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Outstanding Student & PhD candidate Presentation contest

Groundwater Flow System in Klang River Watershed, Kuala Lumpur, Malaysia

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Mariko Saito

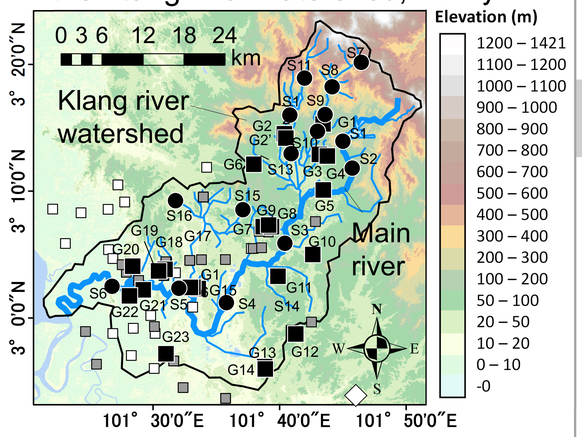
- Few studies on the groundwater flow system using stable isotopes as a tracer in complex geological setting in tropical climate regions.
- We apply the tracer method in mega-city of Kuala Lumpur, highly urbanized watershed underlain by complex geological setting in tropical climate regions.
- Our results show that the deep groundwater in the downstream area is recharged mainly in the mountainous areas with the highest altitude of 1421 m, and the shallow groundwater is recharged partly in the hilly areas with the highest altitude of 250 m.

Abstract

Study area and Methods

Water sampling and groundwater level observation

in the Klang river watershed, Malaysia



Locations of sampling
(Jan-Mar 2019, Aug 2022)

- River water
- Groundwater
- Rainwater (GNIP database)

Static water level observation
(provided by JMG Malaysia, 2022)

- Unconfined groundwater
- Confined groundwater

Chemical analysis

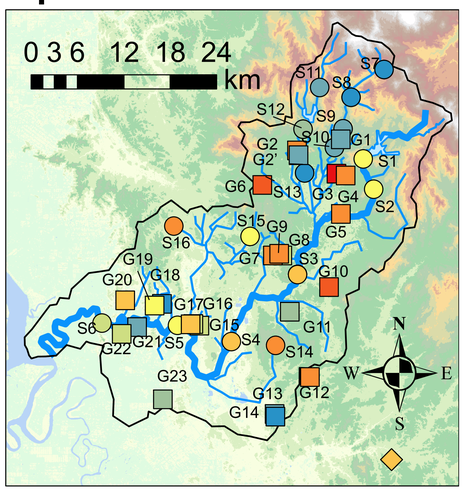
- Water stable isotopes ($\delta^{18}O$, $\delta^{2}H$)
- Inorganic dissolved ions (Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3^-, SO_4^{2-}, HCO_3^-)
- Silicate (SiO_2)

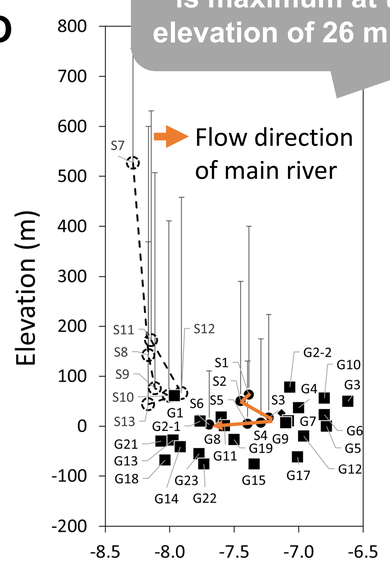
Spatial distribution of data and hydraulic head

Evaluating groundwater flow system in Klang river watershed

Results and Discussion

Spatial distribution of $\delta^{18}O$





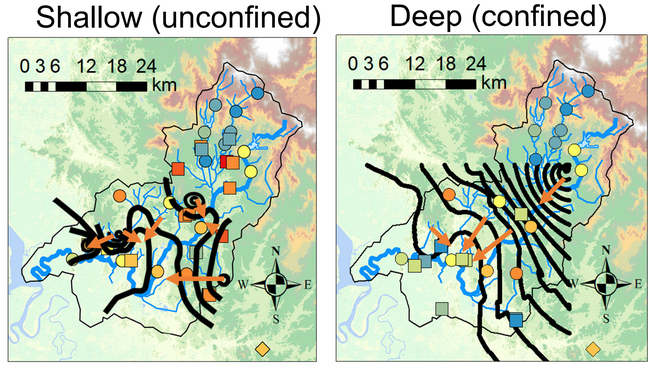
$\delta^{18}O$ of river water is maximum at the elevation of 26 m (S3)

$\delta^{18}O$ (‰)
−6.79 ～ −6.6
−6.99 ～ −6.8
−7.19 ～ −7.0
−7.39 ～ −7.2
−7.59 ～ −7.4
−7.79 ～ −7.6
−7.99 ～ −7.8
−8.19 ～ −8.0
−8.30 ～ −8.2

Locations of sampling

- River water
- Groundwater
- Rainwater (GNIP database)
- … River water (Mean elevation of sampling)
- … River water (sampling elevation)
- … Groundwater (median screen depth)

Contour map of hydraulic head and $\delta^{18}O$



Contour line of hydraulic head
Estimated flow direction

Why $\delta^{18}O$ of river water is maximum at the elevation of 26 m?

(1) Geology changes at 26 m
(igneous, sedimentary → sedimentary)

(2) Groundwater flow changes at 26 m
(losing → gaining stream)

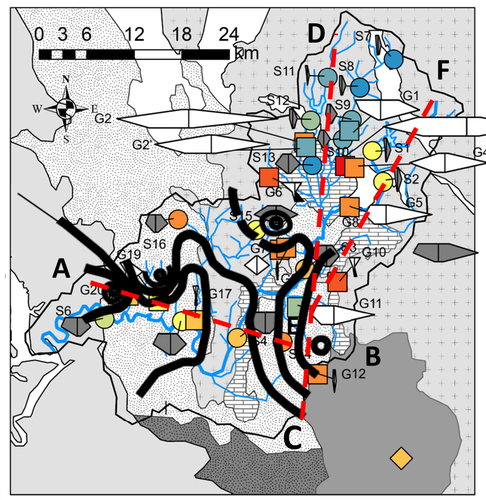
Groundwater with high $\delta^{18}O$ discharges at 26 m

Stiff diagram

Geology

- Sandstone
- Granite
- Schist
- Limestone
- Clay, Silt

Shallow (unconfined)



Contour line of hydraulic head
Geological cross section

How does the groundwater flow?

Estimated recharge elevation based on $\delta^{18}O$ (70～1,421m)

Well Screen Depth unknown