



Groundwater storage and aquifer buffer capacity in weathered hard rocks of Africa:

comparison of results obtained in Benin, Burkina Faso and Uganda

Results obtained thanks to GRIBA project

LAWSON, F.M.A., VOUILLAMOZ, J.M., KOÏTA, M., SORO, D.,
YALO, N., OWOR, M., OKULLO, J.

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Context: groundwater and changes



- **Groundwater: the most used source of water in Africa**
- **Climatic and anthropogenic changes: a threat for sustainable groundwater supply**

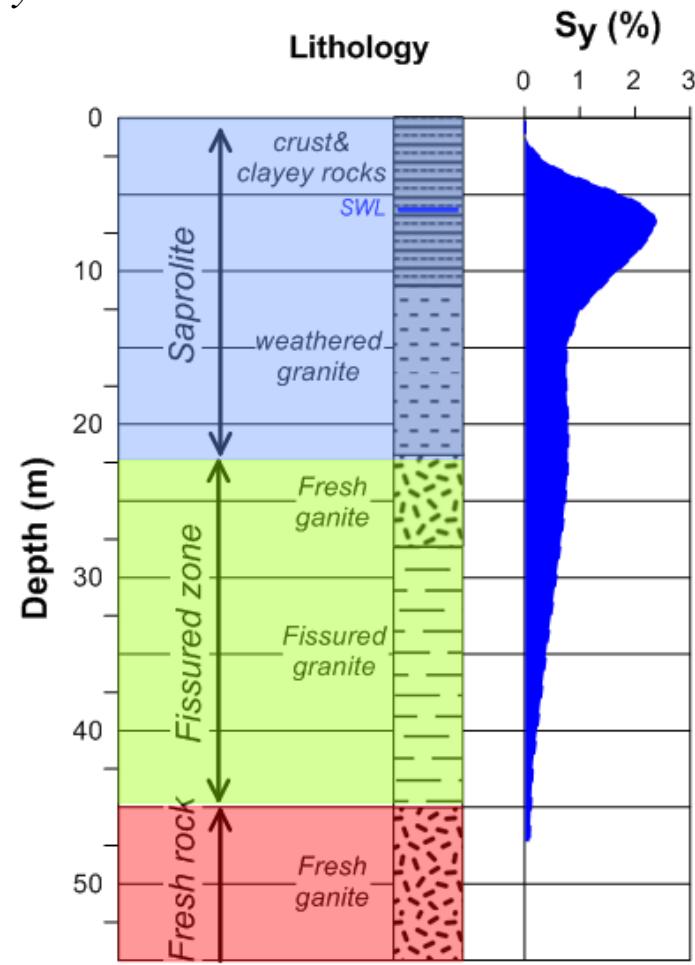
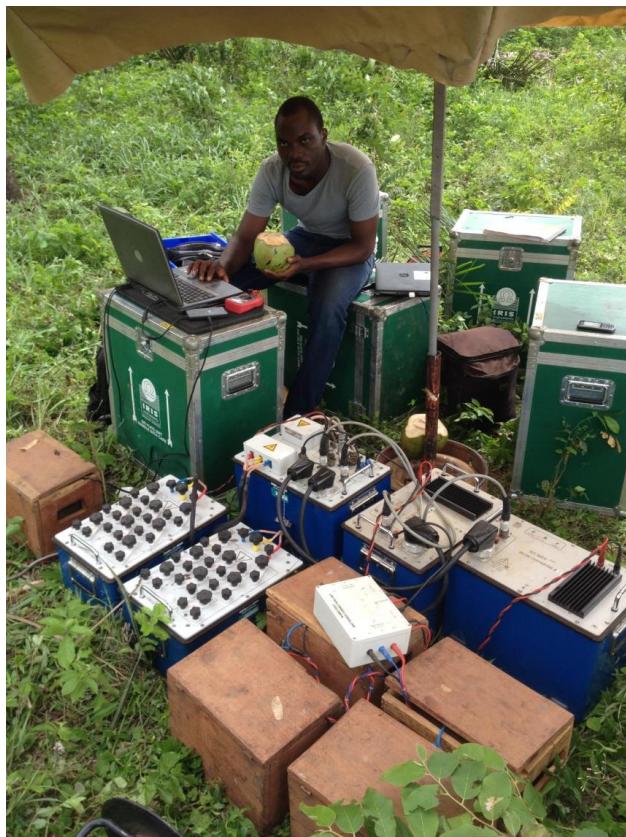
Important to know:

