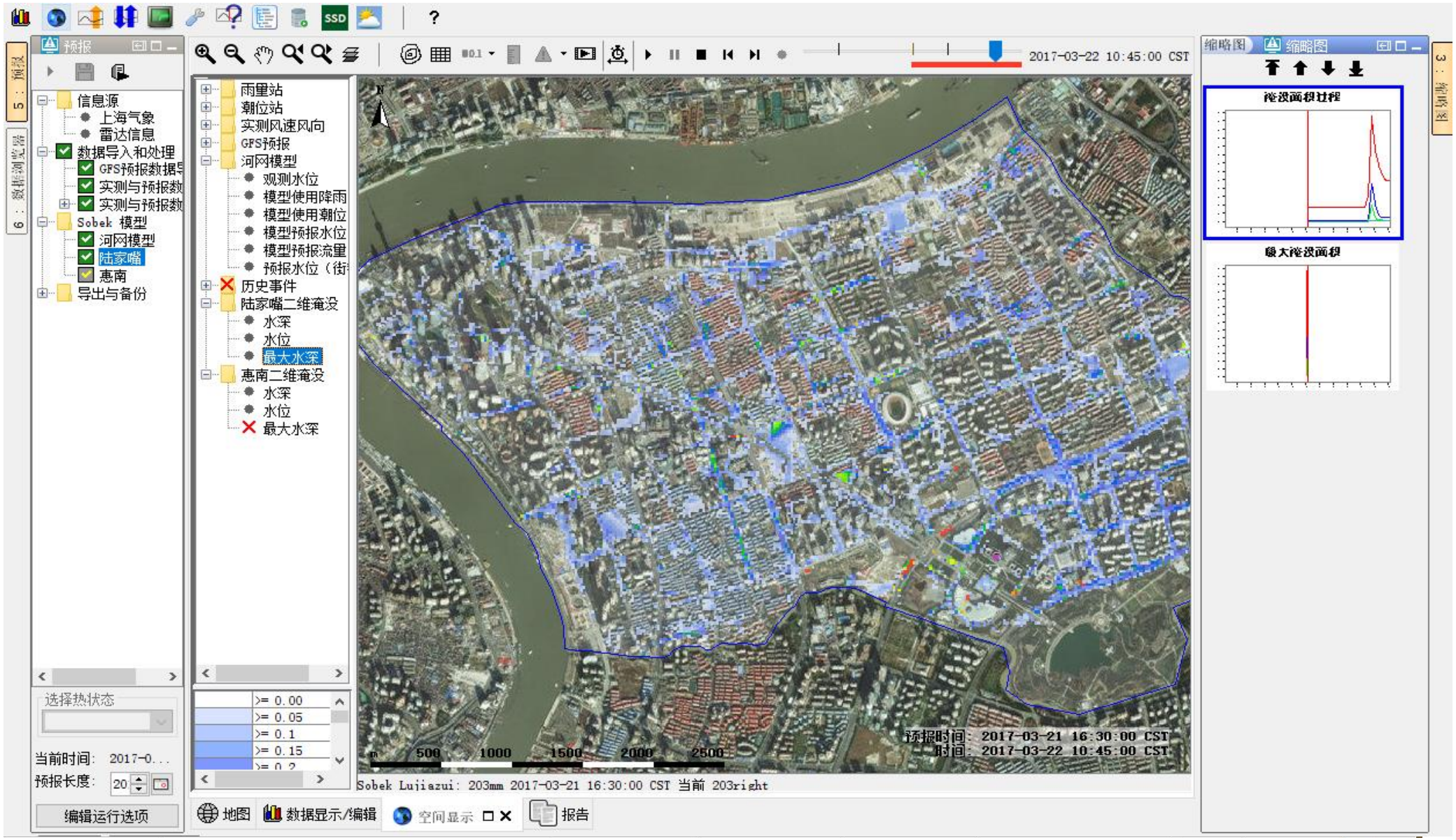
Using 40 monitoring river level for calibration



40个实测水位站点模拟成果与实测值

（菲特台风2013年10月7日0点~2013年10月11日0点）

Sobek Urban 1D-2D Pipe model



3 Phase I deliverables

浦东新区洪涝预报预警系统 (Stand alone)

