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Academic background

Presented by: Li Tailin (Terrence)

Supervisor: David Zumr

The Department of Landscape Water Conservation

Faculty of Civil Engineering

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Education:

Bachelor:

Water engineering in Hohai University, Nanjing, China (09. 2012 -- 06.2016)

Master:

The Erasmus Mundus Joint Master Degree Programme on

Groundwater and Global Change (09.2016 -- 09.2018)

- Master of Environment Engineering in IST, Lisbon, Portugal
- Master of Water Science and Engineering in IHE, Delft, Netherlands
- Master of Hydro Science and Engineering in TU Dresden, Dresden, Germany

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Experience:

Intern:

07.2017 -- 08.2017

Topic: Validation method of the Global Groundwater Model

Location: Deltares, Utrecht, the Netherlands

Deltares
Enabling Delta Life

Graduate Research assistant:

10.2018 -- 03.2019

Topic: Setup demo groundwater models on the INOWAS platform

Location: INOWAS Junior Research Group, TU Dresden, Dresden, Germany

INOWAS
MAR Junior Research Group

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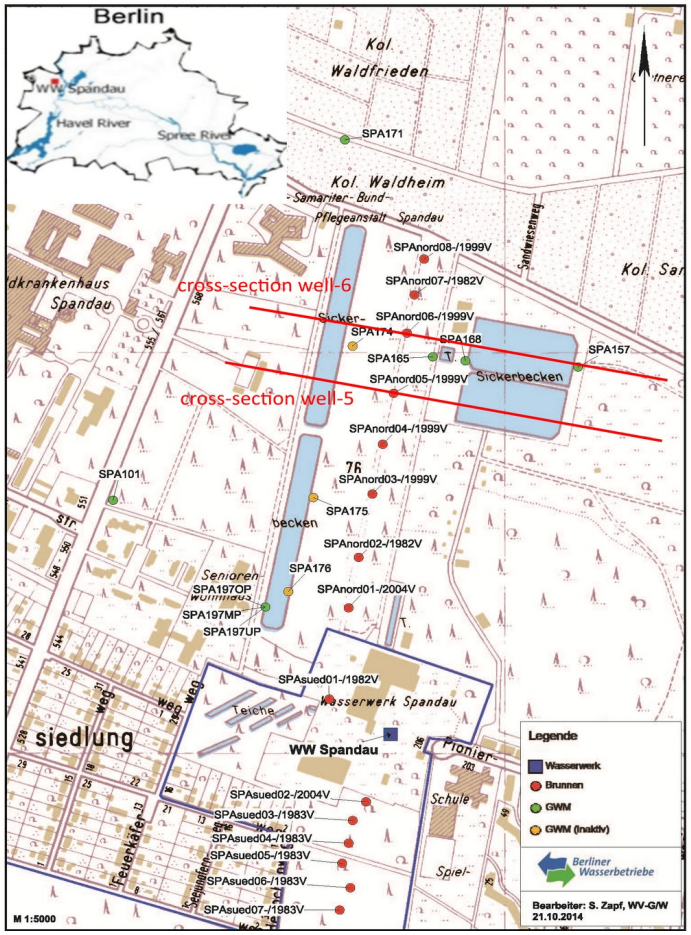
Master Thesis:

Topic:

Setup of numerical groundwater flow and transport model to determine flow paths and travel times at the Berlin-Spandau MAR site

Background:

- The Berlin-Spandau MAR (Managed Aquifer Recharge) site is in the north-western part of Berlin.
- Natural groundwater recharge does not cover the water demand.
- Groundwater is augmented by artificial recharge through the infiltration basins, lakes and trenches.