- Groundwater storage
- Aquifer buffering capacity

Groundwater storage

□ Estimating

$$GW_{storage} = S_y \cdot \Delta z$$



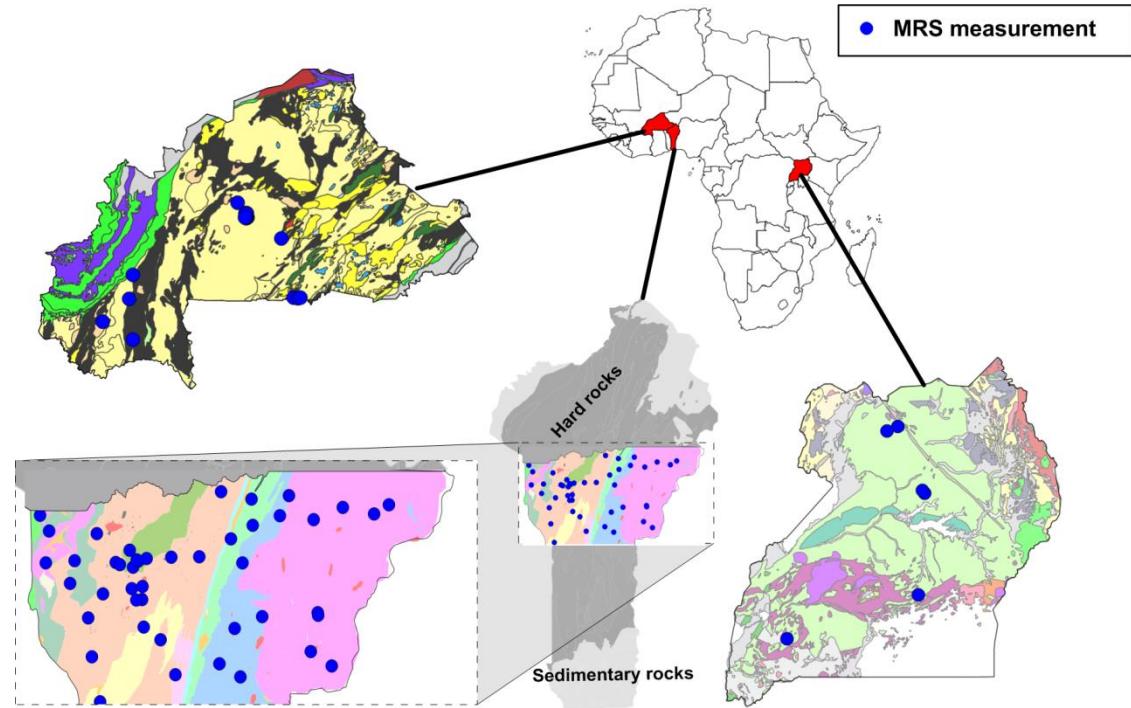
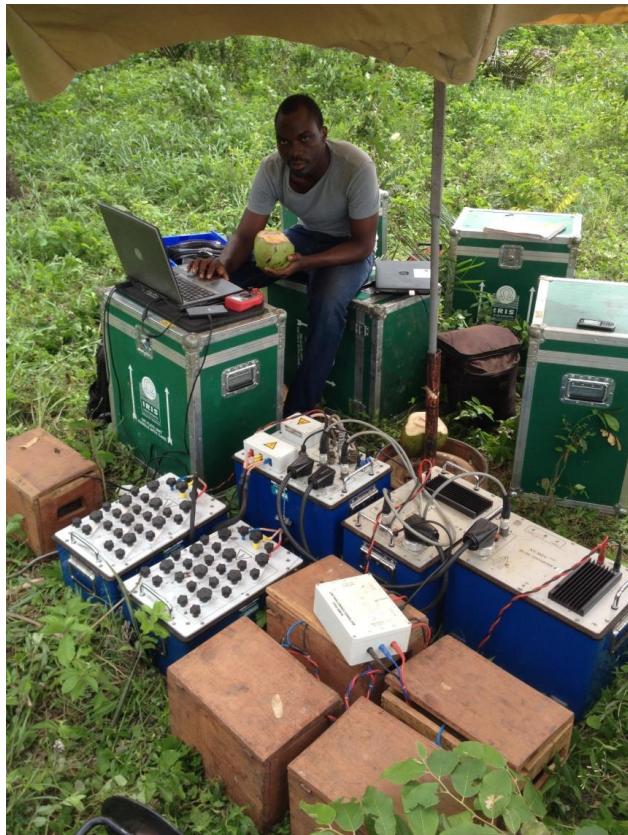
(modified from Vouillamoz et al., 2015)

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Groundwater storage

□ Estimating

$$GW_{storage} = S_y \cdot \Delta z$$



73 MRS measurements in 3 African countries

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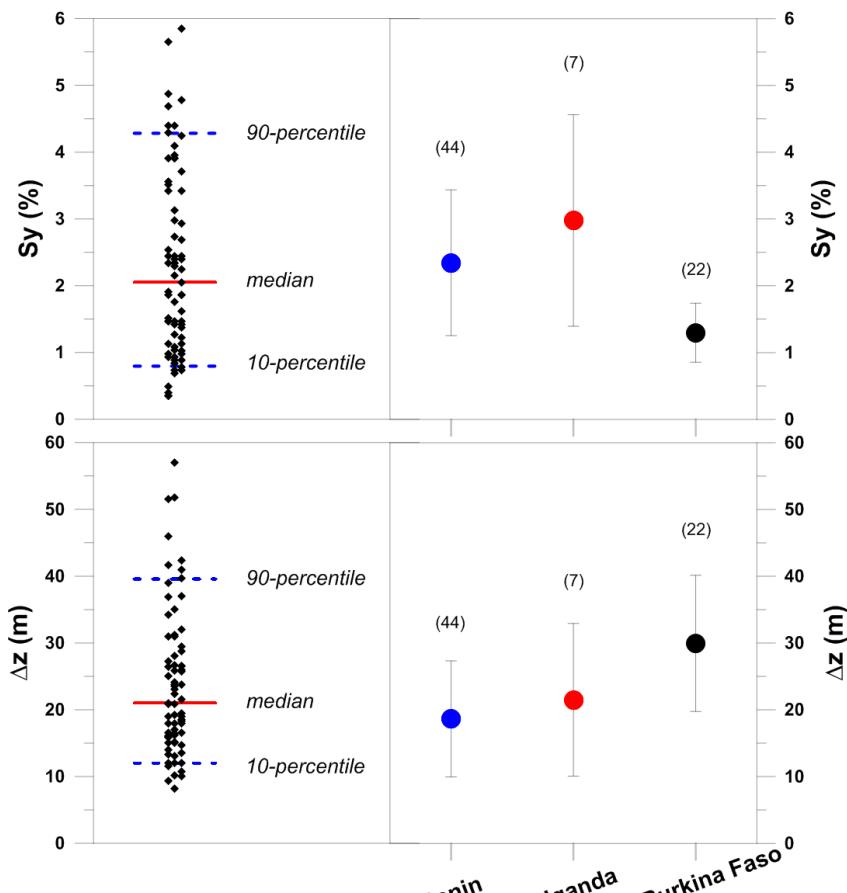


