

Impact of the climate changes to shallow groundwater in Baltic artesian basin

Didzis Lauva, Peteris Bethers ,Andrejs Timuhins and Juris Sennikovs

UNIVERSITY OF LATVIA

peteris.bethers@gmail.com



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2. Boundary conditions and calculations with 3D model
3. 1D model and climate impact on groundwater
4. Climate change in area
5. Groundwater change in area?
6. Summary

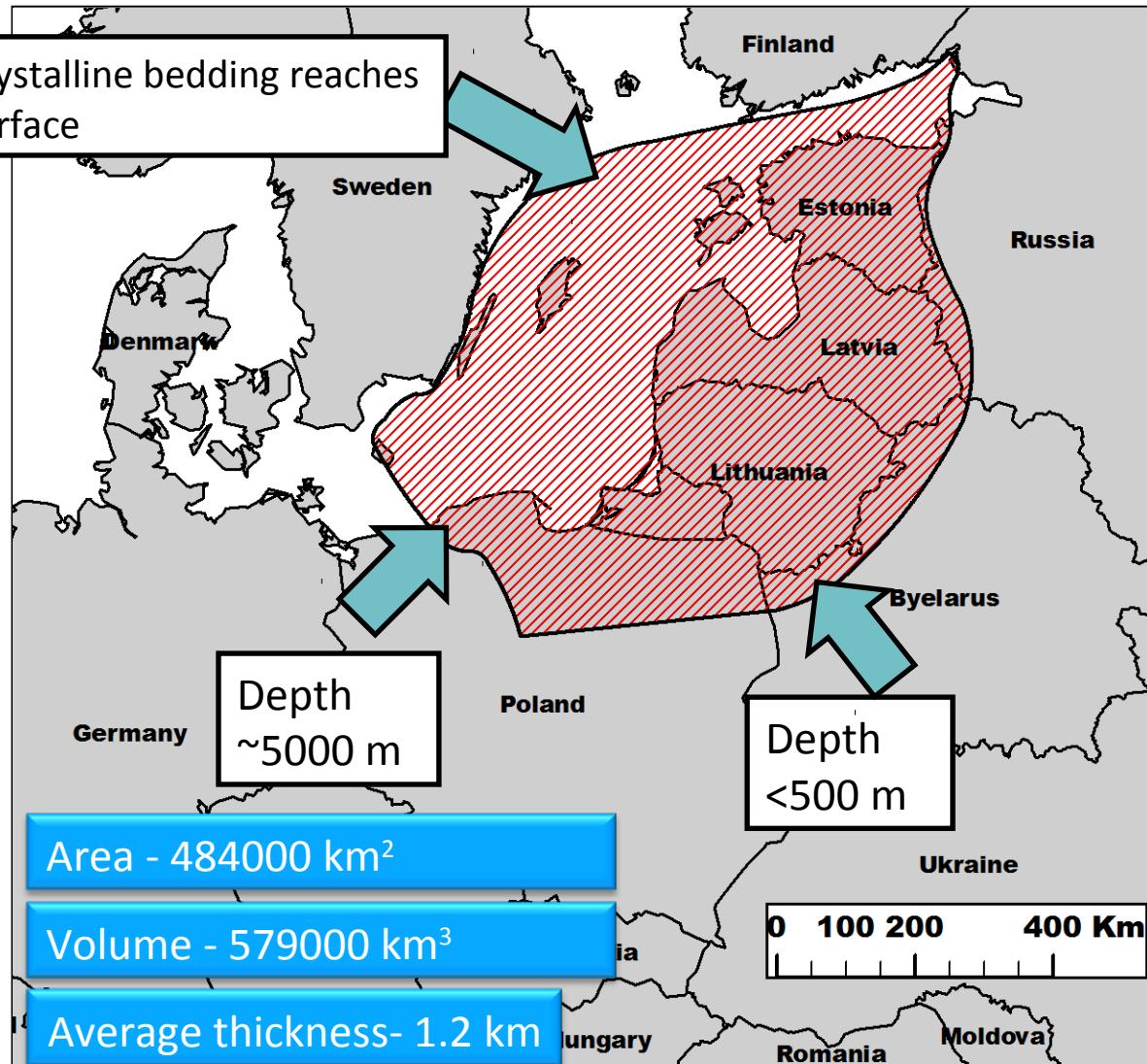
Motivation

We have developed a mathematical model for the whole BAB

Question about boundary conditions:

How to correctly assess infiltration and how shallow groundwater levels interact with them. What will change in the future?

Area of study

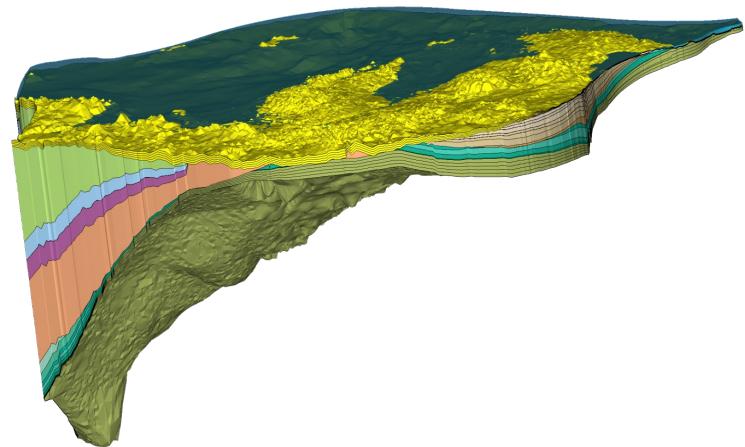
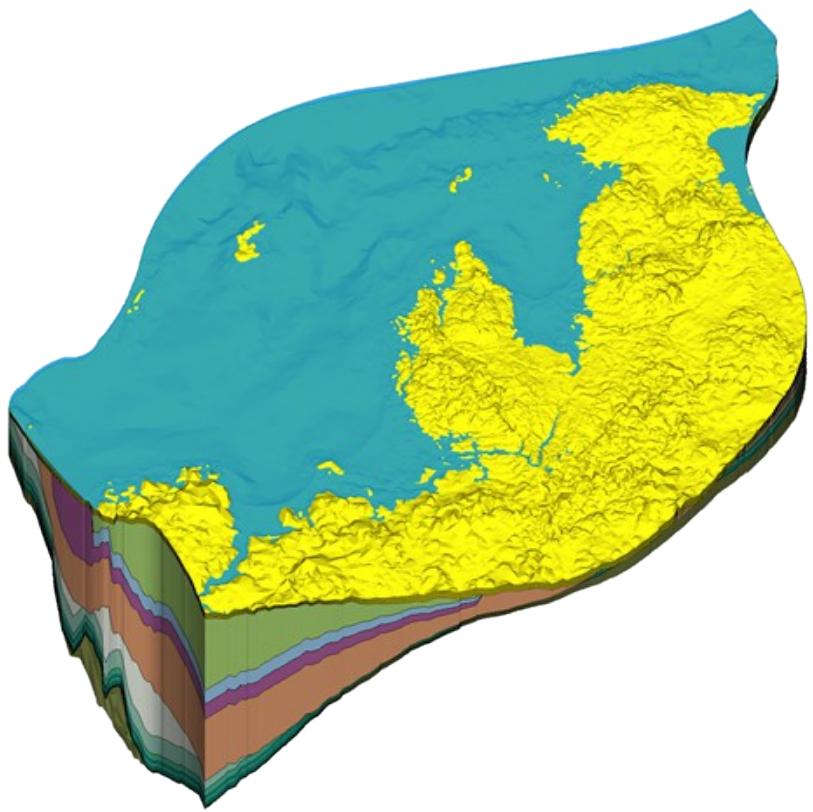