(Source of the picture: Berliner Wasserbetriebe)

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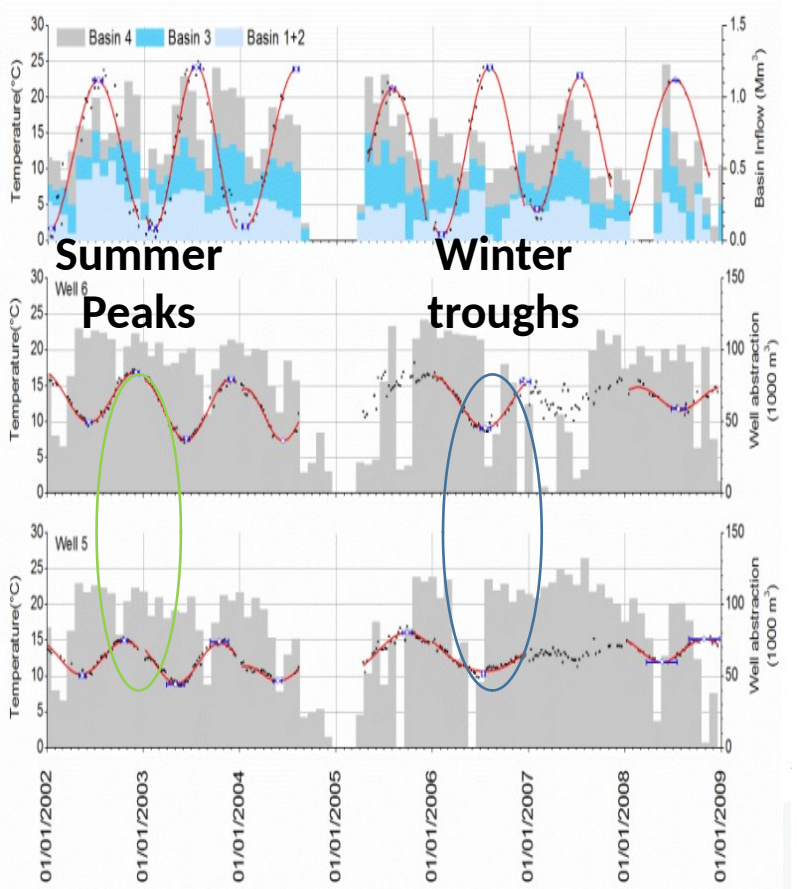
Problem Definition

- The travel time between the **infiltration ponds** and **abstraction area** is a vital parameter of the MAR system.
- German regulations - the minimum flow time of **50 days** (Bartel, 2007).
- Pervious study used temperature as a tracer to determine the flow travel time: **50 to 70 days.**
- The temperature peak in **summer** arrives earlier than in the **winter** time in abstraction well 5 and well 6 (Sprenger et al., 2016).



(Sprenger et al., 2016)

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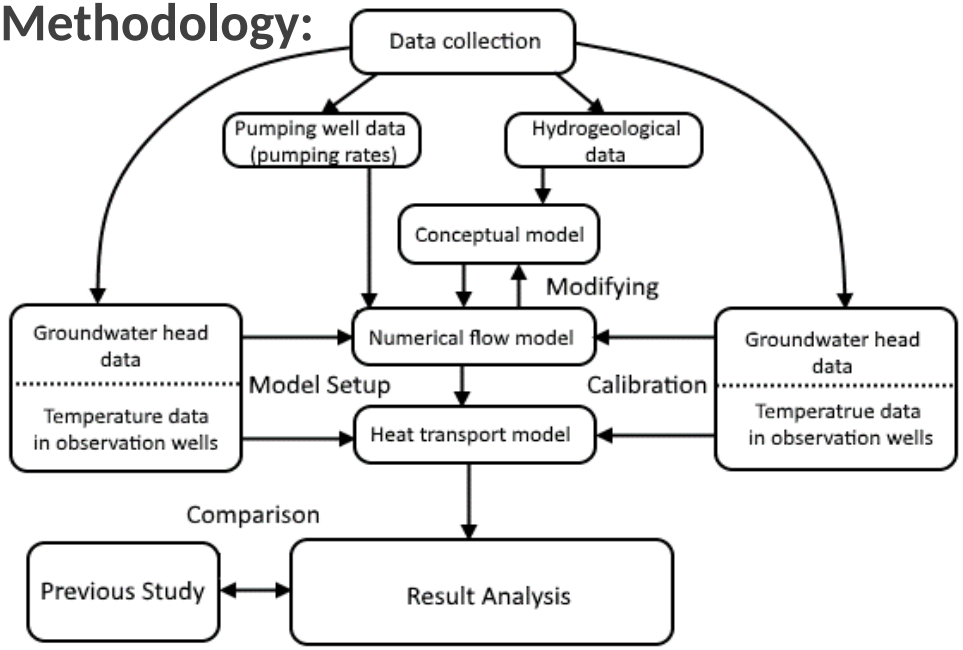
Objective

- Set up numerical flow and heat transport model to define the flow path & to ascertain the reasons for the earlier temperature peak in summer and the later trough in winter.
- Calculate the travel time between the infiltration basins and the abstraction well to verify it reaches the standard of 50 days.