Groundwater storage

□ Estimating

$$GW_{storage} = S_y \cdot \Delta z$$

□ Storage VS countries



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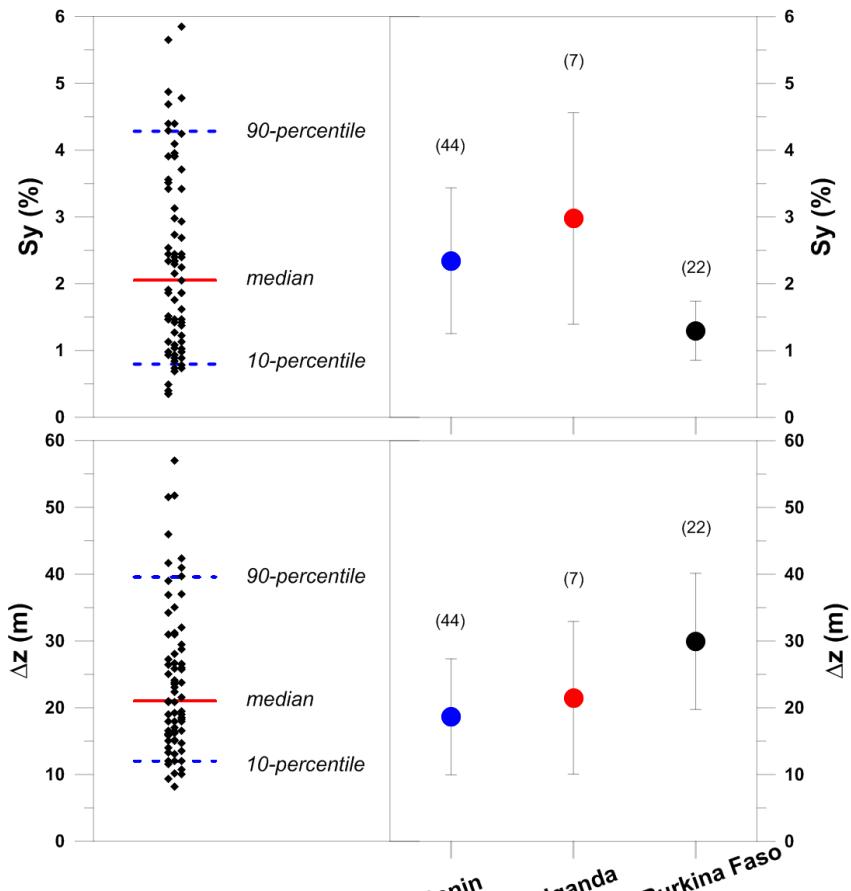


Groundwater storage

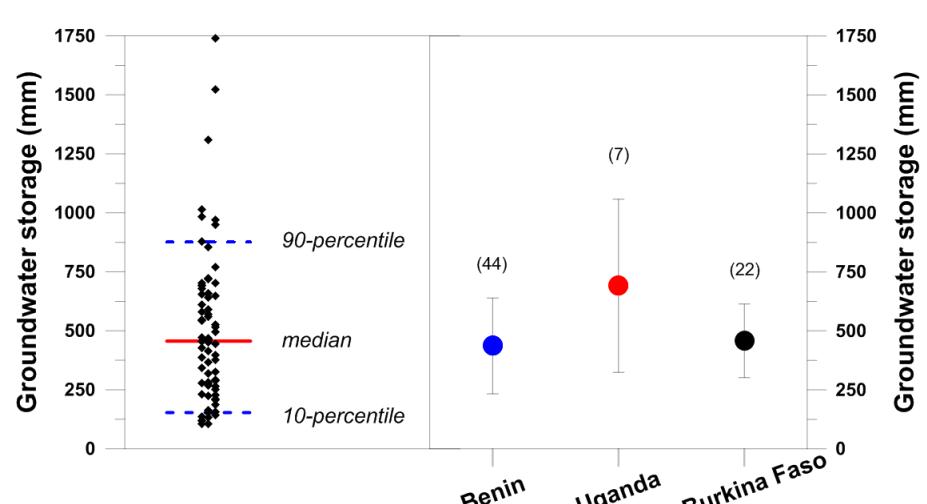
□ Estimating

$$GW_{storage} = S_y \cdot \Delta z$$

□ Storage VS countries



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✓ Storage is about the same

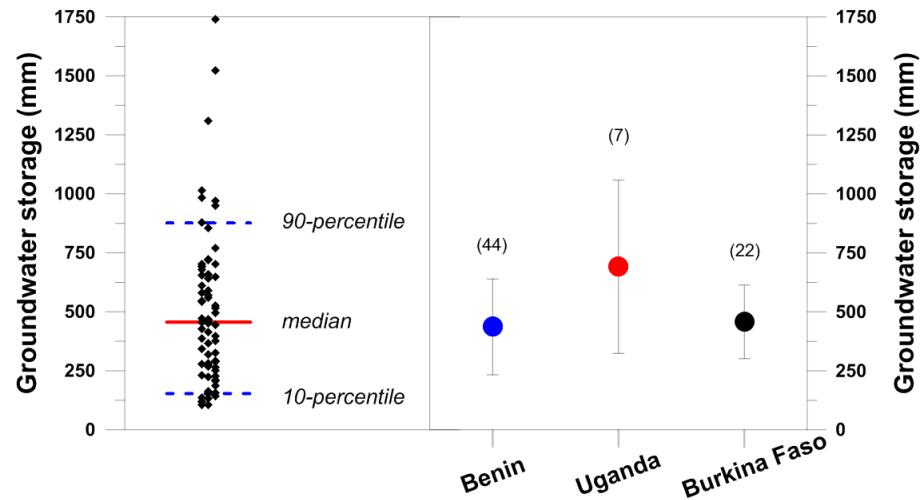
Groundwater storage

- Estimating
- Storage VS countries
- Storage VS geology

- Metamorphic rocks: 463mm
- Intrusive granites: 340mm
- Volcano sedimentary rocks: 183mm



