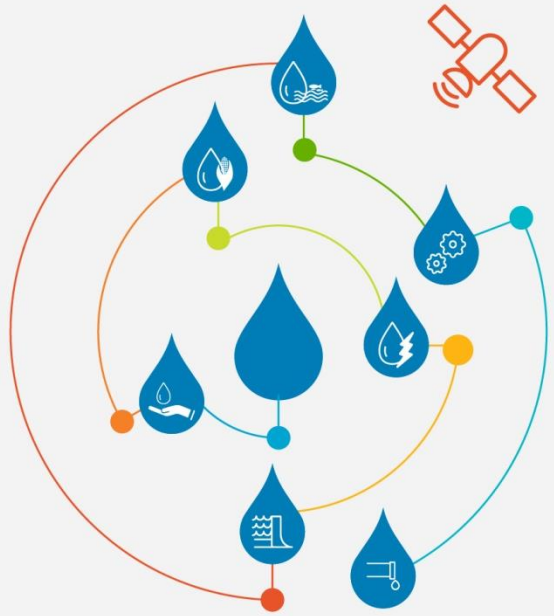
Visualization of Groundwater Flow for IWRM



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2-4 October 2018

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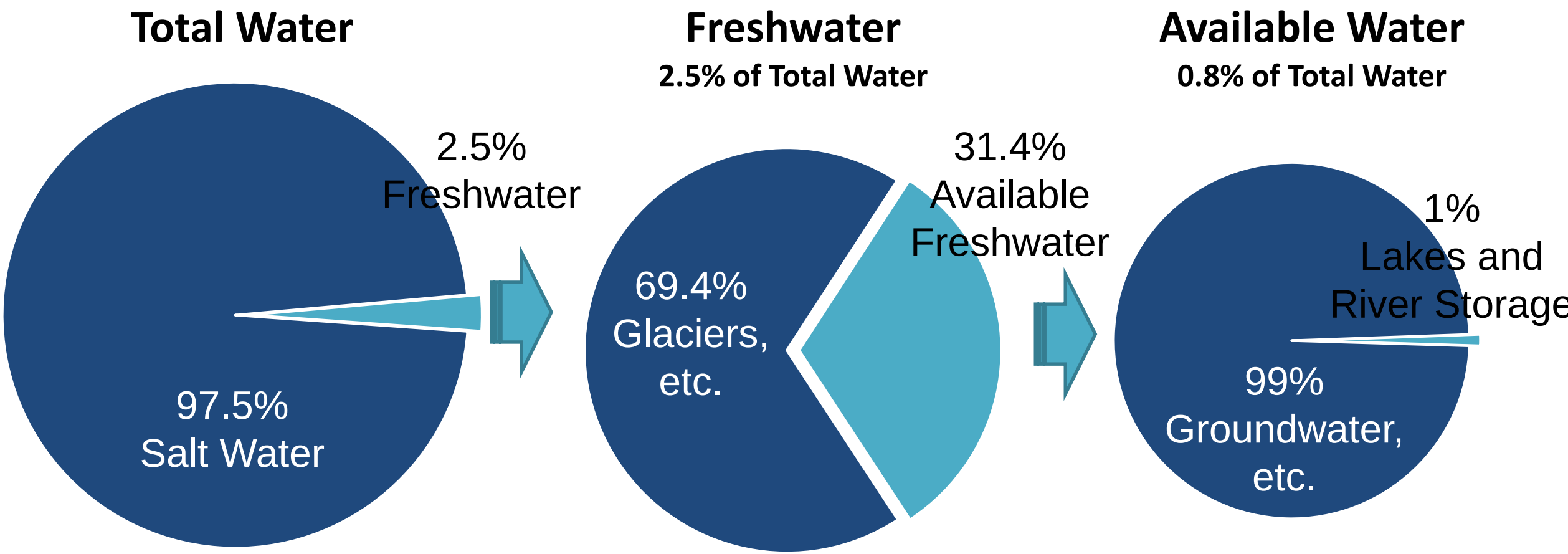
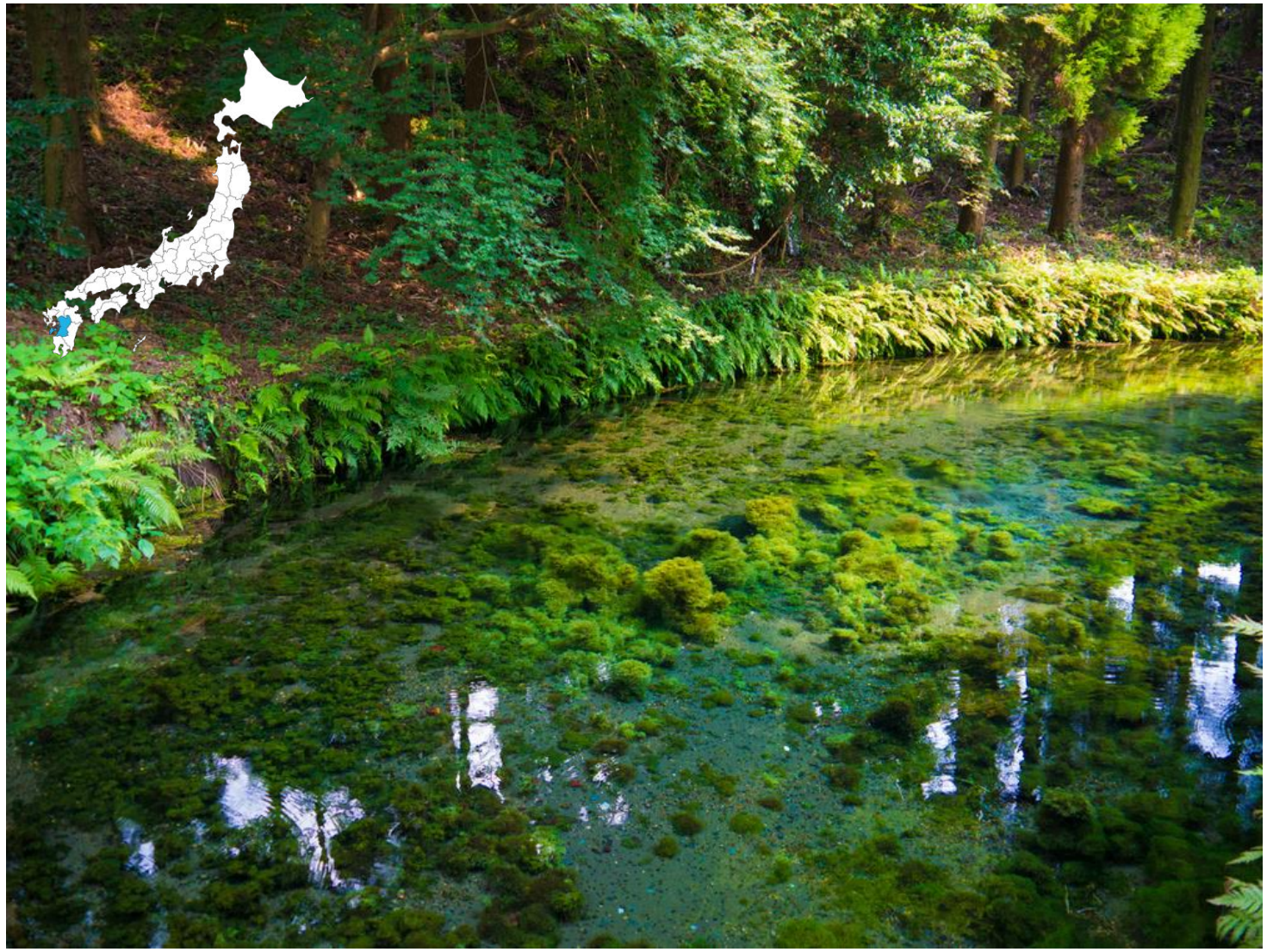
Water on the Earth