Methodology:



Modelling tools:

- Flopy
- MODFLOW (Flow model)
- MT3DMS (Heat transport model)
- SEAWAT (Heat transport model, viscosity effects)
- MODPATH (Flow path and travel time)

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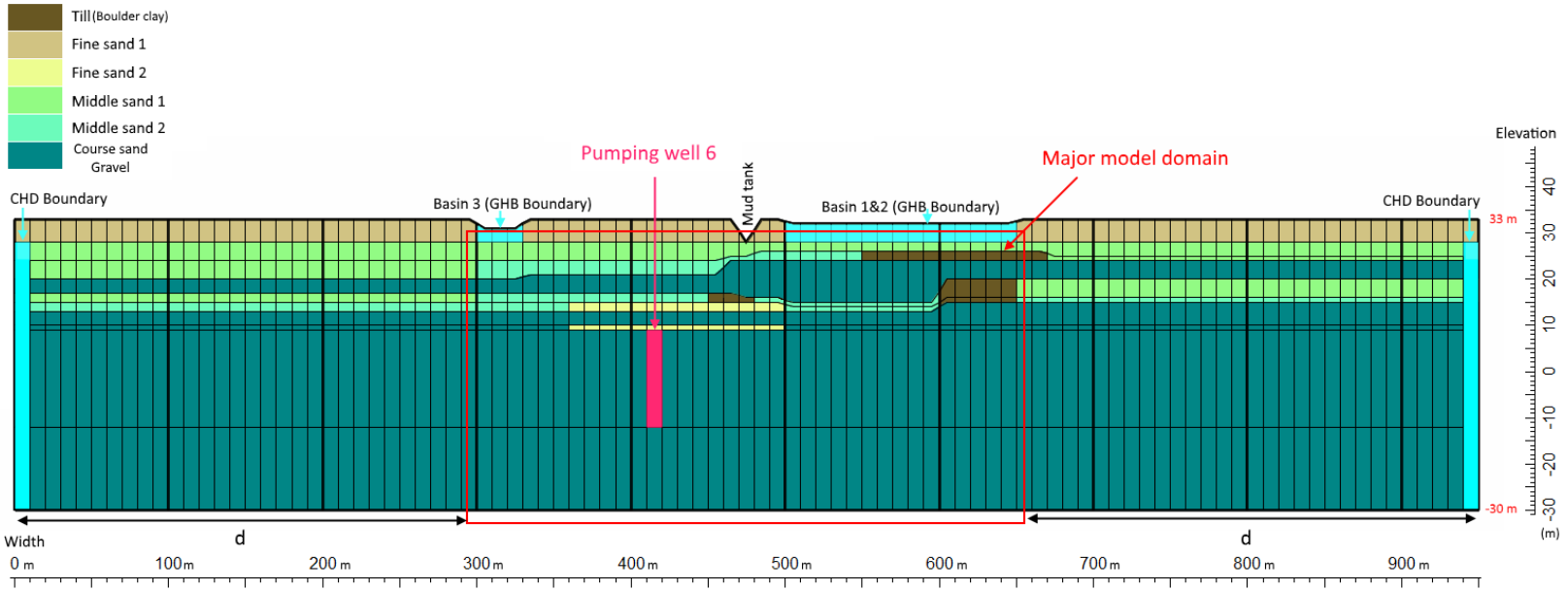
Model setup:

- 2D Cross-section | Daily time step | Time frame (2005-2014)
- Infiltration basins were defined as **GHB (General Head Boundary)**
- Two side-boundaries were defined as **CHD (Time-Variant Specified Head)**
- Heat sources: **GHB** (Temperature records in the basins)