$$GW_{storage} = S_y \cdot \Delta z$$



- ✓ Storage is about the same
- ✓ There is a geological control

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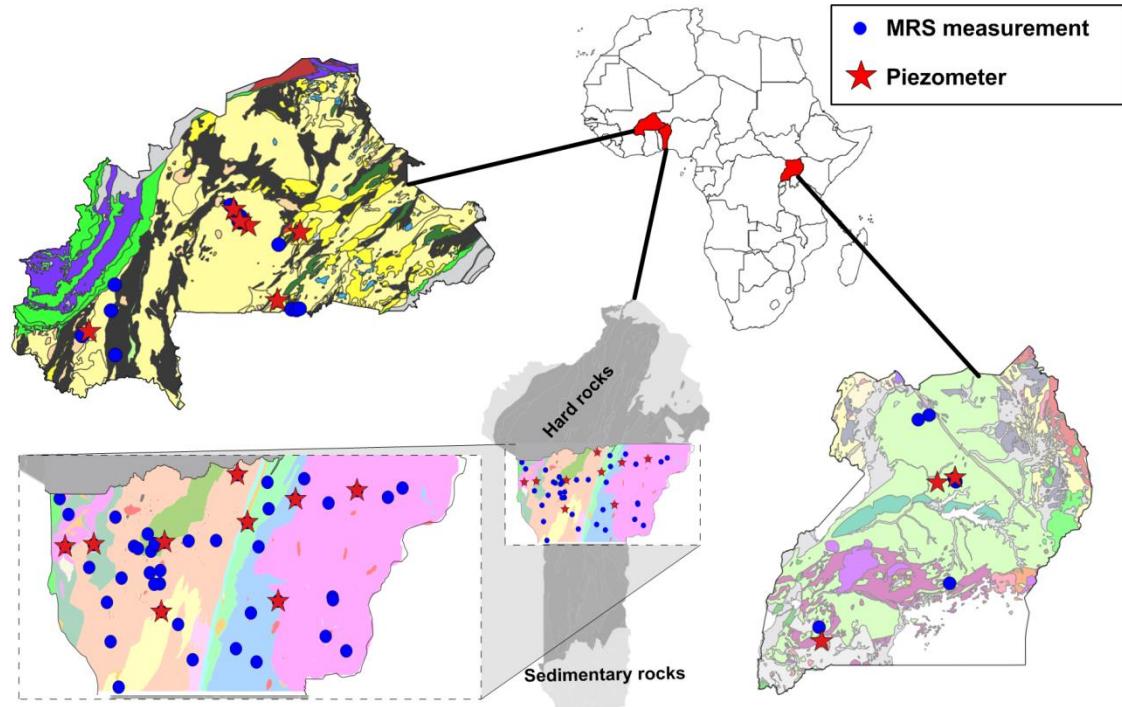
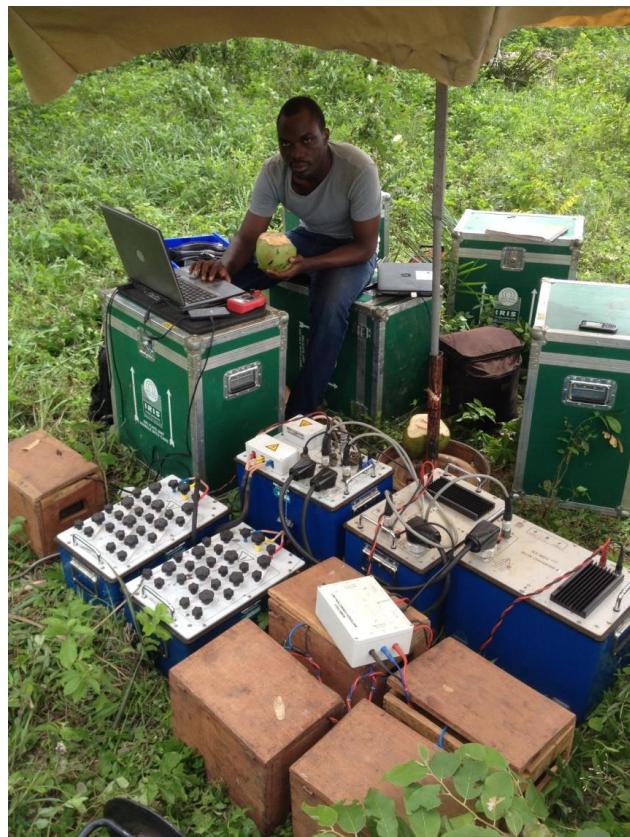
Aquifer buffer capacity

