

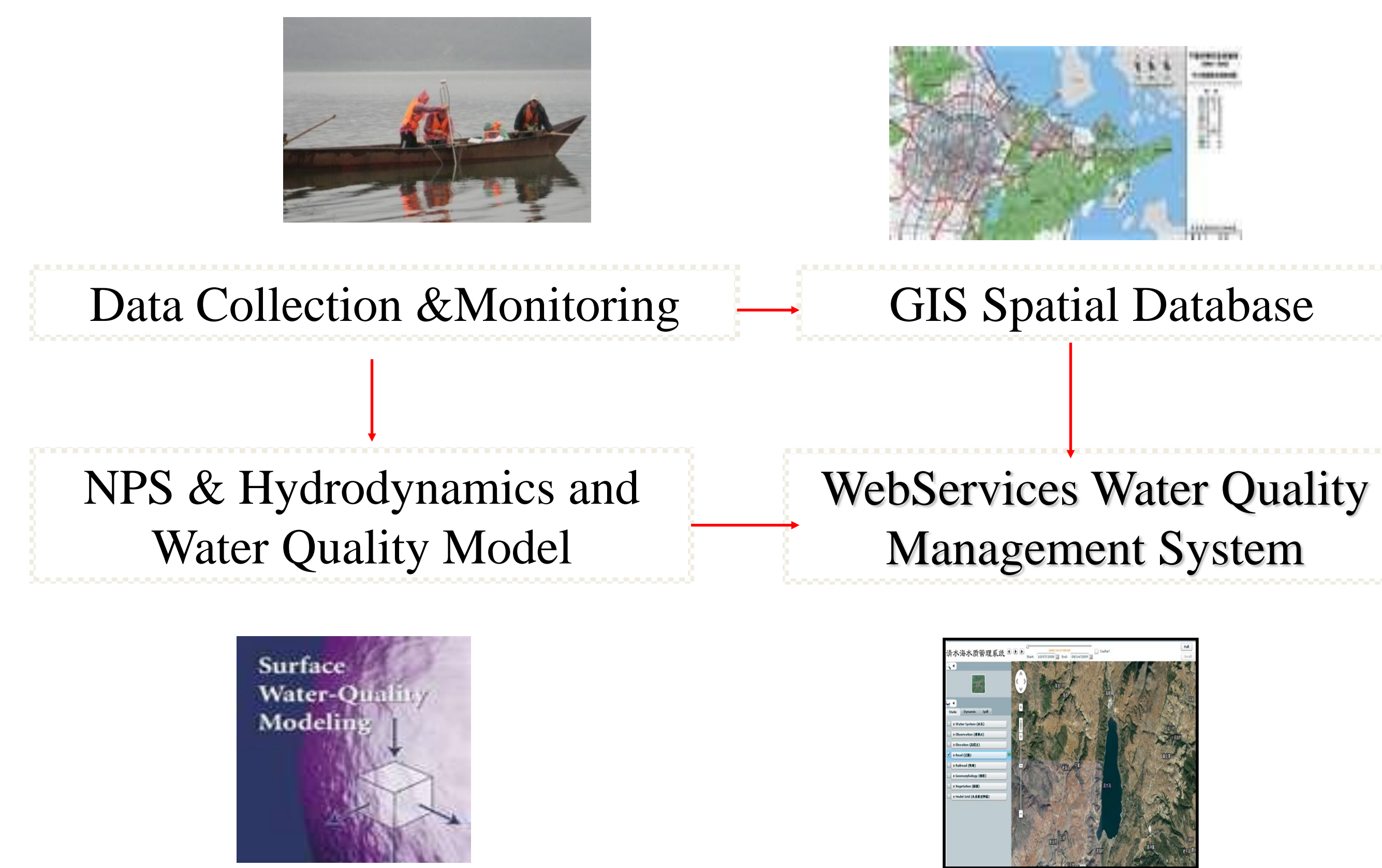
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## PURPOSE

It is well recognized by worldwide scientists and decision makers that water quality models can help environmental managers understand the ecosystem functioning of the water body and help evaluate the potential benefits to the water body's water quality and living resources that might result from the reduction of wastewater and watershed pollutant loadings to the water body. The development of a modern integrated water quality model of Qingshuihai Reservoir and its watershed would permit decision-makers and water quality managers to address the following issues and/or needs:

- to develop an understanding of the mechanisms underlying observed trends in water quality within Qingshuihai Reservoir;
- to assess the potential risk for drinking water safety and its impact;
- to project the benefits of reductions in point source, non-point source inputs of nutrients;
- to provide the Authority with a user-friendly management software for basin management and drinking water security system.