文件 工具 选项 帮助

数据浏览器

- 气象数据
  - 降雨
    - 观测降雨
    - 1小时雨量
    - 3小时雨量
    - 6小时雨量
    - 12小时雨量
  - 气压
  - 蒸发
- 雨量站
  - 观测降雨
  - 观测降雨（街镇）
  - 预报降雨（站点）
  - 预报降雨（网格）
  - 预报降雨（街镇）
- 潮位站
  - 观测潮位
  - 预报潮位
- 实测风速风向
- GFS预报
  - GFS预报降雨
  - GFS预报风速风向
- 河网模型
  - 观测水位
  - 模型使用降雨
  - 模型使用潮位
  - 模型预报水位
  - 模型预报流量
  - 预报水位（街镇）
- 历史事件
- 陆家嘴二维淹没
- 惠南二维淹没

万亩良田
万祥
三林港闸
三林镇
三灶
三甲港
三门闸
下沙
世博园区
世纪公园
东沟
东滩
中港闸
九段沙
书院
五七农场
五号沟
六灶
凌桥
北蔡

观测降雨
预报降雨

移动累积
15 分
忽略缺失

>= 1.0
>= 1.2
>= 1.4
>= 1.6
>= 1.8
>= 2.0
>= 2.2
>= 2.4
>= 2.6
>= 2.8
>= 3.0
>= 3.2
>= 3.4
>= 3.6
>= 3.8
>= 4.0
>= 4.2

2017-03-21 14:15:00 CST

2.55 m - 高桥镇
2.61 m - 高东镇
2.57 m - 高行镇
2.47 m - 沪东新村街道
2.47 m - 浦兴路街道
2.62 m - 曹路镇
2.60 m - 金杨新村街道
2.60 m - 洋泾街道
2.62 m - 唐镇
2.64 m - 合庆镇
2.62 m - 南码头路街道
2.64 m - 周家渡街道
2.66 m - 上钢新村街道
2.68 m - 张江镇
2.66 m - 北蔡镇
2.52 m - 川沙新镇
2.64 m - 东明街道
2.64 m - 三林镇
2.67 m - 康桥镇
2.63 m - 六灶镇
2.66 m - 周浦镇
2.63 m - 祝桥镇
2.64 m - 航头镇
2.59 m - 宣桥镇
2.65 m - 惠南镇
2.64 m - 老港镇
2.65 m - 大团镇
2.65 m - 万祥镇
2.64 m - 书院镇