Source: Ministry of Land, Infrastructure and Tourism, Japan
World Water Resources: A New Appraisal and Assessment for the 21st Century (Report). UNESCO. 1998.

Pure Groundwater City, Kumamoto, Japan



Water resource of service water for

1 million people

in Kumamoto region is almost

100% groundwater

Kumamoto Region's Actions for Sustainable Groundwater

- Recharge Amount
  - Forestation, Paddy fields, Rainwater infiltration holes
- Water Quality
- Water Balance

- **Research & Study**
- Regulation & Institution
- Monitoring
- Public Awareness

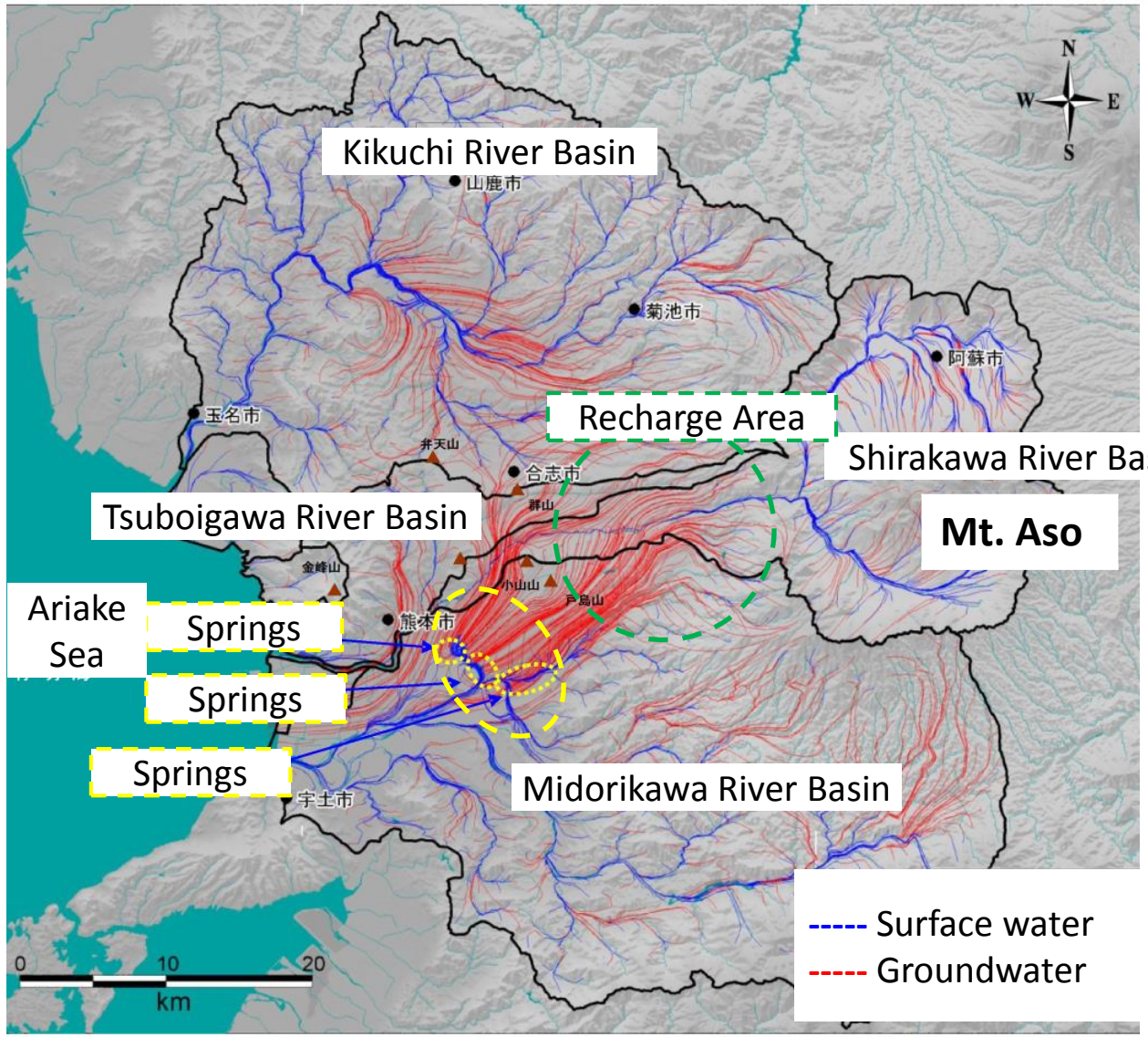
Where is conservation area for groundwater recharge?

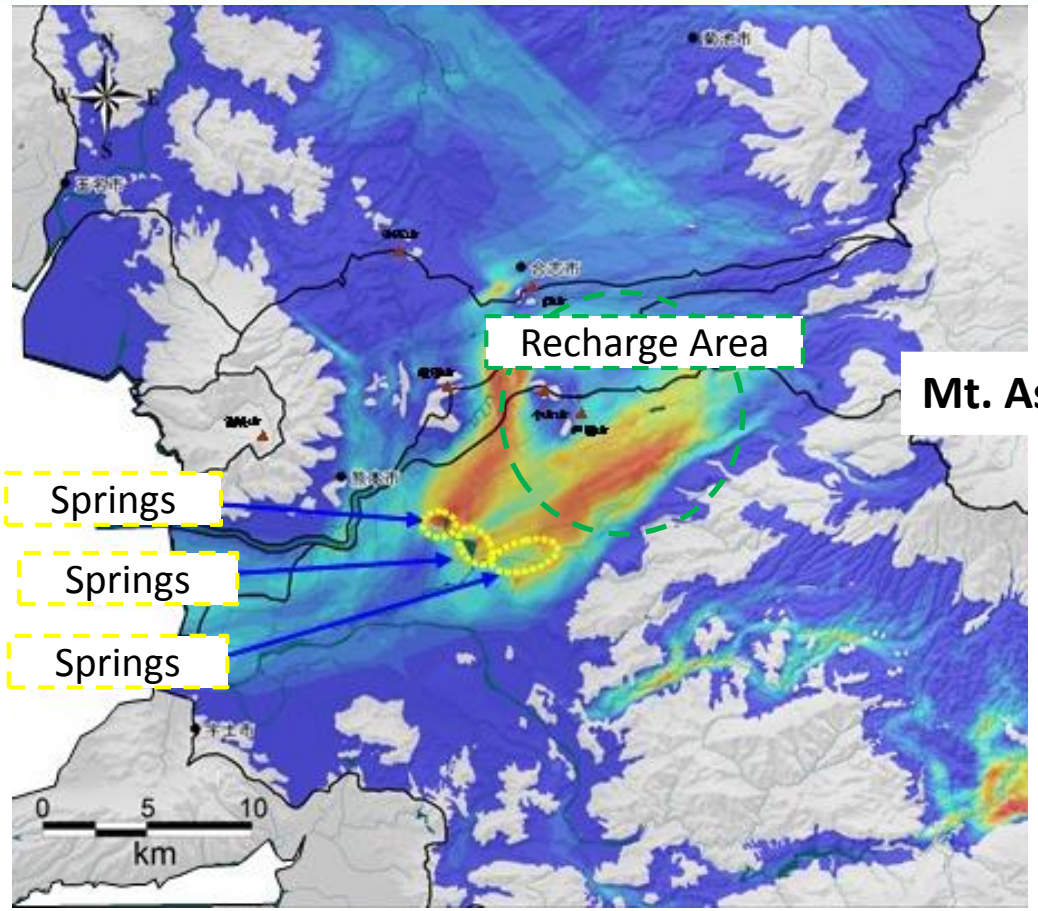
How much groundwater can be used?