□ Estimating

$$B_c = GW_{storage} / GW_{discharge}$$

With

$$GW_{discharge} = S_y \cdot \Delta h$$



20 SWL chronicles of 3 to 18 years in 3 countries

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Aquifer buffer capacity

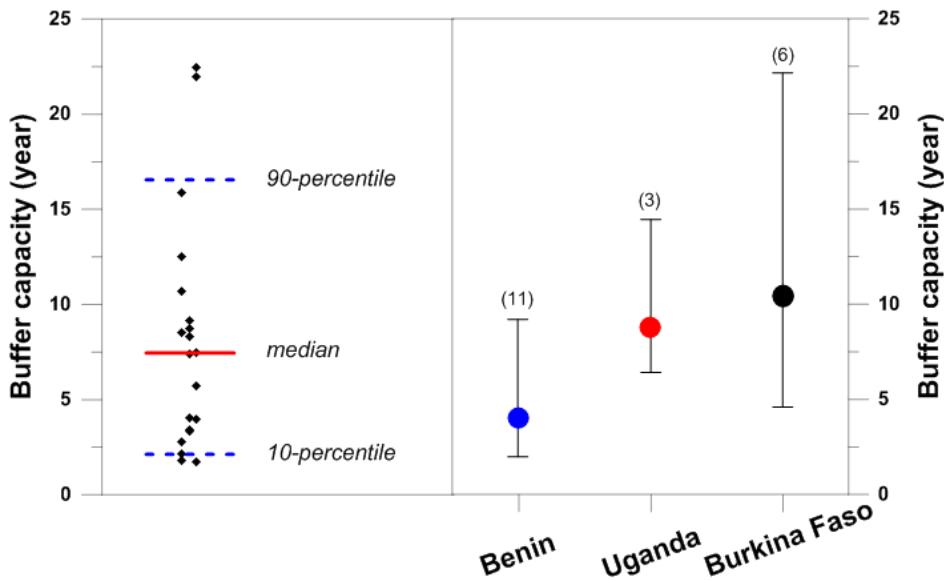
Estimating

$$B_c = GW_{storage} / GW_{discharge}$$

With

$$GW_{discharge} = S_y \cdot \Delta h$$

Buffer capacity VS countries



✓ Buffer capacity is not the same

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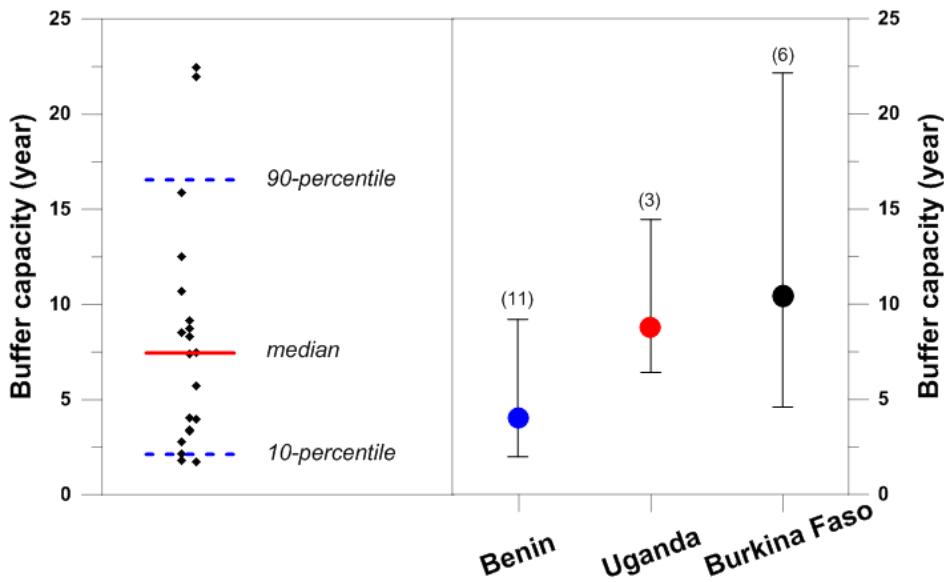


Aquifer buffer capacity

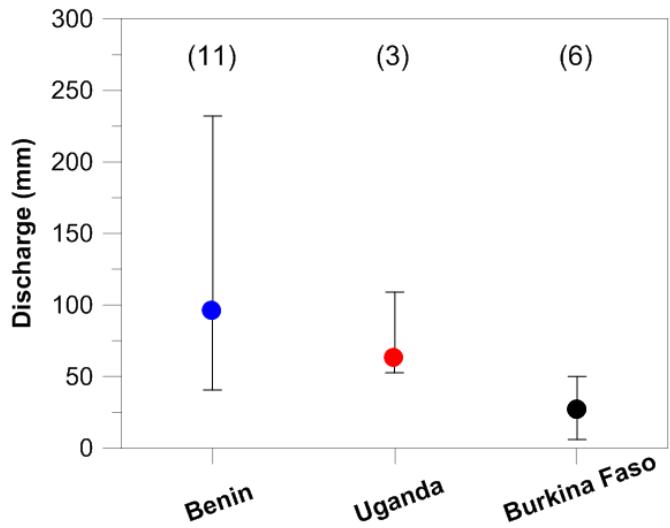
Estimating

$$B_c = GW_{storage}/GW_{discharge}$$

Buffer capacity VS countries



✓ Buffer capacity is not the same



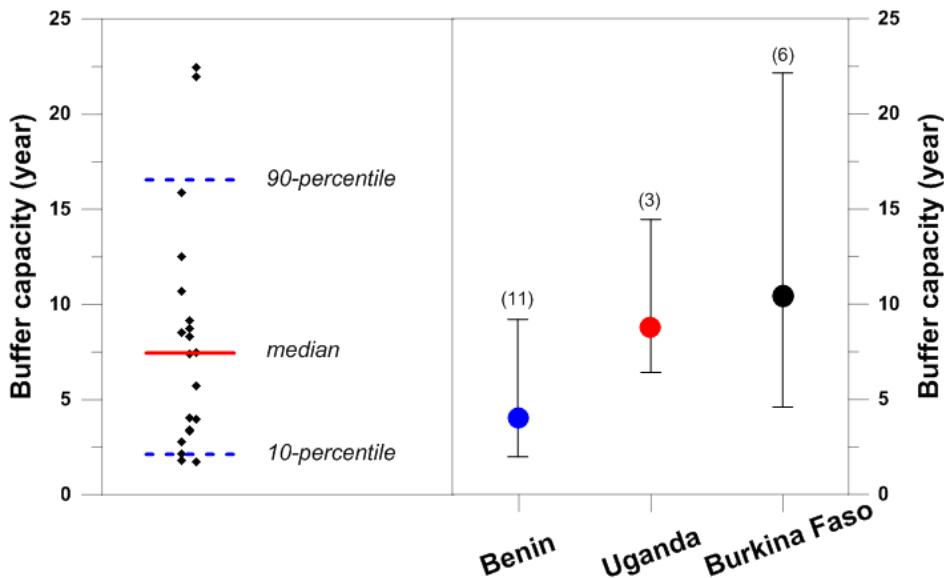
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Aquifer buffer capacity

