



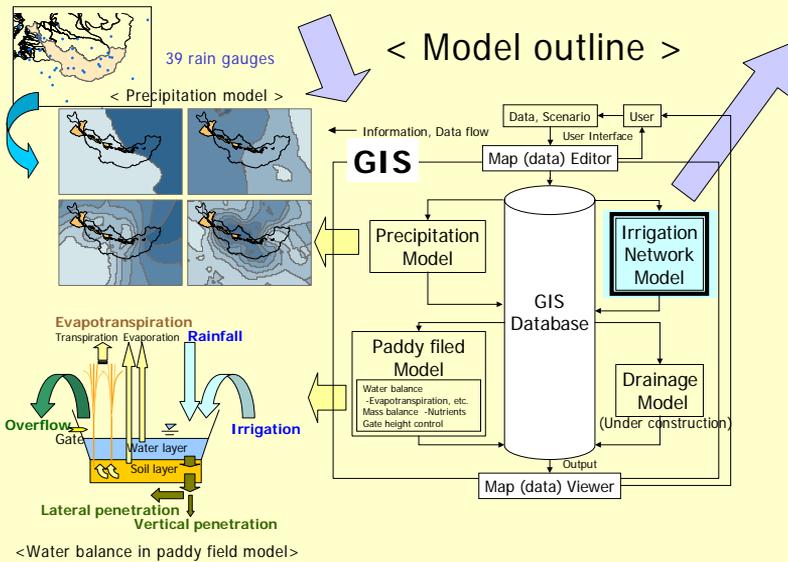
# Management of NPS pollutants from agricultural area by using GIS



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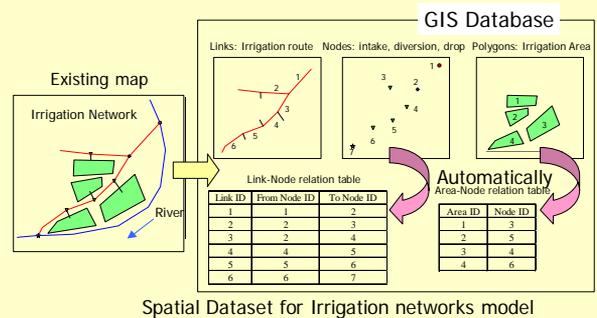
## Objectives of Study

- To construct a new computational model based on GIS technology, [in order to estimate pollutant loads from paddy fields and to evaluate some countermeasures to reduce loads from paddy]



## Irrigation model

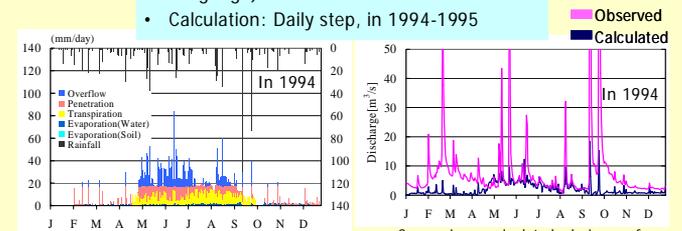
- requires:
  - an irrigation map and some records
    - 3 layers from the map: links, nodes and polygons
  - Daily intake from river to network
  - Drainage from network
  - Rule of diversion
- Characteristics:
  - Distribution of irrigation are decided using topology of irrigation network
- Advantage:
  - connectability, relationships are automatically determined using topology and coordinate in GIS
  - Making data easily on GUI



Spatial Dataset for Irrigation networks model

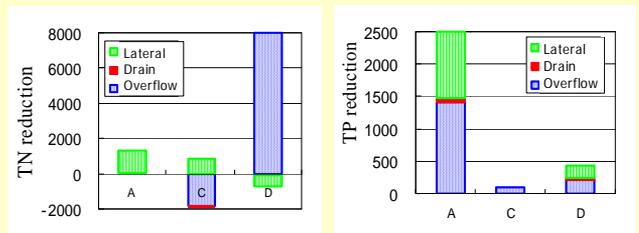
## Results

- Program: written by AML (Arc Macro Language) on ArcGIS8.1
- Calculation: Daily step, in 1994-1995



< Comparison calculated drainage from paddies with observed river flow >

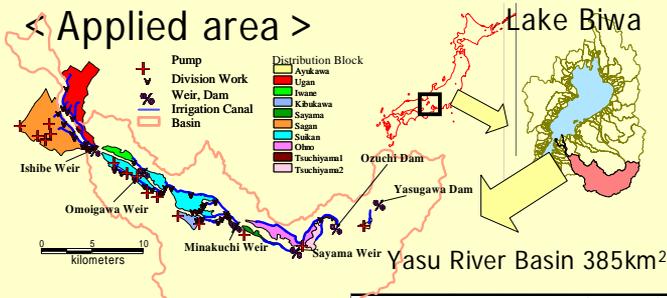
- Water balance (water consumption) is different according to properties of paddy fields
  - Overflow:
    - Large, well-drained paddy,
    - Small, semi ill-drained paddy
- The ratio of paddy drainage to river flow, in irrigation season (May - Sep.)
  - 40-50 % in 1995 (ordinary climate)
  - Over 80 % in 1994 (drought year)



## Conclusions

- A new irrigation model was introduced.
  - Based on GIS technology
    - It can estimate amount of irrigation to paddy field from simple data set [digitized maps, daily intake water, rule of diversion]
      - connectability, relationship is automatically determined using topology and coordinate
    - User can confirm and replace data using GUI of the GIS
  - Applied with distributed model
    - It can be used to estimate distribution of pollutant loads from paddies.
    - And ratio of paddy drainage in river flow in any river section

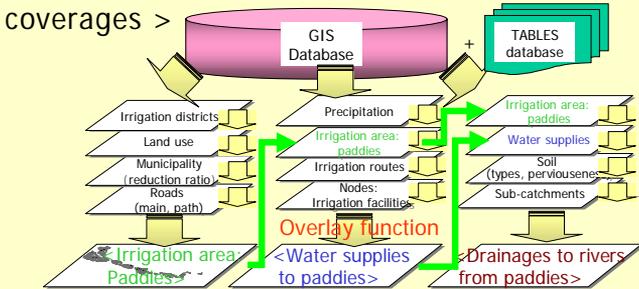
## < Applied area >



- 5 irrigation networks,
- water are intaken at weirs and dam
- The daily amount is recorded

	Yasu River	Lake Biwa
Catchment Area [km <sup>2</sup> ]	385.3	3,597.0
River length [km]	62.5	
Population	121,214	1,198,166
manufactured goods [billion yen]	906	5,738
Area of Paddy field [km <sup>2</sup> ]	73.1	676.2
Annual pollutant loads estimated by load unit [t-TN/year]	733	6,472

## < Construct database for the basin & Overlay coverages >



- 9 coverages (Layers) were digitized into GIS for the models
- Area, Water supplies and Drainages were calculate using Overlay function

## < Scenario Analysis >

- Case A: reduction of fertilizers
- Case C: appropriate drainage
- Case D: appropriate management of irrigation water