Baltic artesian basin (BAB) is a multi-layered and complex hydrogeological system up to 5000 m deep

BAB fully covers the territory of Latvia, Lithuania and Estonia, parts of Poland, Russia, Belarus as well as large area of the Baltic Sea, including island of Gotland.

It is the main drinking water source in the Baltic countries

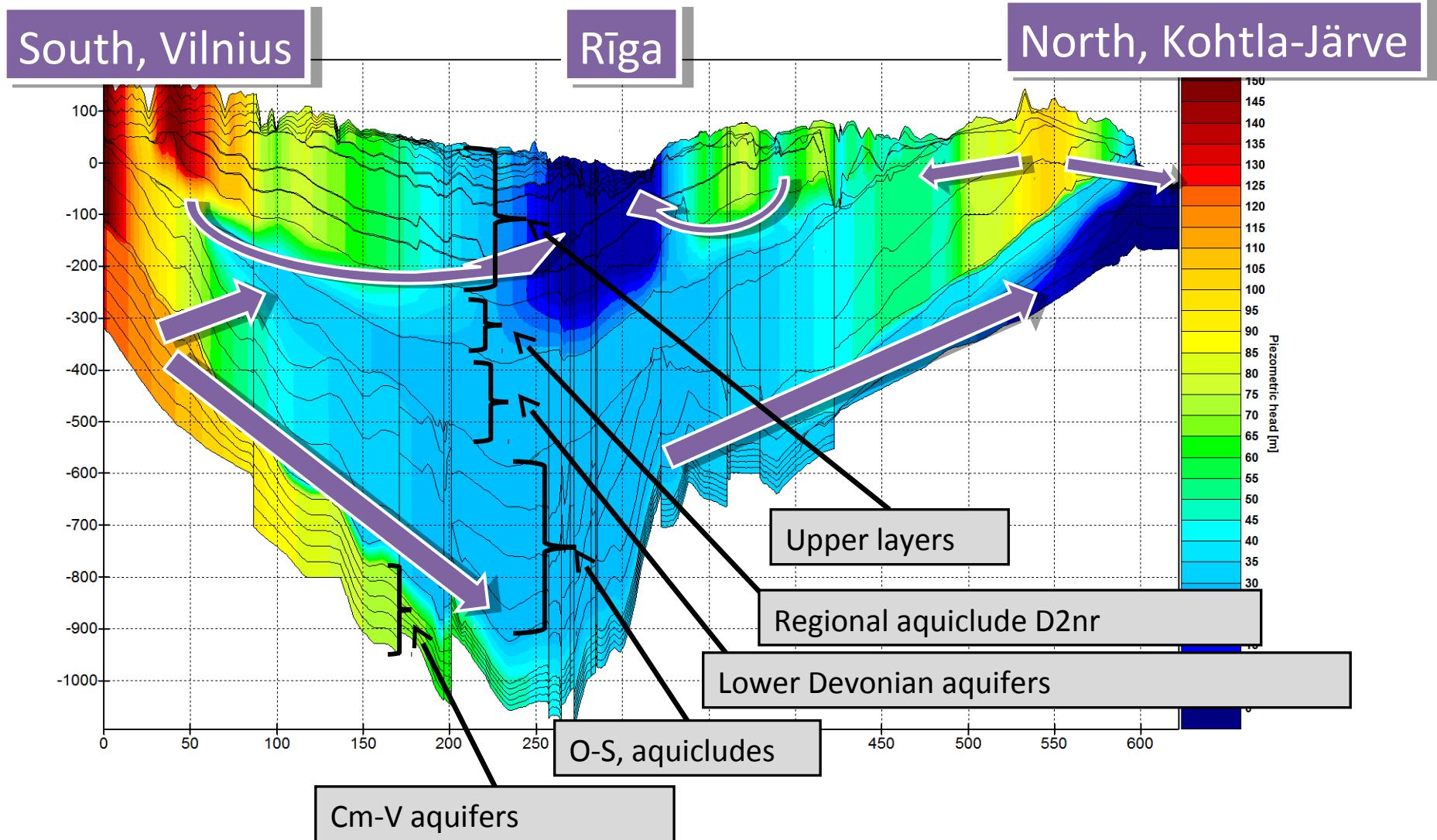
BAB