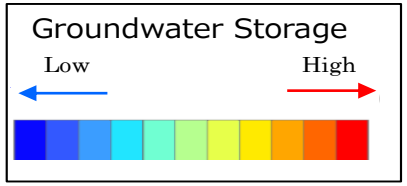
What is the appropriate normal flow of river?

How is water pollution diffused?

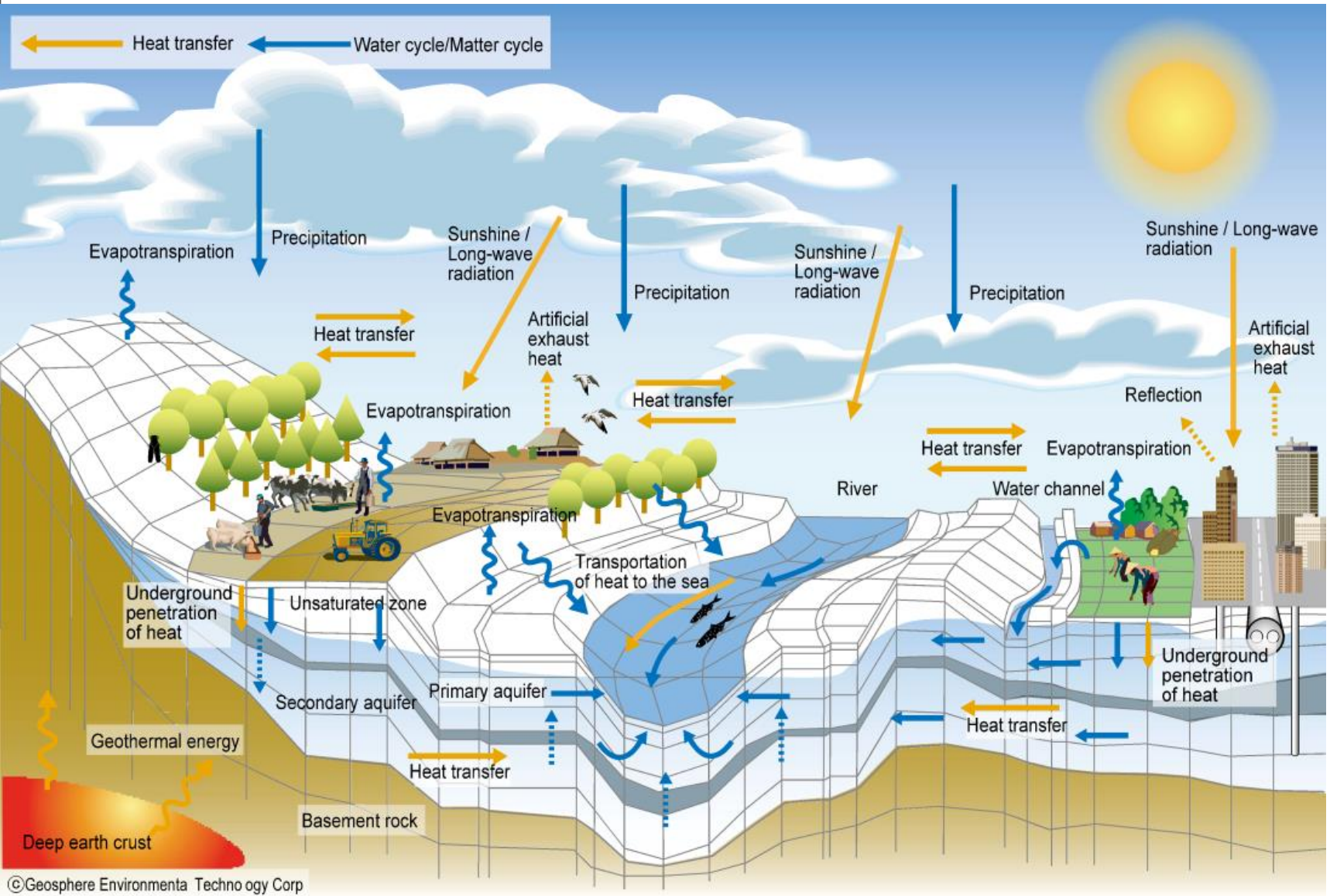
Groundwater Flow and Storage in Kumamoto