□ Estimating

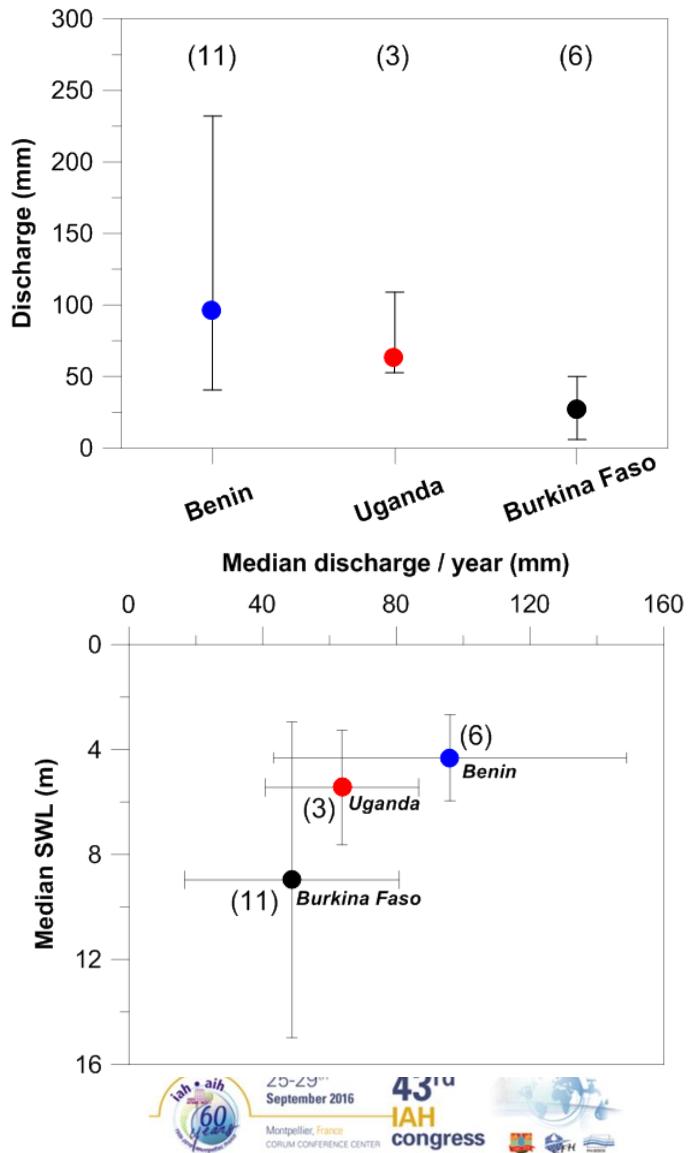
$$B_c = GW_{storage}/GW_{discharge}$$

□ Buffer capacity VS countries



✓ Buffer capacity is not the same

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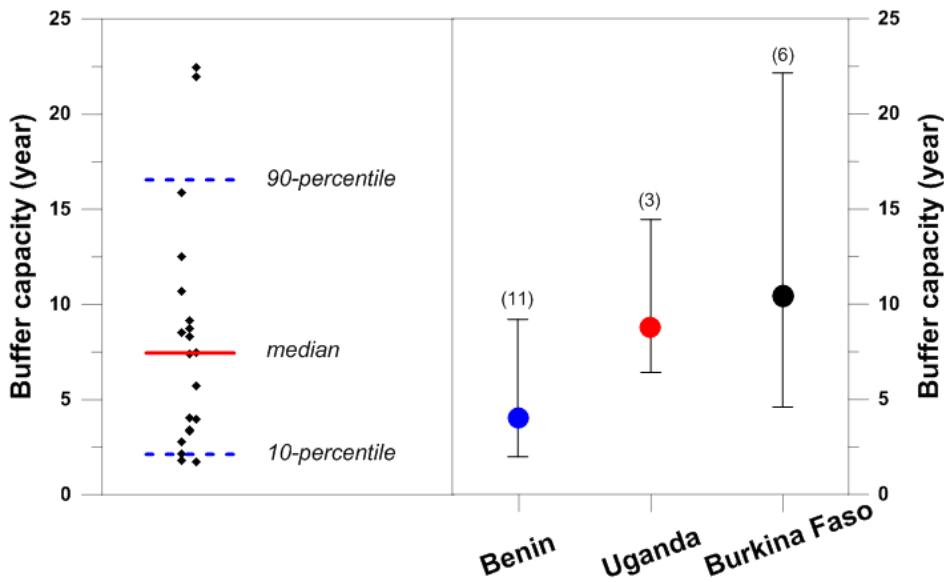


Aquifer buffer capacity

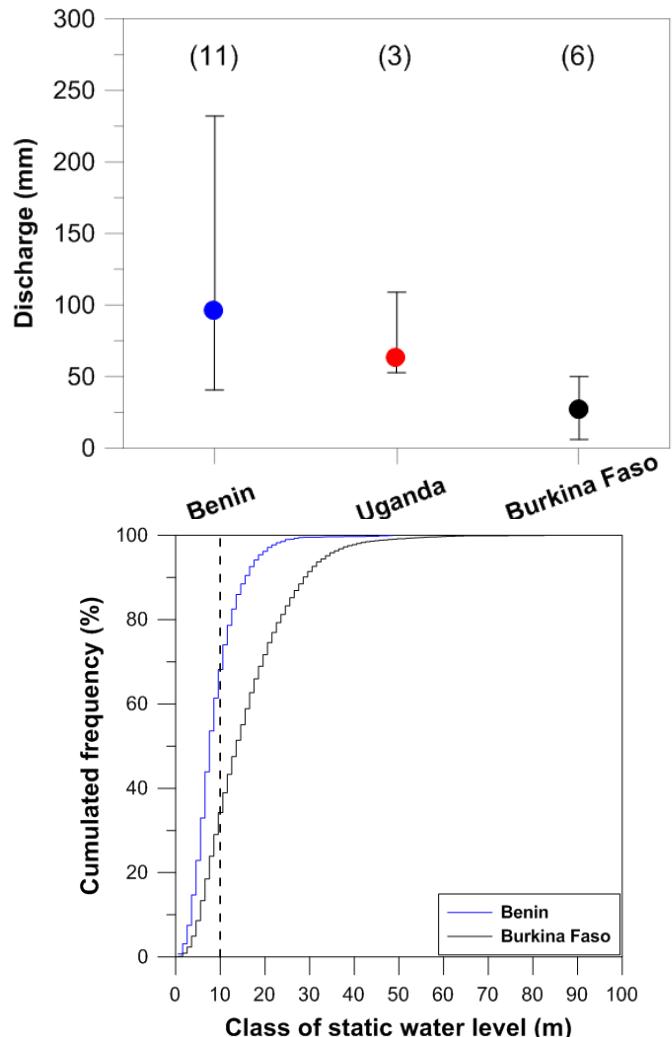
Estimating

$$B_c = GW_{storage}/GW_{discharge}$$

Buffer capacity VS countries



✓ Buffer capacity is not the same



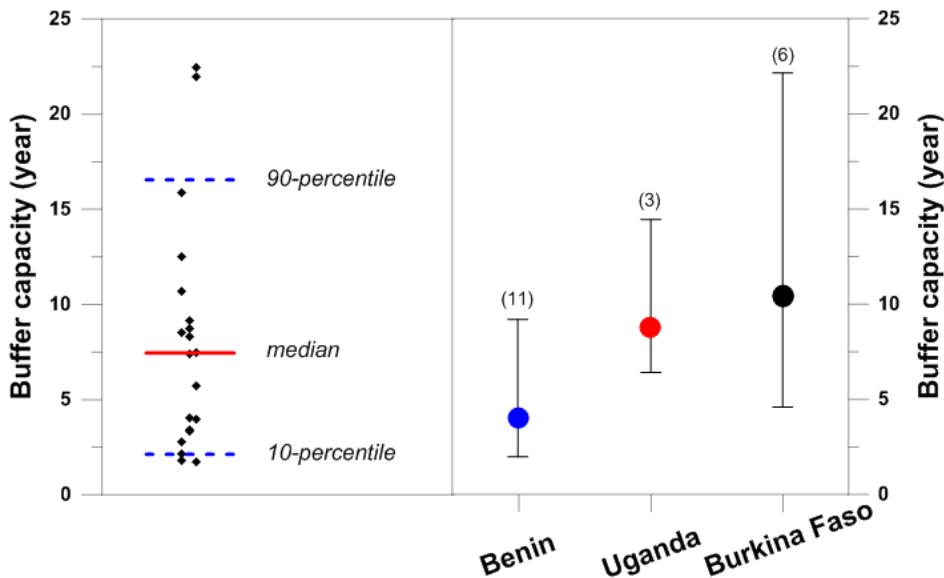
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Aquifer buffer capacity