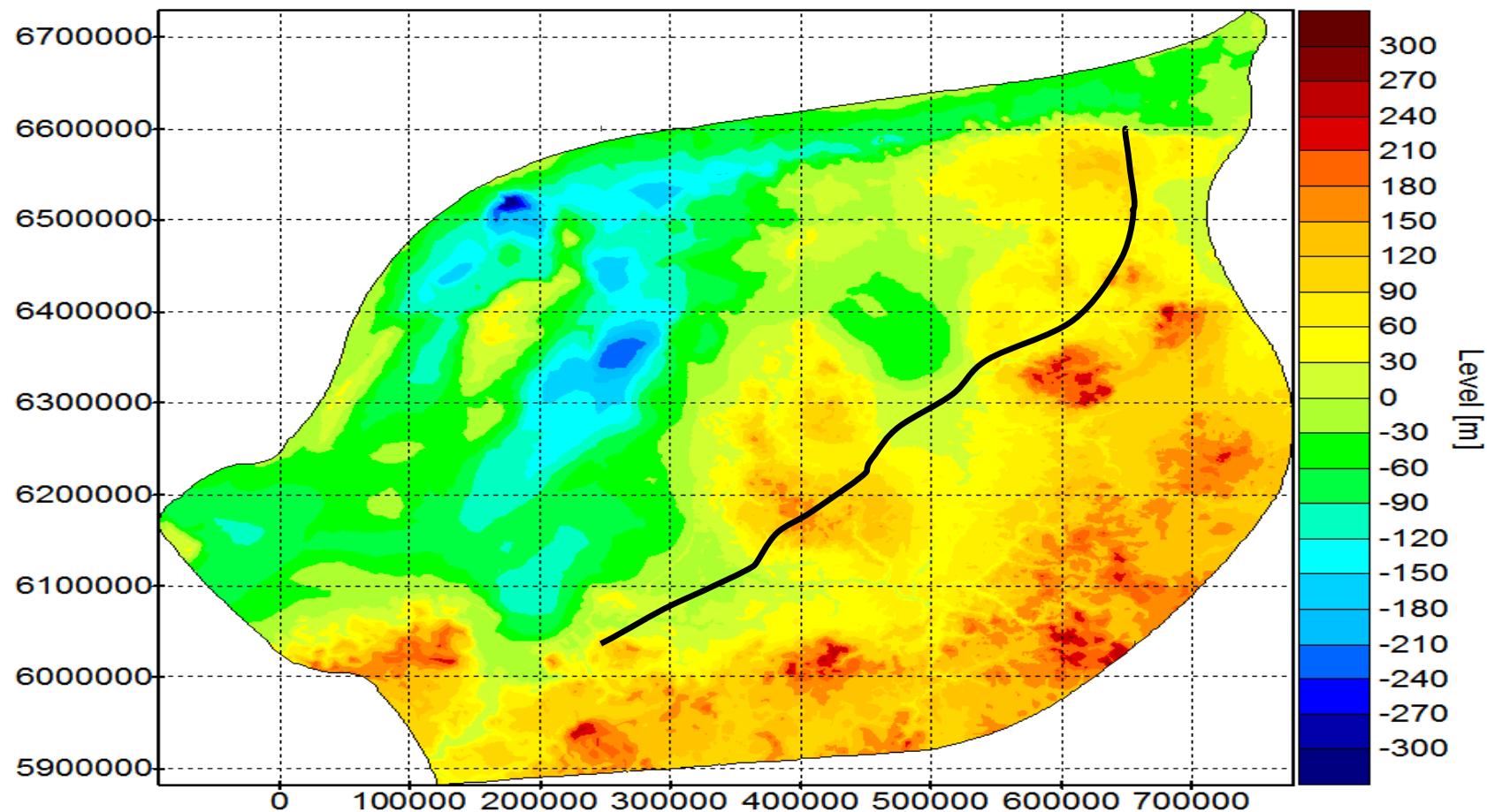
Evolution

1. Steady state fixed level and infiltration.
2. Steady state fixed level fixed and distributed infiltration.
3. Non-steady state fixed level non-fixed and distributed infiltration.
4. Non-steady state non-fixed level and infiltration.

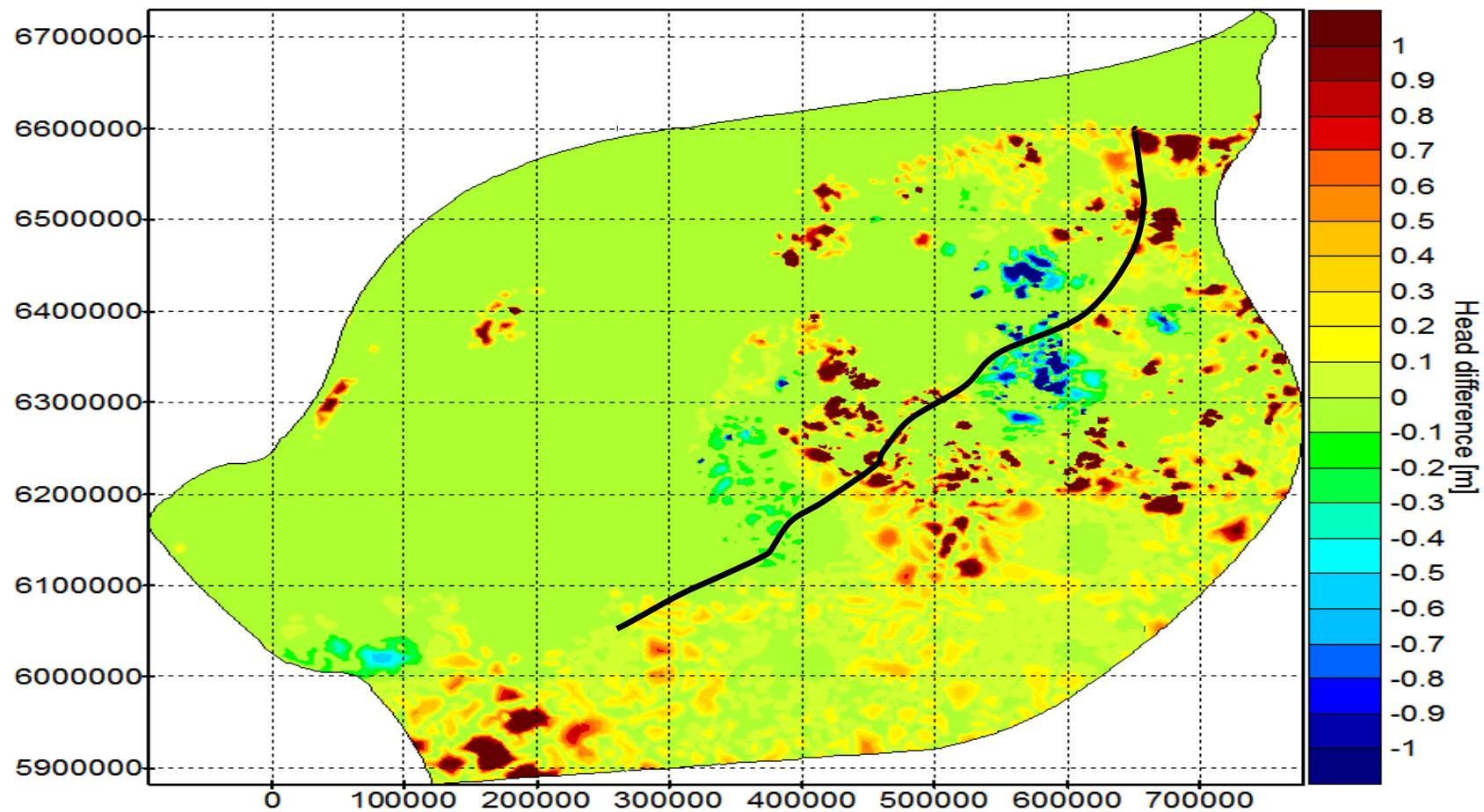
Distribution of piezometric head in south-north vertical crossection