Outline of Water Circulation Model (GETFLOWS)

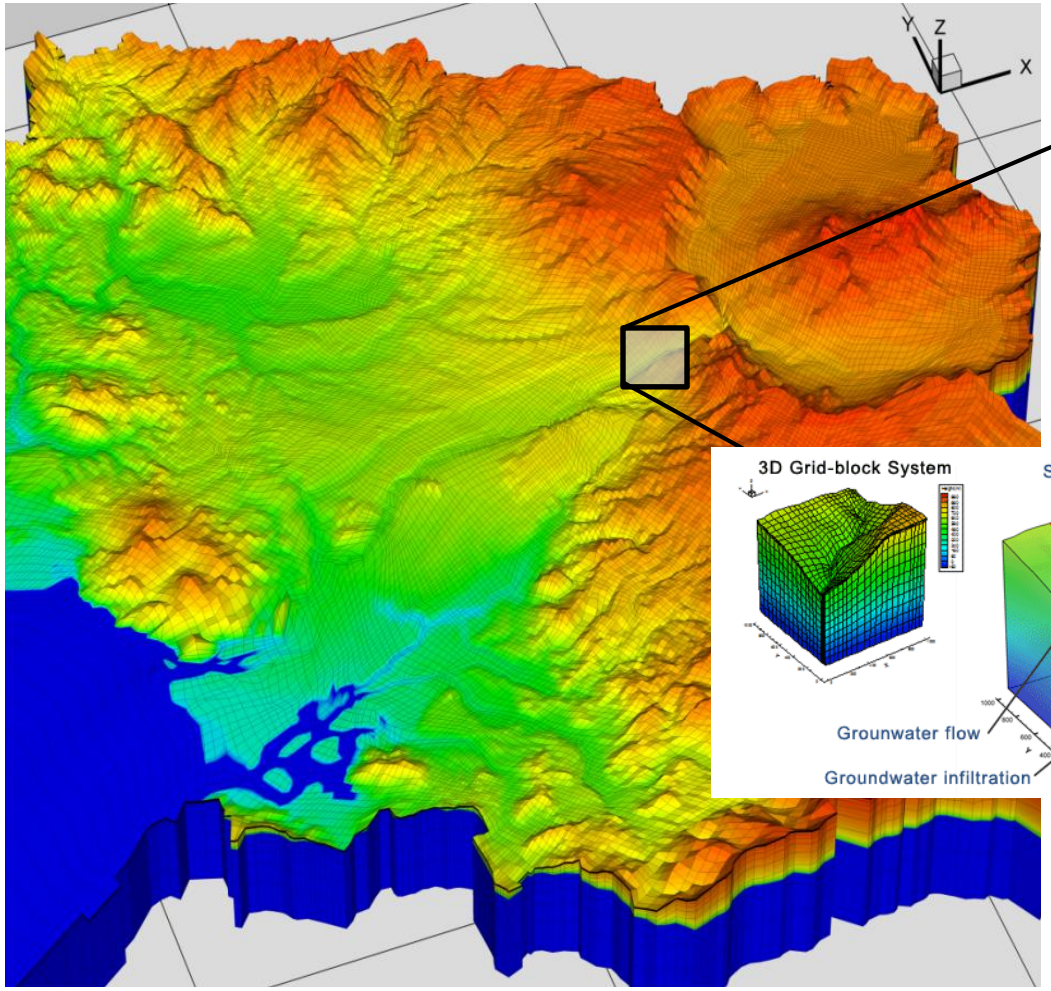


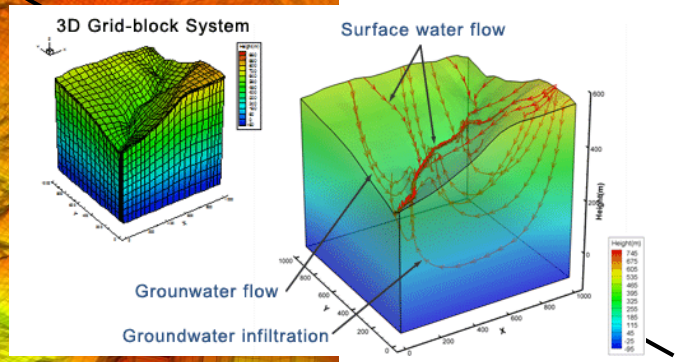
‘GETFLOWS’ is

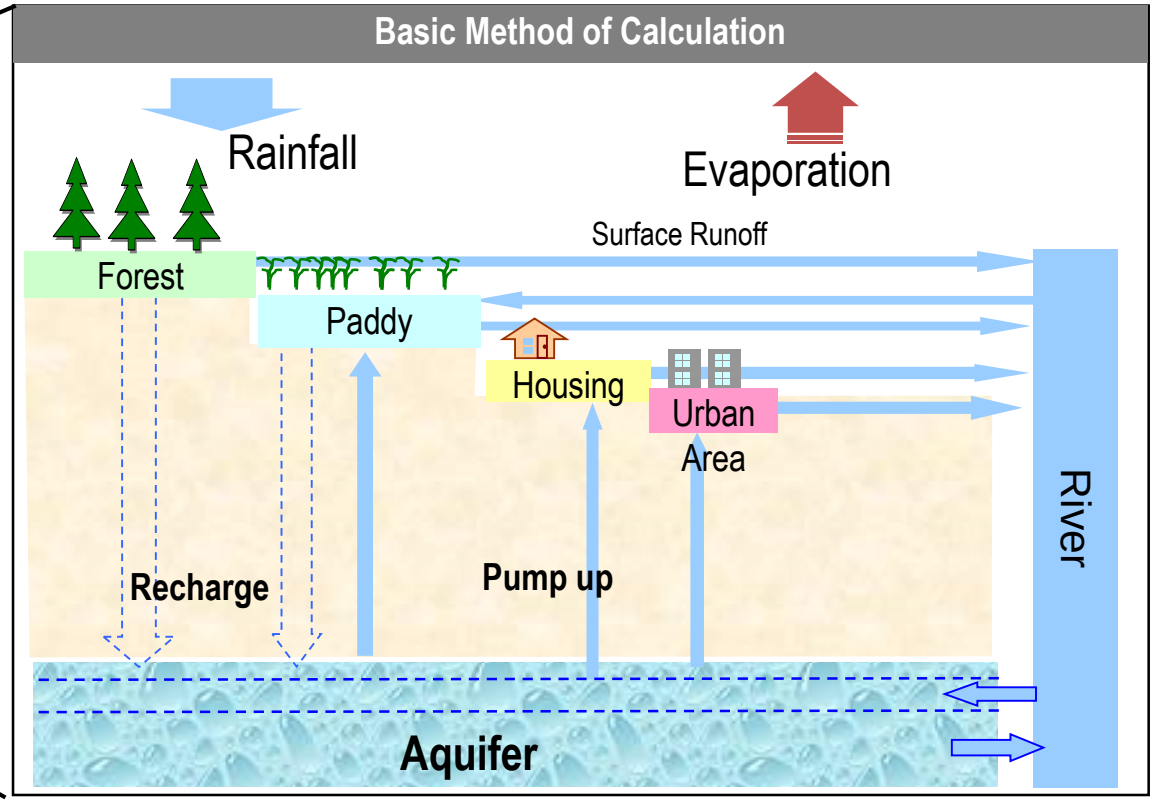
a **three-dimensional** finite difference, multi-phase & multi-component fluid-flow simulator with