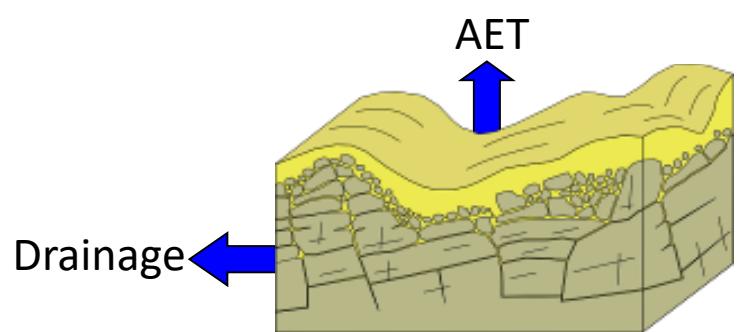
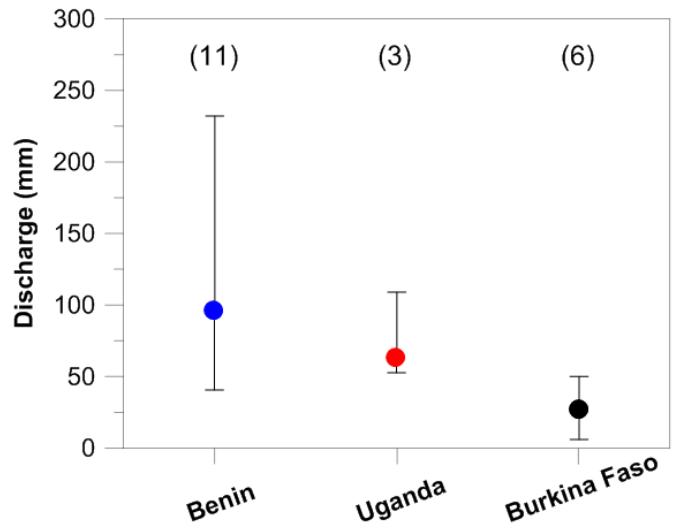
□ Estimating

$$B_c = GW_{storage}/GW_{discharge}$$

□ Buffer capacity VS countries



✓ Buffer capacity is not the same



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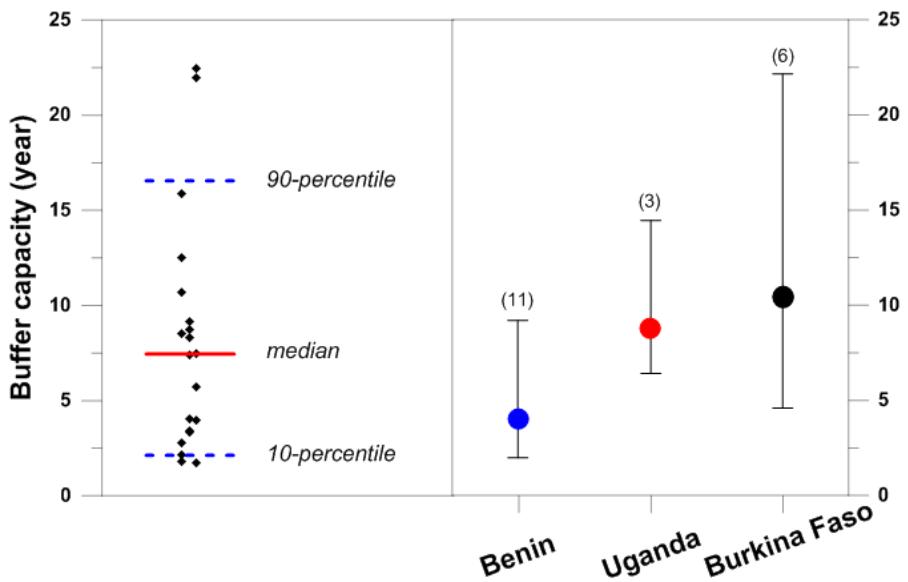
Aquifer buffer capacity