横沙岛
九段沙
上海市
徐汇区

预报时间: 2017-03-21 14:15:00 CST
时间: 2017-03-21 14:15:00 CST

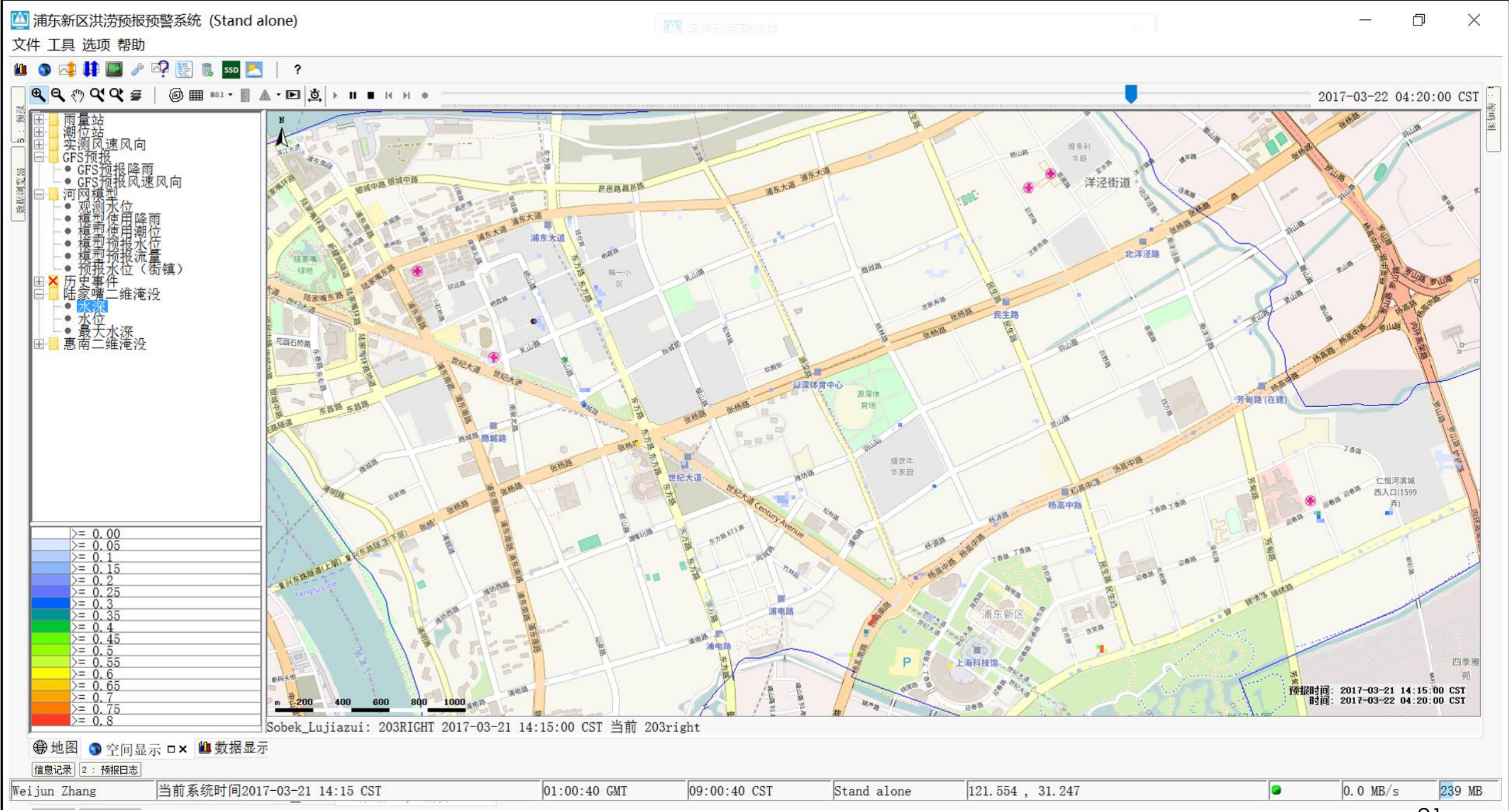
Sobek_River: 203RIGHT 2017-03-21 14:15:00 CST 当前 203right