the **fully-coupled surface and subsurface fluid-flow**

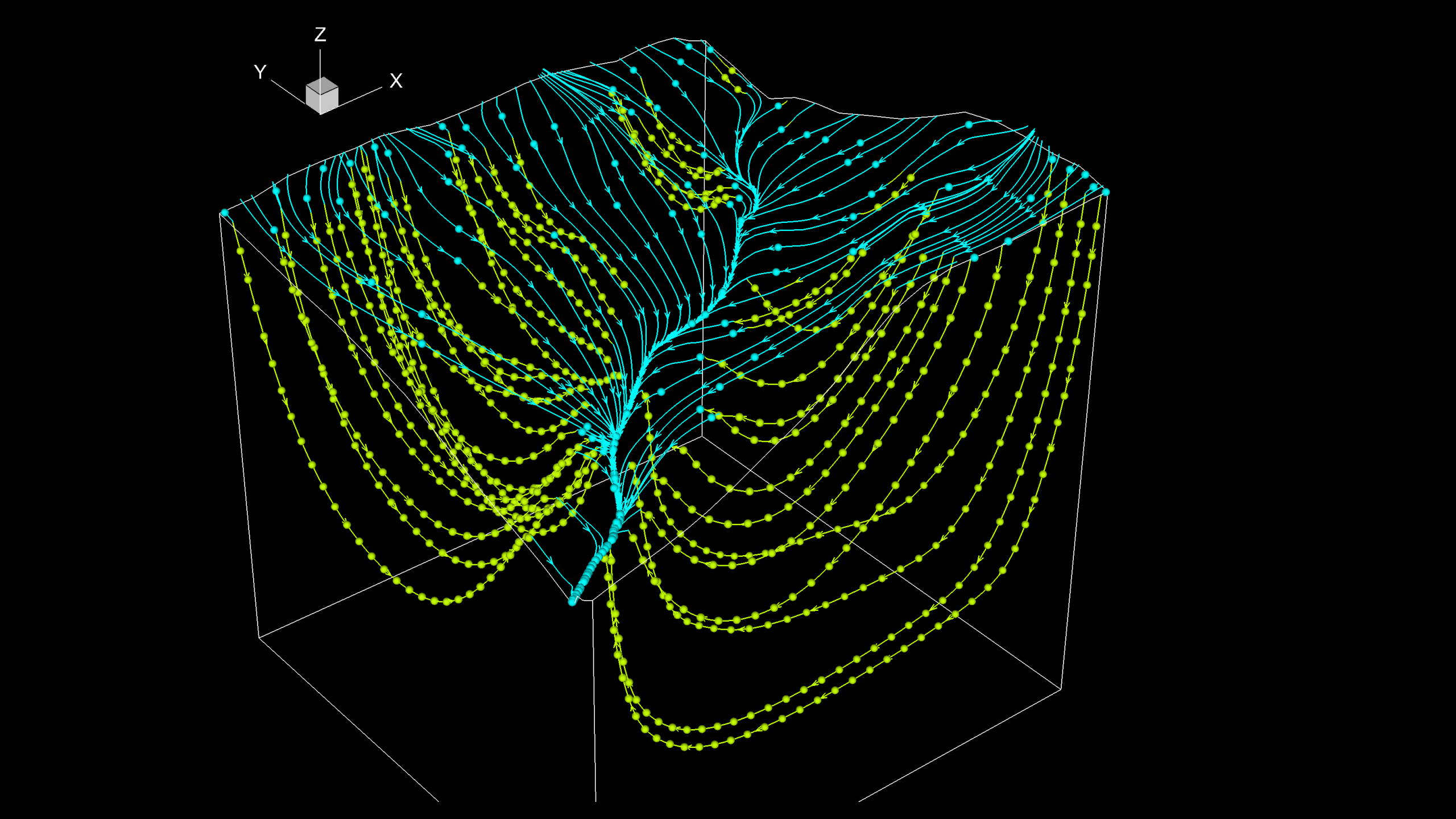
Basic Method of Water Circulation Calculation