□ Estimating

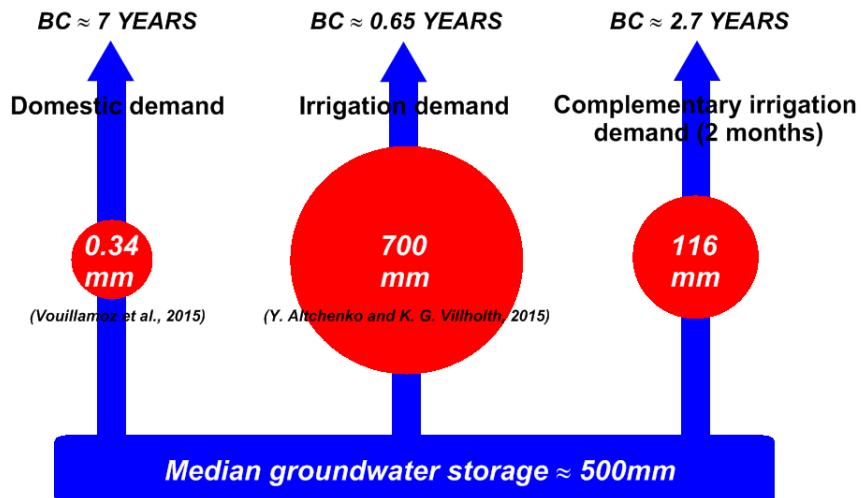
$$B_c = GW_{storage}/GW_{discharge}$$

□ Buffer capacity VS countries

□ Significance of Buffer capacity

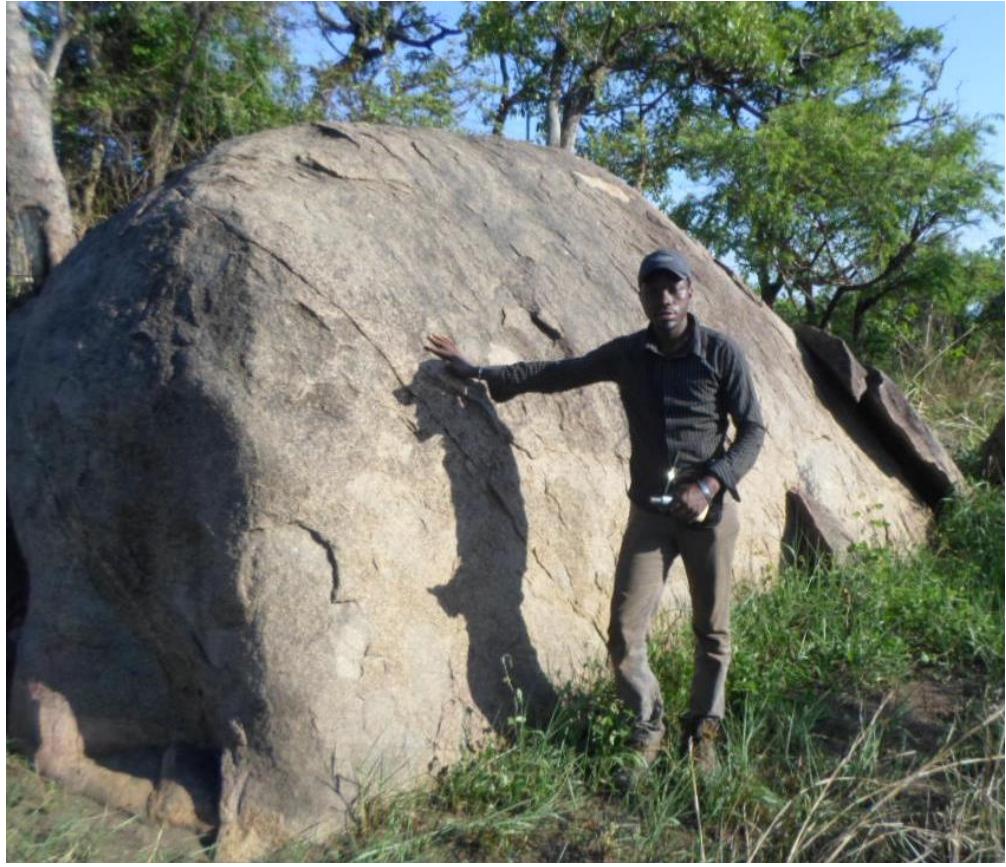
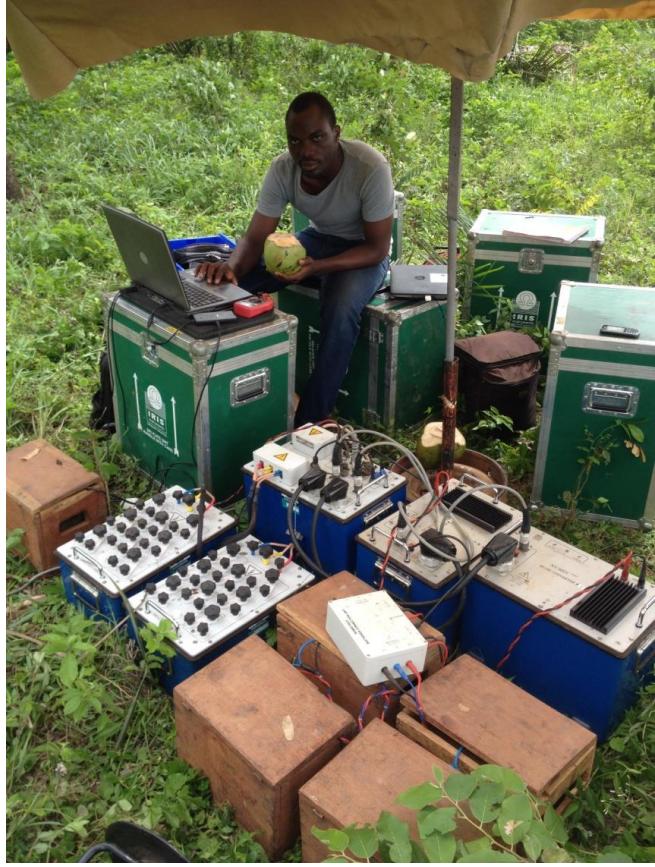


Median Bc of the 3 countries



- ✓ Buffer capacity is not the same
- ✓ GW storage is enough to buffer inter-annual changes

Thanks for your attention!



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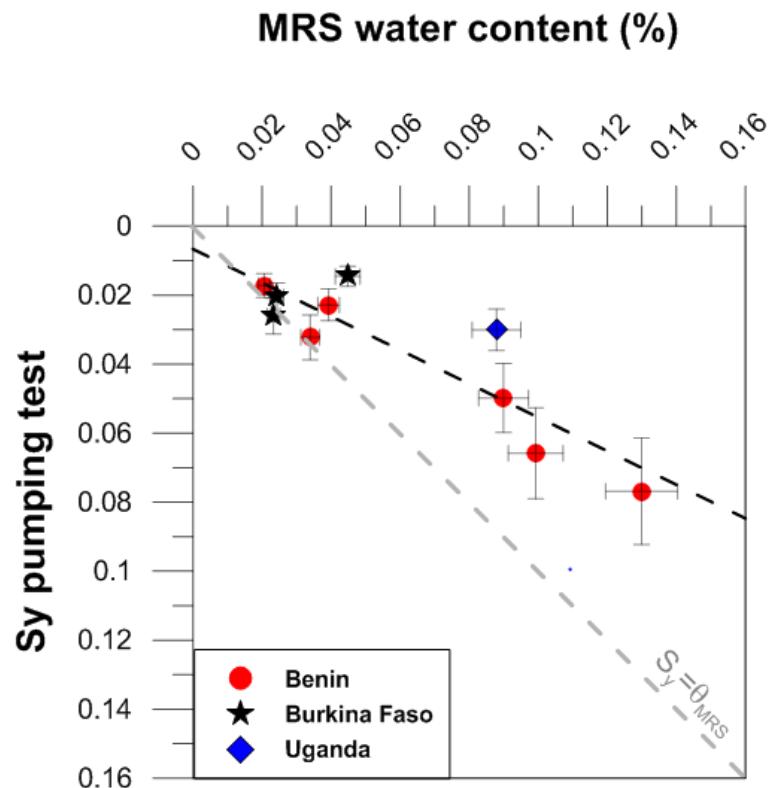
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