## Execute Solution



## METHODOLOGY

### Nonpoint Source Model

The watershed model generally uses meteorological conditions and land cover/use data to simulate flow, sediment transport, temperature variations, and water quality processes over the entire hydrologic cycle. The model can represent the processes that control runoff quantity and quality for land and in-stream environments.

### Hydrodynamic Model

The transport and mixing of point and nonpoint source loads introduced to the water body are controlled by water circulation in the system.

A three-dimensional, time-dependent, hydrodynamic model should be applied to compute water surface elevation, three-dimensional water velocity, temperature, tracer, and water turbulence in both reservoir and rivers in response to weather conditions (wind speed, wind direction and incident solar radiation), inflows, and temperature and tracer at the open boundaries.

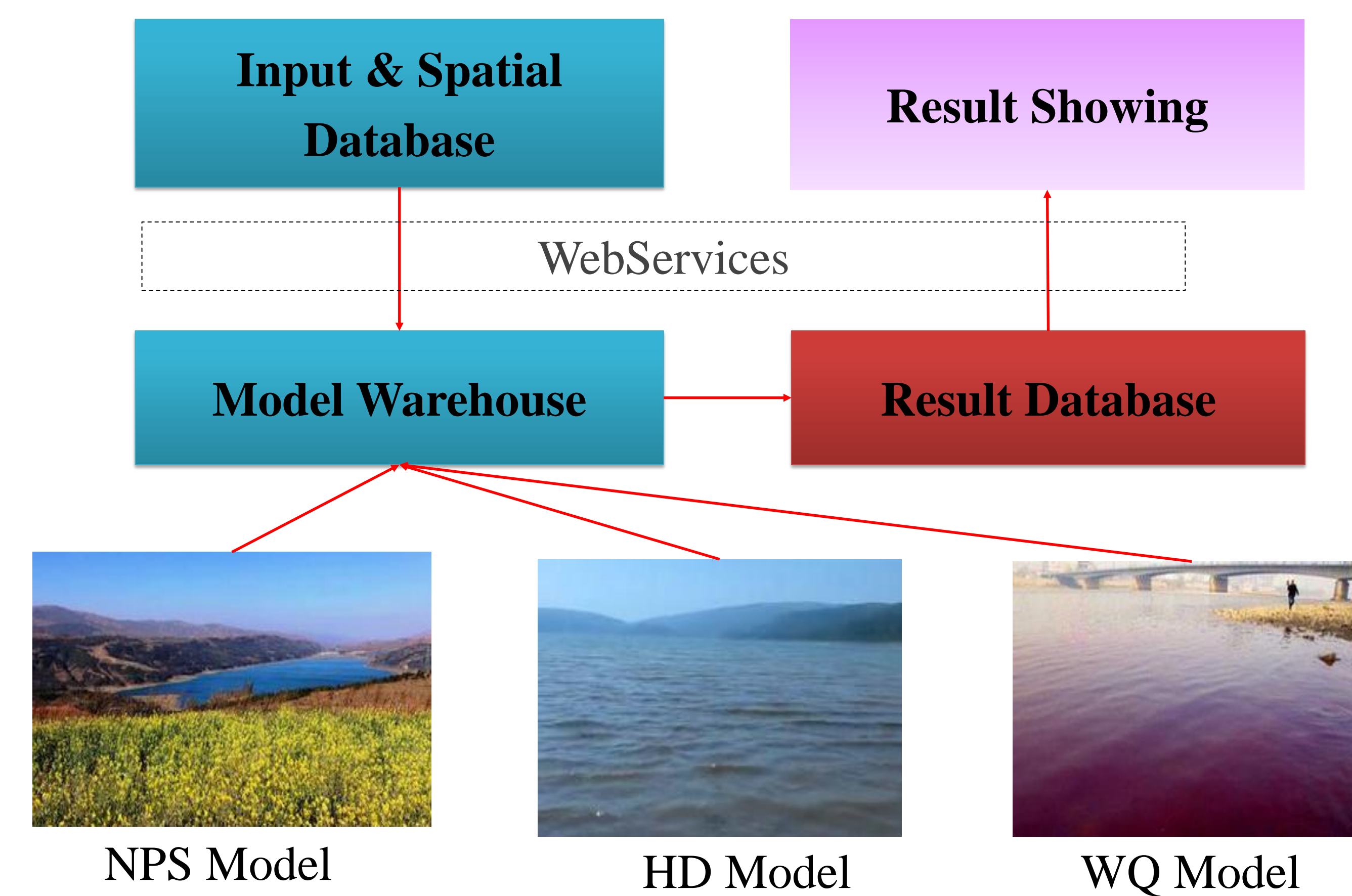