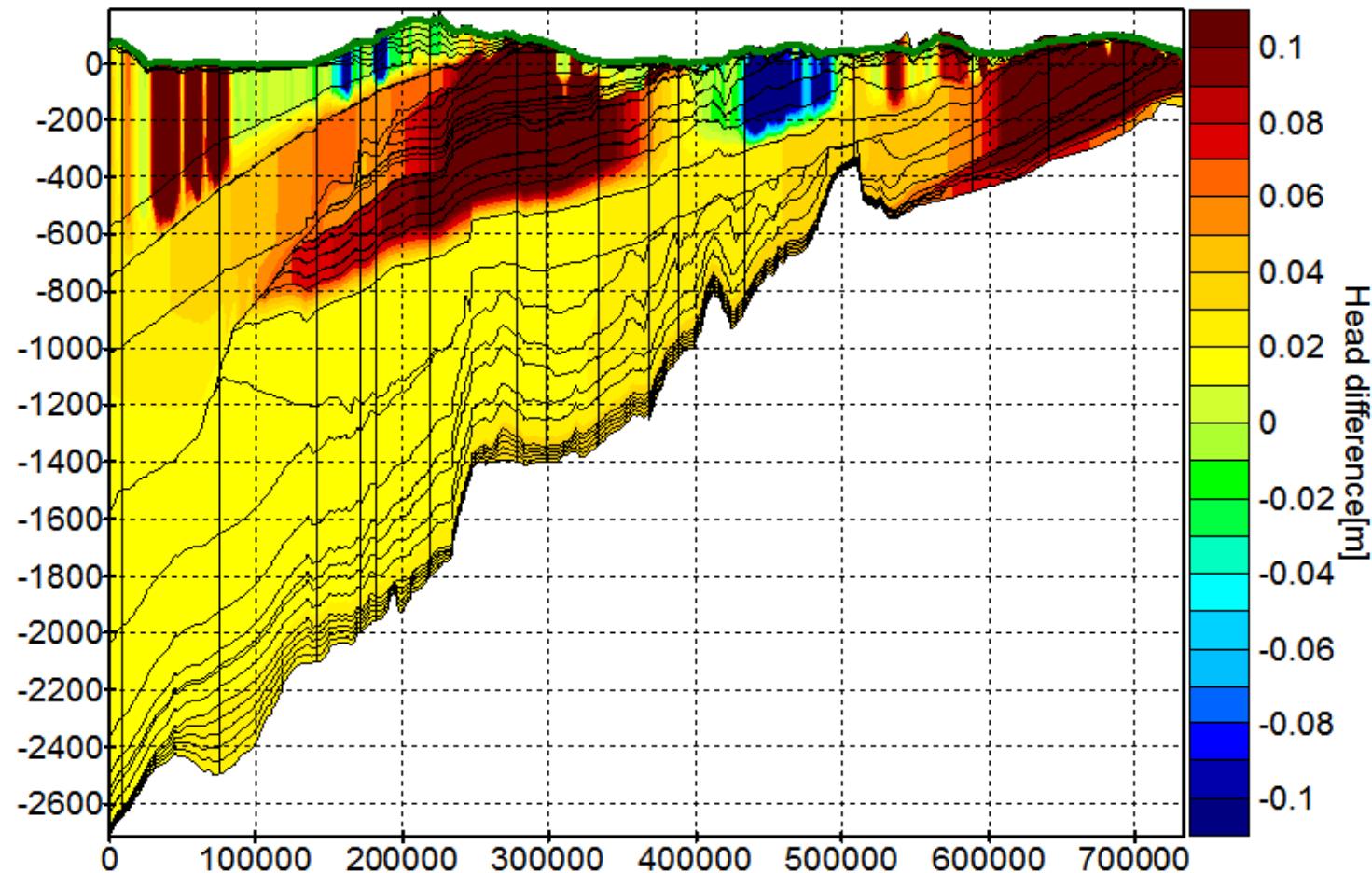
Level



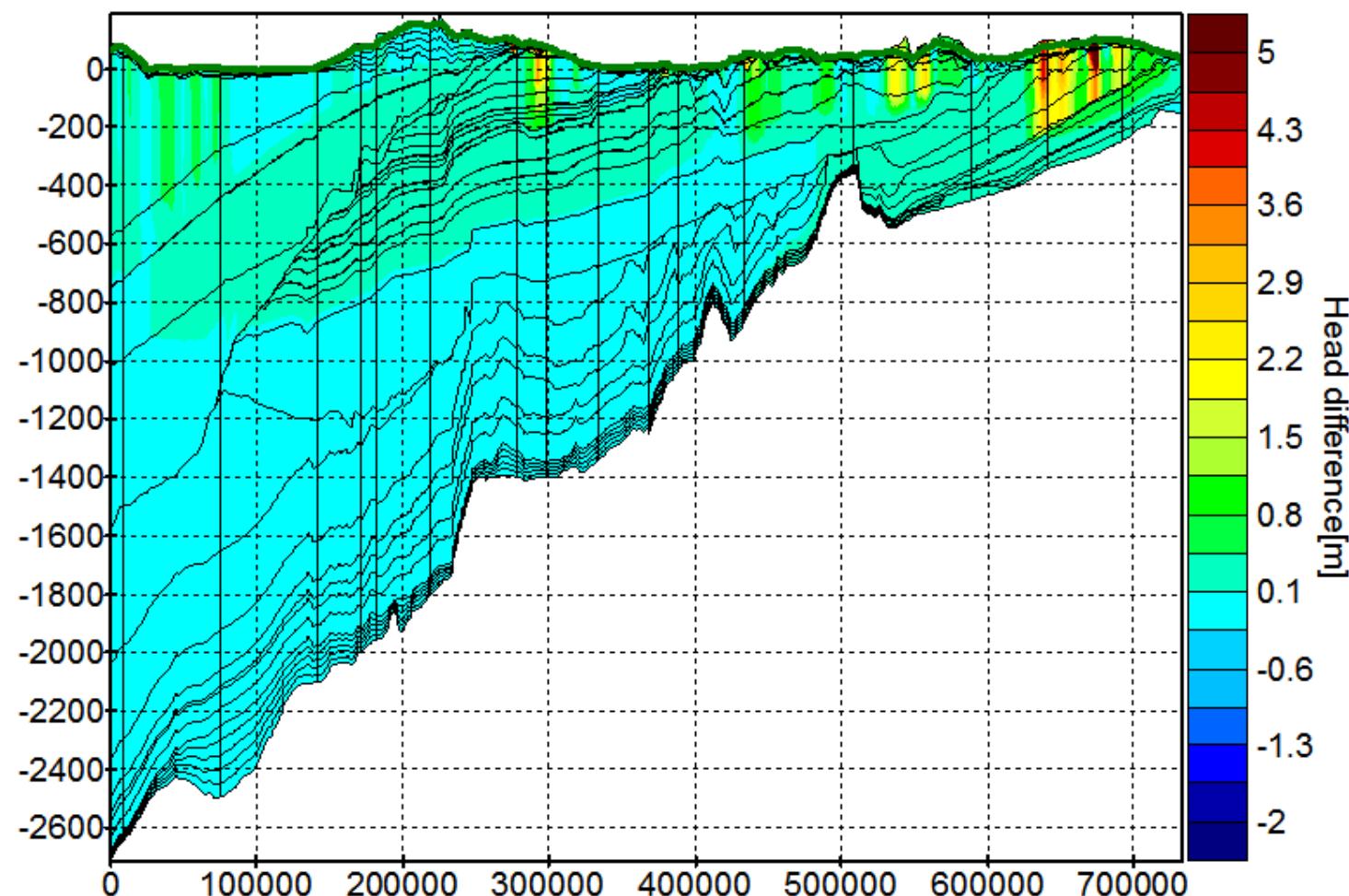
Run-off module