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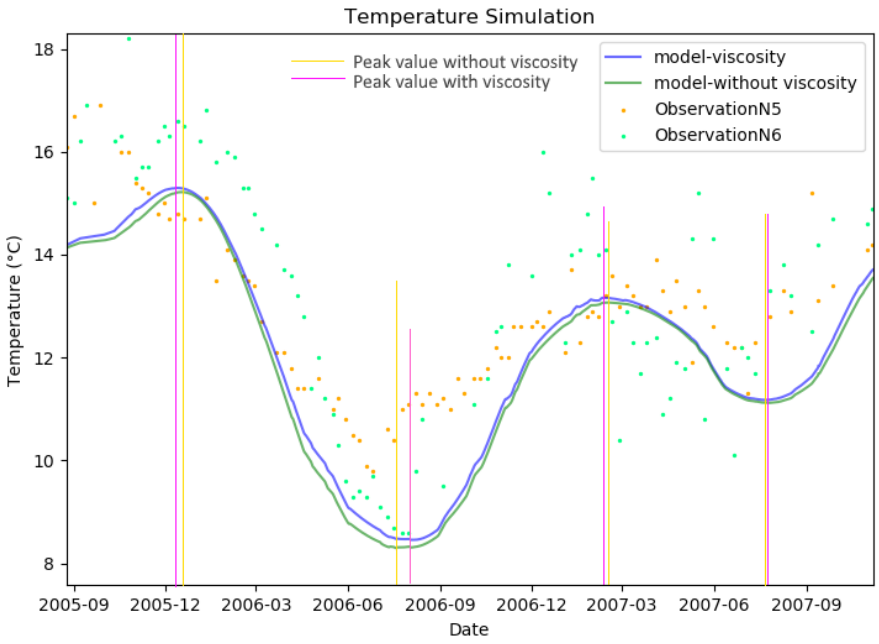
Results & Conclusions:



High temperature variance

higher viscosity effects

heat transport process

- Flow travel time from the basins to the pumping wells: the warm infiltrated water in summer is faster than the cold infiltrated water in winter
- The travel time of the infiltrated water in basin 3 (30-40 days) < the water in basin 1&2 (40-50 days)
- The simulated travel time was about 10-20 days shorter than the results from previous research *(Sprenger et al., 2016)*

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Research Assistant Work

- Optimizing the scripts of the model from the master thesis (Flopy)
- Testing and developing web groundwater modelling platform
- Flopy model cases study notebooks (Github)
- Writing documentations for the modelling tools on the platform
- MODFLOW Api

Thank you!
Děkuji!
谢谢！

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Reference

Sprenger, C. et al. (2016) Temperature measurements during Managed Aquifer Recharge for safeguarding subsurface travel times, Proceedings of 9th International Symposium on Managed Aquifer Recharge (ISMAR9). June 2016.

Sprenger, C. et al. (2017) ENTWICKLUNG EINER MONITORINGSTRATEGIE ZUR KONTINUIERLICHEN ÜBERWACHUNG DER FLIEßZEITEN VON GWA-BECKEN UND UFERFILTRATION ZU TRINKWASSER-BRUNNEN AM BEISPIEL BERLIN-TIEFWERDER UND -SPANDAU. Berlin. Available at: http://www.kompetenz-wasser.de/wp-content/uploads/2017/12/schlussbericht-t-mon_fin.pdf.

Ringleb, J., Sallwey, J. and Stefan, C. (2016) 'Assessment of Managed Aquifer Recharge through Modeling—A Review', Water, 8(12), p. 579. doi: 10.3390/w8120579

Bartel, H. (2007) 'Drinking water quality: Requirements claimed by national and international standards'. Global Change: Enough water for all; 151-156. doi: 10.2312/WARNSIGNAL.KLIMA.ENOUGH-WATER-FOR-ALL.26

Brühl, H. and Limberg, A. (1985) *Untersuchungen zur Steigerung der Versickerungsleistung der Grundwasseranreicherungs-Anlage Spandau (Abschlussbericht)*.