## Water Quality Model

The water quality model is directly coupled with the hydrodynamic model and computation of water quality parameters also occurs within the model framework. The transport processes for the system will be obtained from the hydrodynamic model and the nonpoint source loading input will be calculated from the watershed model. The water quality model will include calculations for nutrient mediated phytoplankton growth, phytoplankton death, zooplankton predation effects, tracer, DO, and the various organic and inorganic forms of nitrogen, phosphorus, silica and carbon (BOD).

## GIS & WebServices

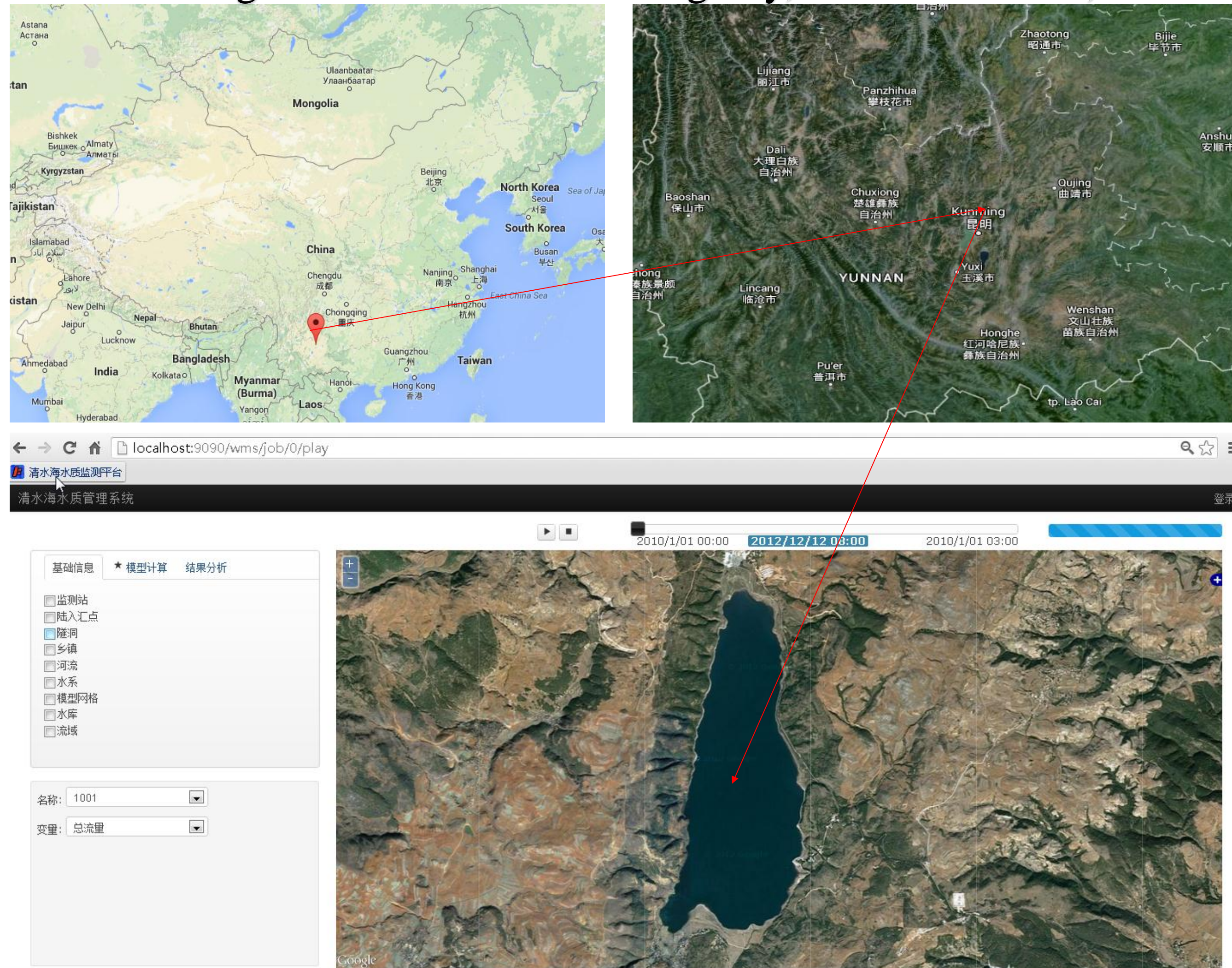
GIS is the basic tool and used for data management and model result showing. Web services are used for providing model services which contain two basic functions. *GetInputData* is used for the browser to submit data to the model server center and start the models. *ReturnResult* is used to return results to the browser for displaying.