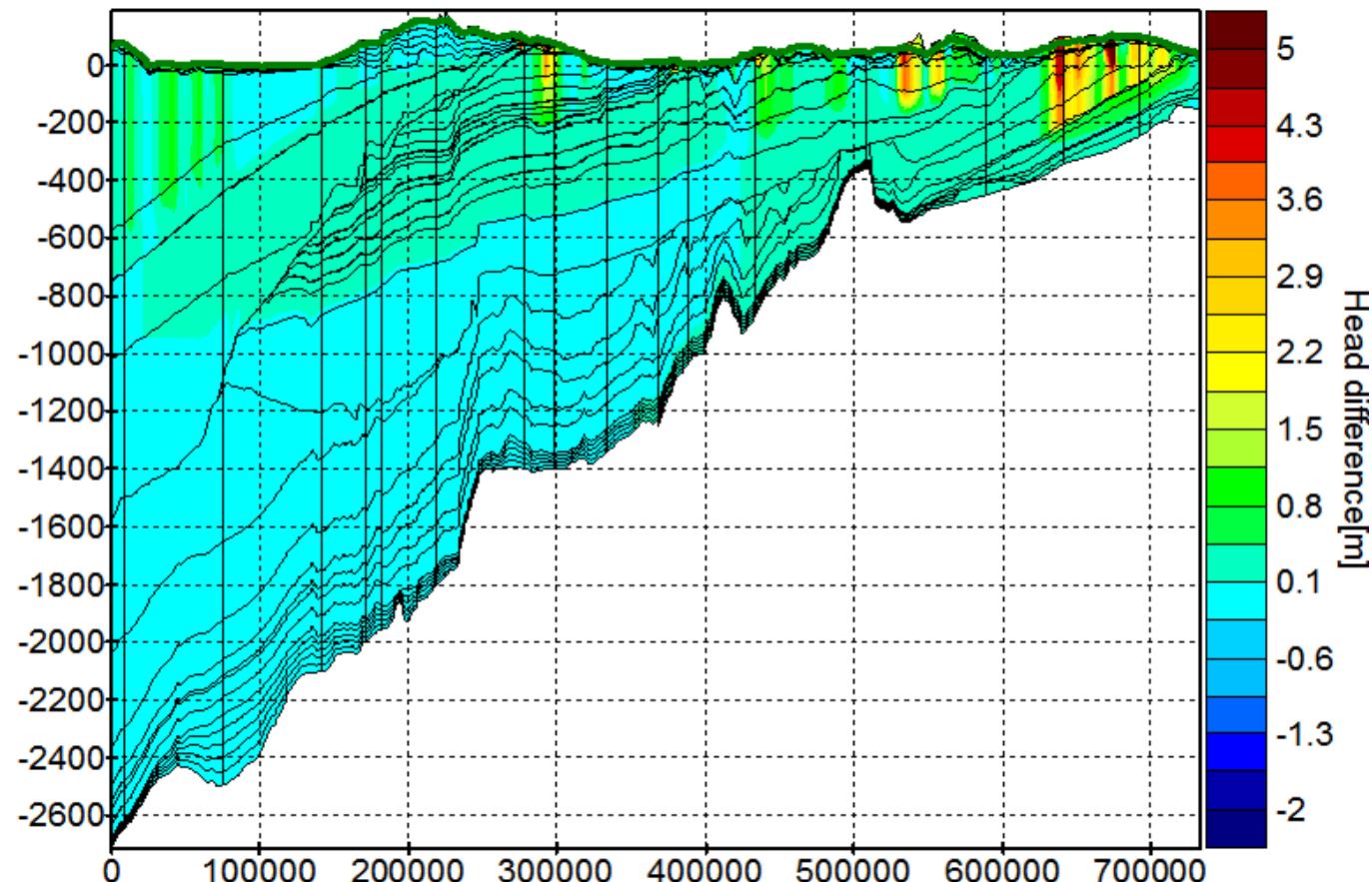
Using run-off module for infiltration distribution