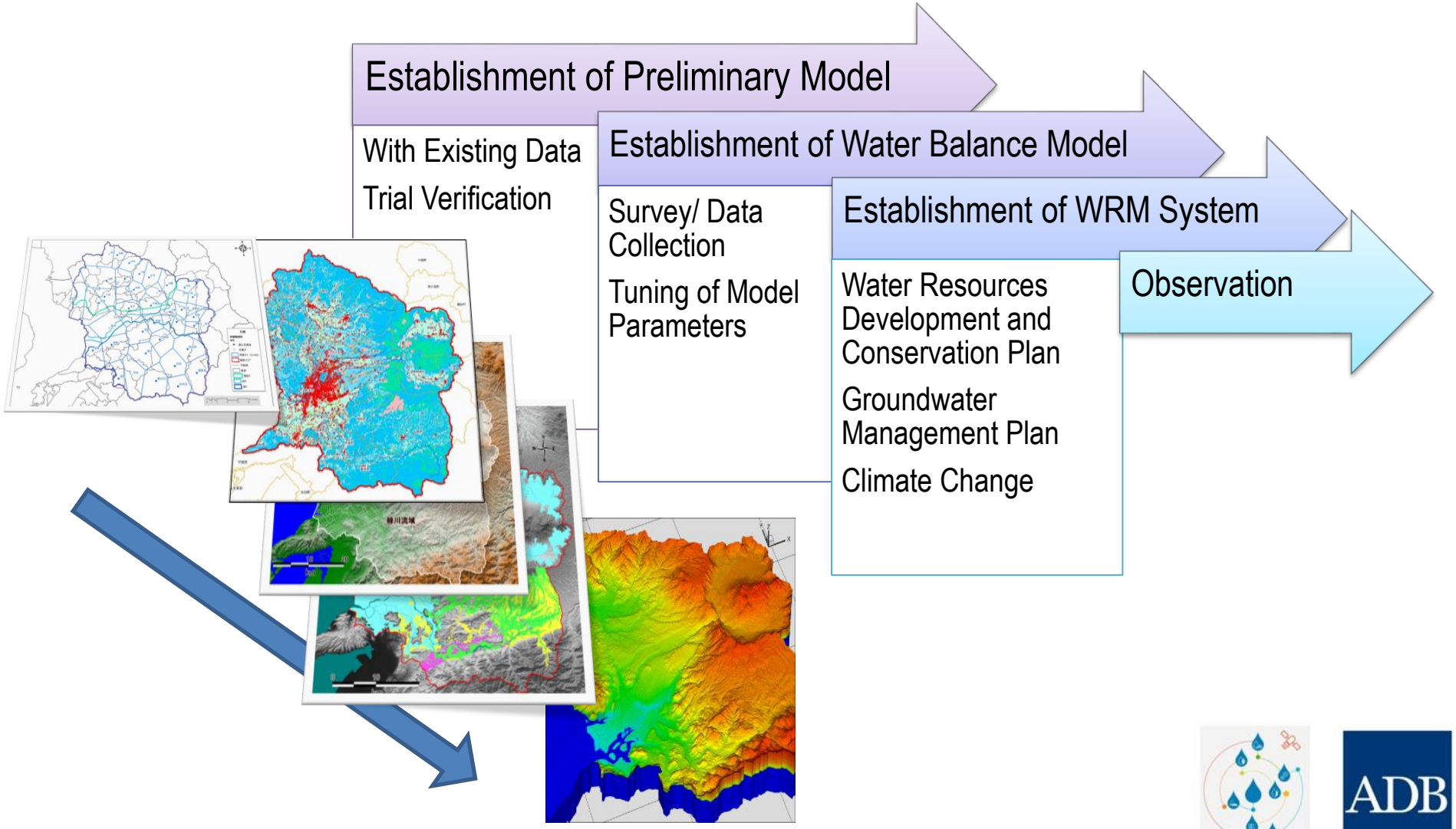
- 3D grids are created based on topography, geological structure, land use, etc.
- Each grid indicates coefficient of permeability.
- Surface and subsurface fluid flow interactions between grids are calculated.


Z
Y
X

Input Data & Modelling Process to Ensure Accuracy

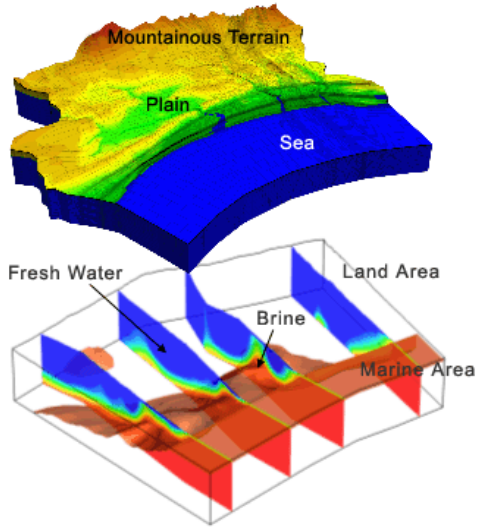
Input Data

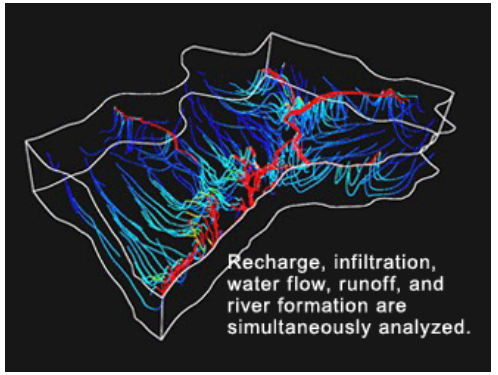
- Meteorology
- Hydrology
- Topography
- Land Use
- Geology
- Water Usage
- Man-made Structures



Simulation Output of Water Circulation Model

- Prediction of water resource potential
- Surface and groundwater flow & amount
- Calculation of Water Balance
- Flood simulation
- Diffusion of groundwater pollution
- Seawater intrusion
- 3D animation





source: Geosphere
Environmental Technology Corp.

Application of Water Circulation Model ‘GETFLOWS’

- Understanding water balance for introduction of IWRM
- Preparing groundwater development/ management plan and selection of intake site
- Regulation on pumping amount of groundwater to mitigate land subsidence in coastal megacities
- Understanding of saltwater intrusion during dry weather in coastal area
- Understanding of groundwater polluted area

YEC is the consulting firm with the most abundant experience of building water circulation model using ‘GETFLOWS’ which was developed by Geosphere Environmental Technology Corp., Japan.
‘GETFLOWS’ was applied not only Japan but also in Asian countries such as Indonesia, Singapore and Thailand.
‘GETFLOWS’ can be applied to ADB Project.

Thank you for your kind attention!

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