## System Structure



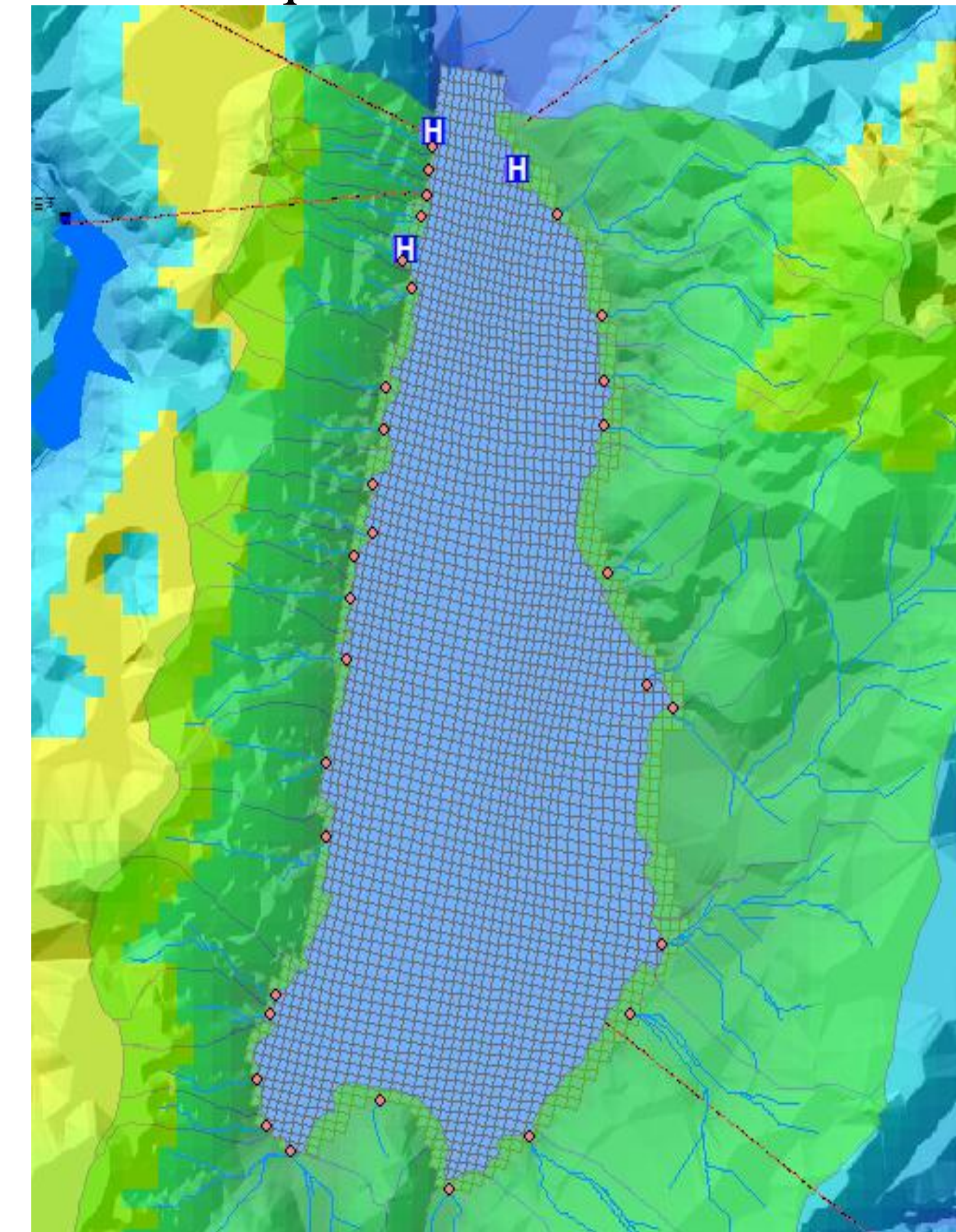
## LOCATION OF QINGSHUIHAI RESERVOIR

the drinking water source of Kunming city, Yunan Province, China



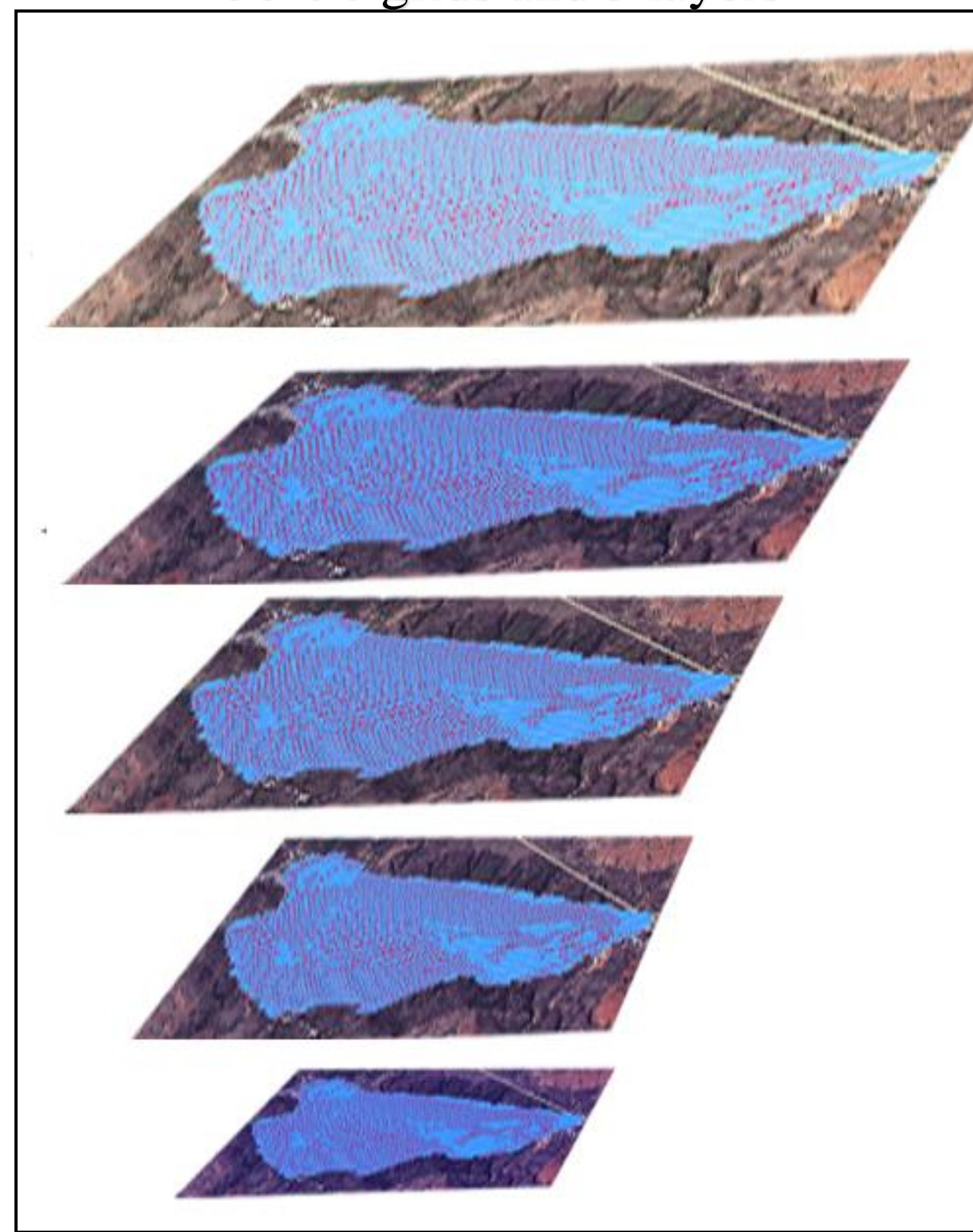
## WATERSHED

30 square km and 34 outlets



## HYDRODYNAMIC RESULTS

58\*90 grids and 5 layers



## WATER QUALITY RESULTS SHOWN IN THE SYSTEM

26 water quality index: dissolved and particulate c&n&p, DO, temperature, algae and etc.