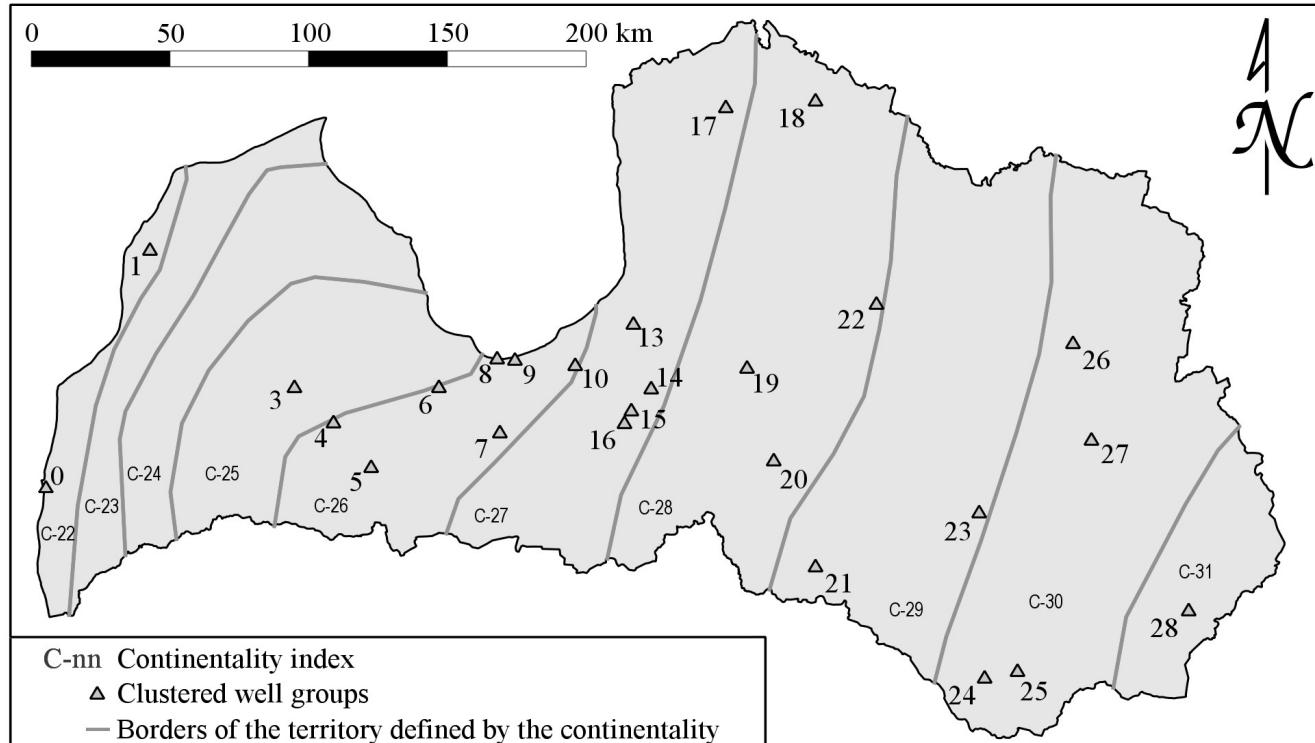
Pressure head (2021-2050) –



Pressure head (2071-2100) – pressure head(1961-1990)



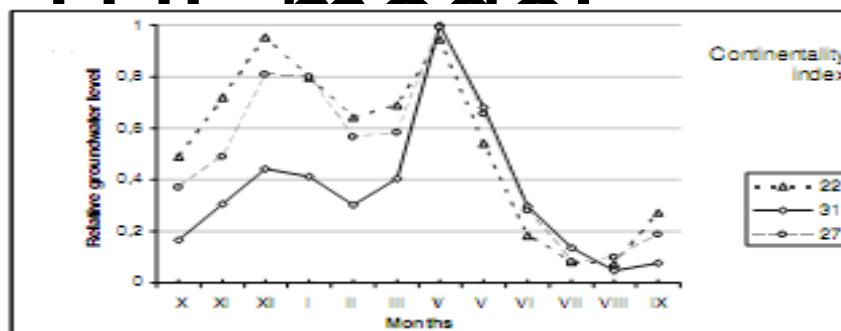
1D METUL model



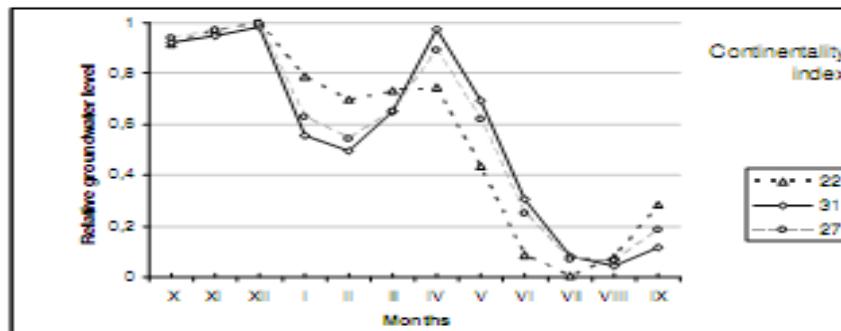
Distribution by continentality and clusters of wells chosen for calculation