据显示/编辑

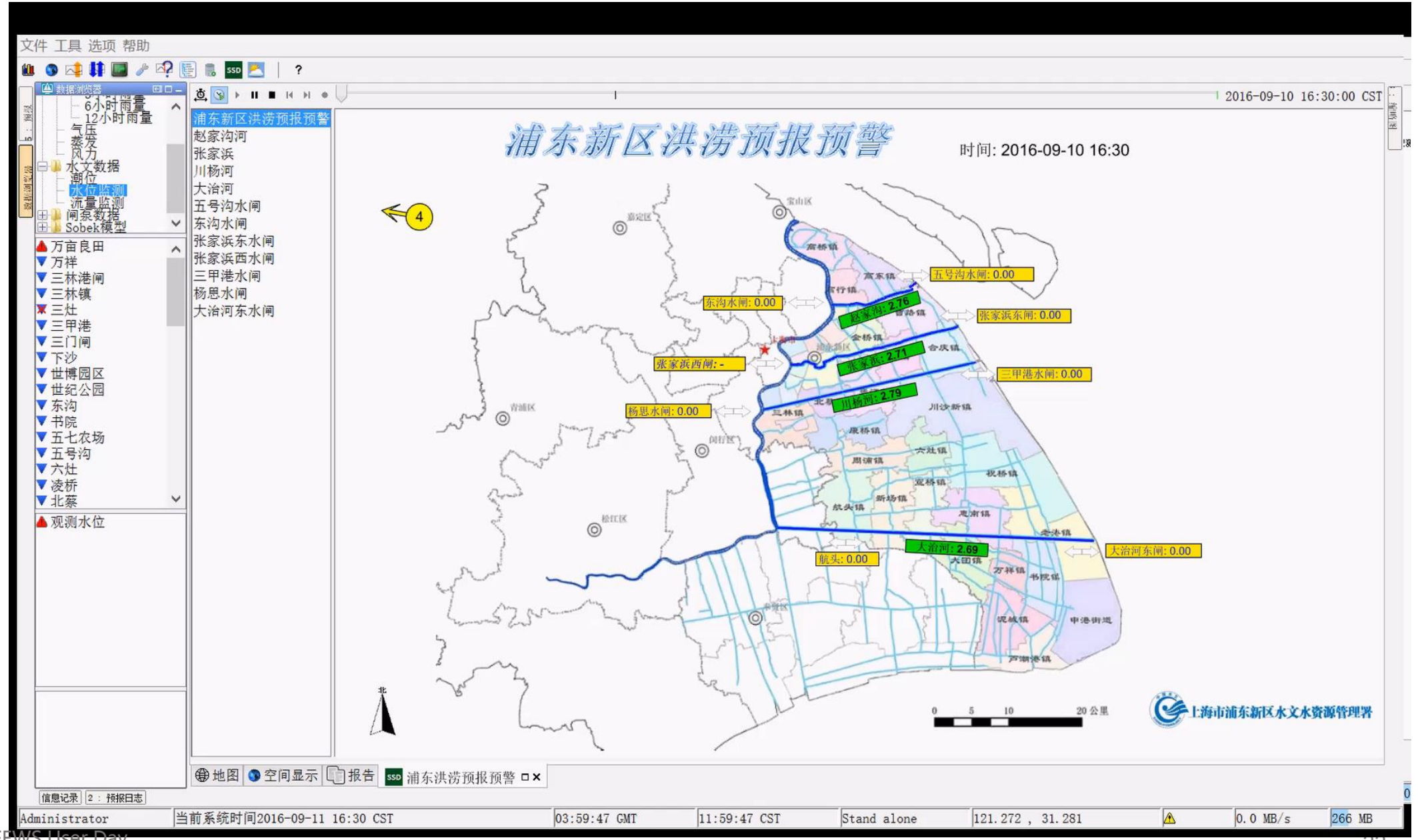
缩略图

信息记录 | 2 : 预报日志

Weijun Zhang | 当前系统时间2017-03-21 14:15 CST | 00:54:11 GMT | 08:54:11 CST | Stand alone | 121.405 , 31.374 | 0.0 MB/s | 209 MB