1D METU model

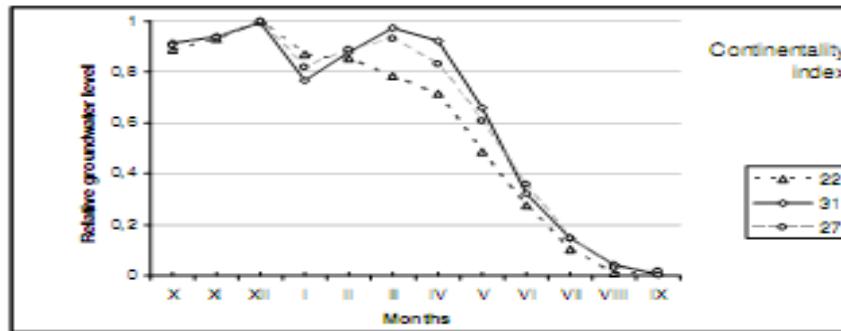
Observed 1961-1990



Modelled 1961-1990



Far future 2071-2100

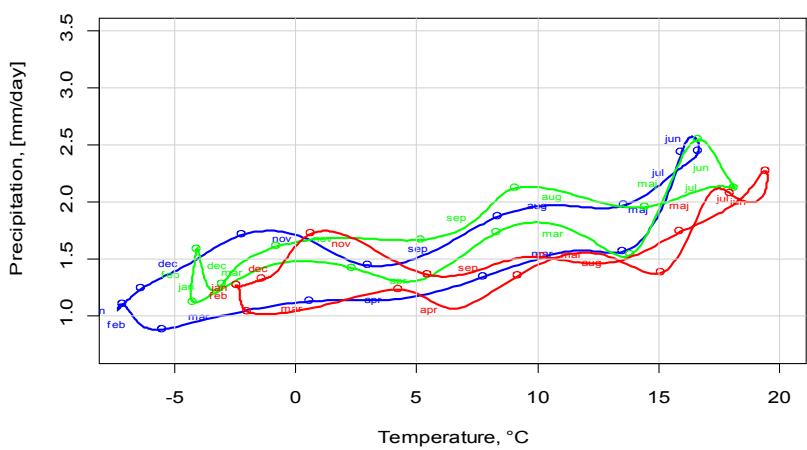


Climate

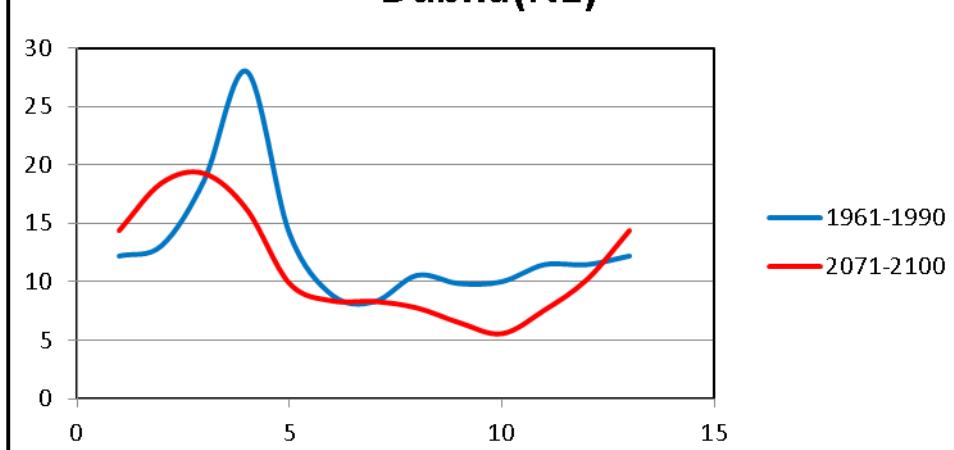
Climate change

Kur-Of

REZEKNE

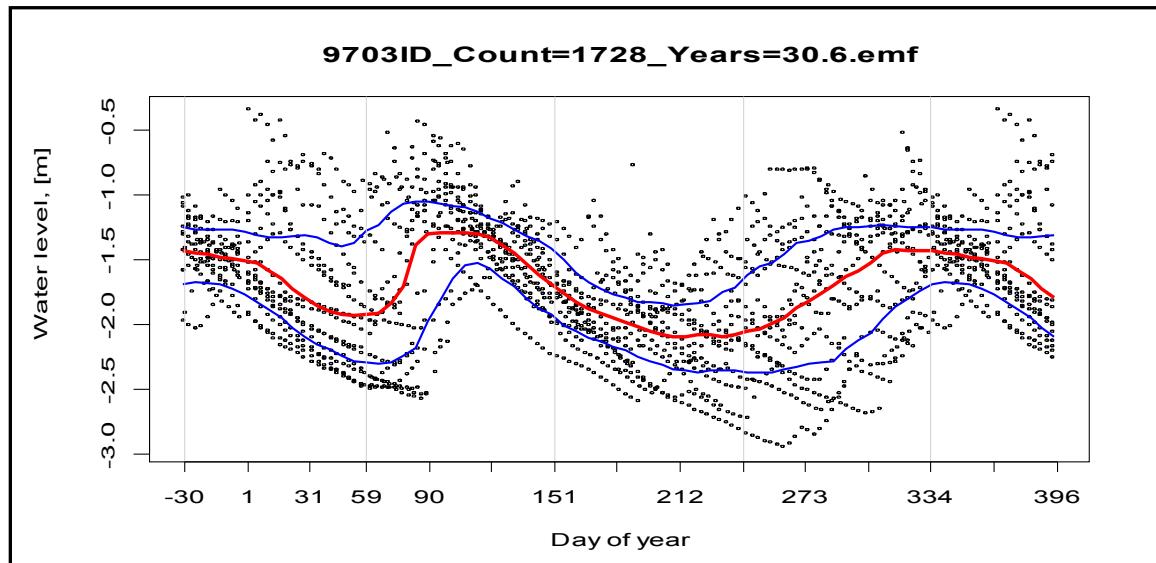


Dubna(NE)



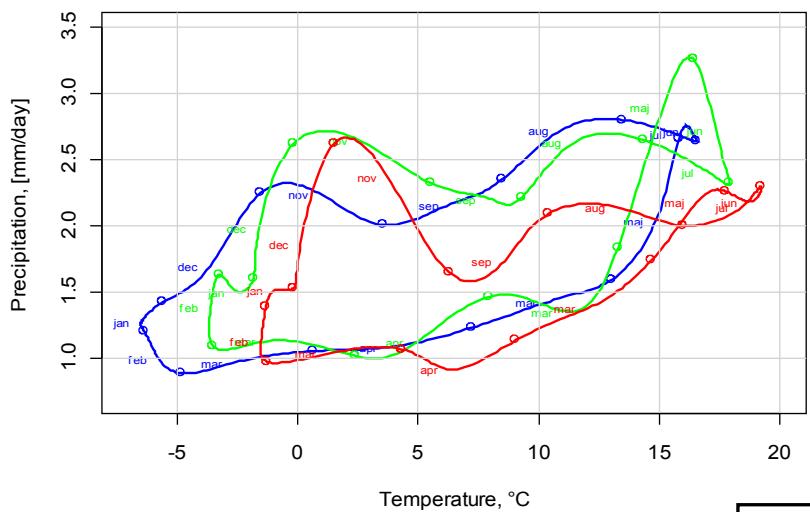
Groundwater

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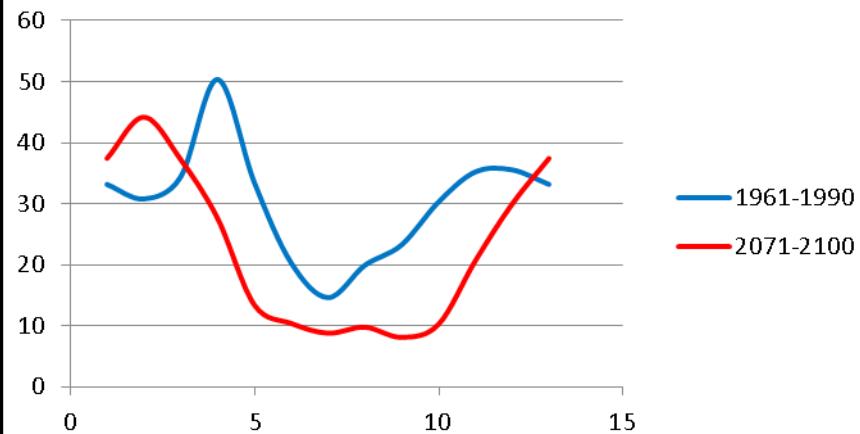