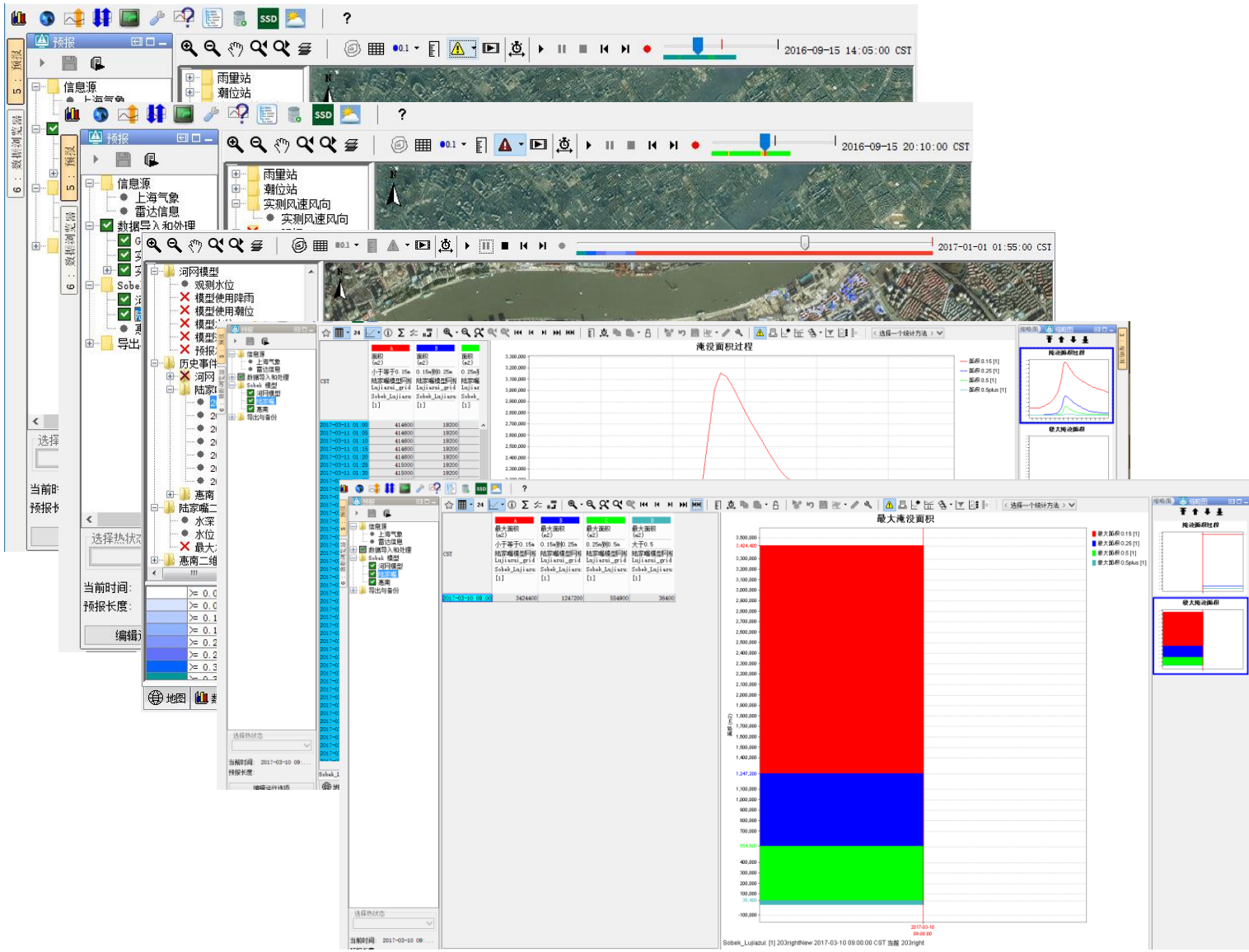

浦东新区洪涝预报预警系统 (Stand alone)
文件 工具 选项 帮助
2017-03-22 04:20:00 CST
雨量站
潮位站
实测风速风向
GFS预报
GFS预报降雨
GFS预报风速风向
河网模型
观测水位
模型使用降雨
模型使用潮位
模型预报水位
模型预报流量
预报水位（街镇）
历史事件
陆家嘴二维淹没
水深
水位
最大水深
惠南二维淹没
>= 0.00
>= 0.05
>= 0.1
>= 0.15
>= 0.2
>= 0.25
>= 0.3
>= 0.35
>= 0.4
>= 0.45
>= 0.5
>= 0.55
>= 0.6
>= 0.65
>= 0.7
>= 0.75
>= 0.8
洋泾街道
北洋泾路
浦东大道
民生路
张杨路
世纪大道
东方路
商城路
浦电路
杨高中路
芳甸路(在建)
浦东新区
上海科技馆
预报时间: 2017-03-21 14:15:00 CST
时间: 2017-03-22 04:20:00 CST
Sobek_Lujiazui: 203RIGHT 2017-03-21 14:15:00 CST 当前 203right
地图
空间显示
数据显示
信息记录
2 : 预报日志
Weijun Zhang
当前系统时间2017-03-21 14:15 CST
01:00:40 GMT
09:00:40 CST
Stand alone
121.554 , 31.247
0.0 MB/s
239 MB

System Overall SCADA Display



Manhole level & flooding forecast & waring

- Manhole water level of Lujiazui & Huinan
- Dynamic flood animation
- Flooding depth and inundation time analysis & statistic



Major system components

- Connection to Telemetry data through WISKI
- Connection with Met Services Forecast
- 2200 km2 river model
- 2 Urban SW 1D&2D models

Client's expectations beyond

Where to go

- Operational, under examination
- **More** robust by using RTC
- Web based online system?
- Scenario management within FEWS made easy?
- Adopt 3Di possible?
- Expand the system to include more urban models, to address more urban details

Acknowledgement

Acknowledgement to Deltares for the good cooperation and support in successfully delivering this very complicated project.

THANK YOU !

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