Climate changes

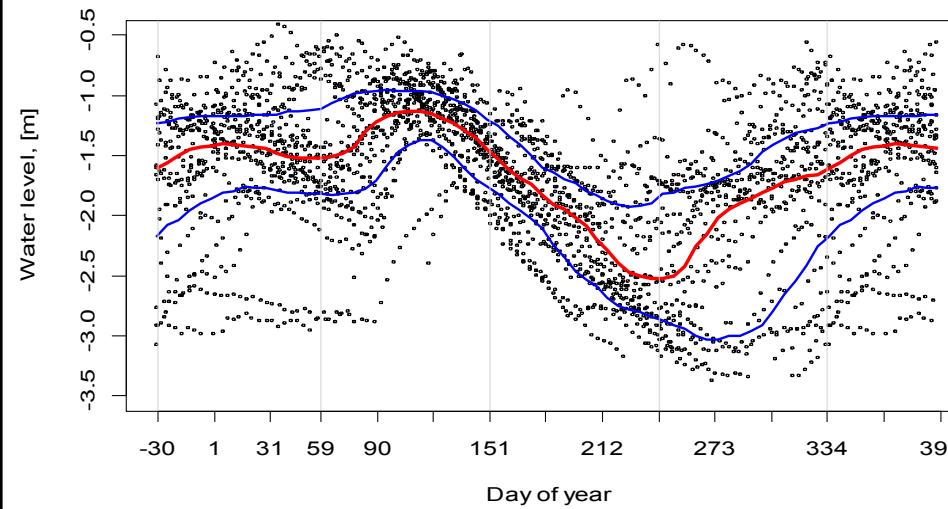
RUJIENA

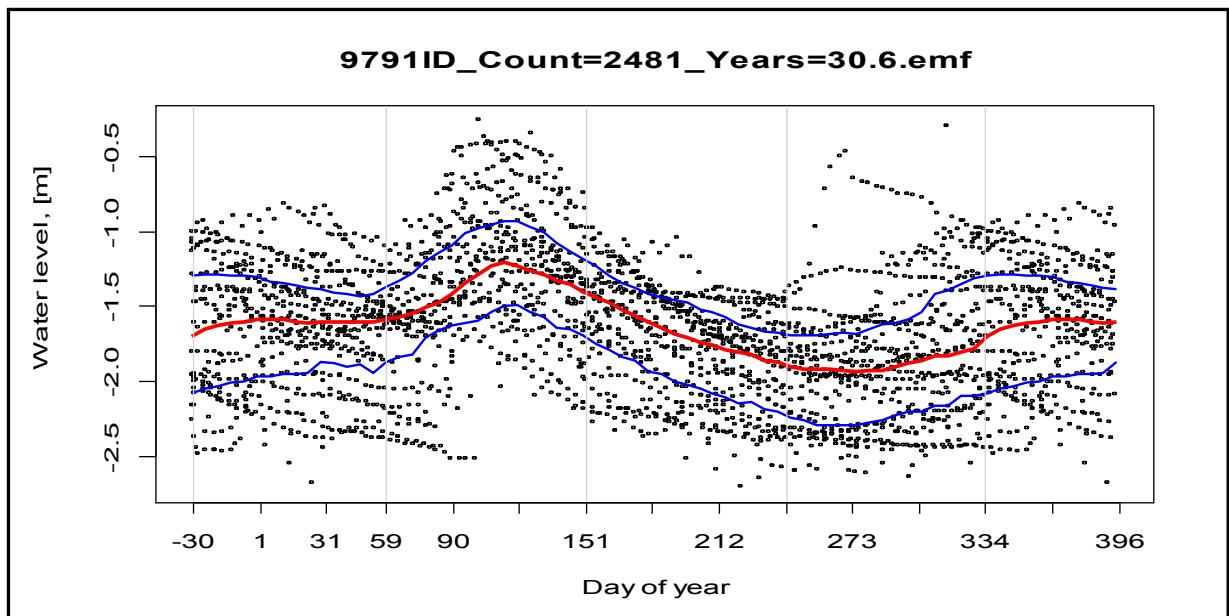
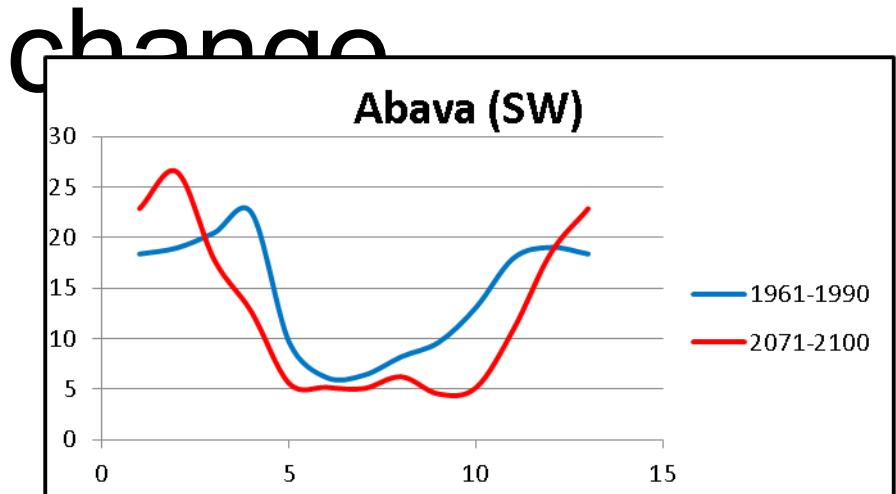
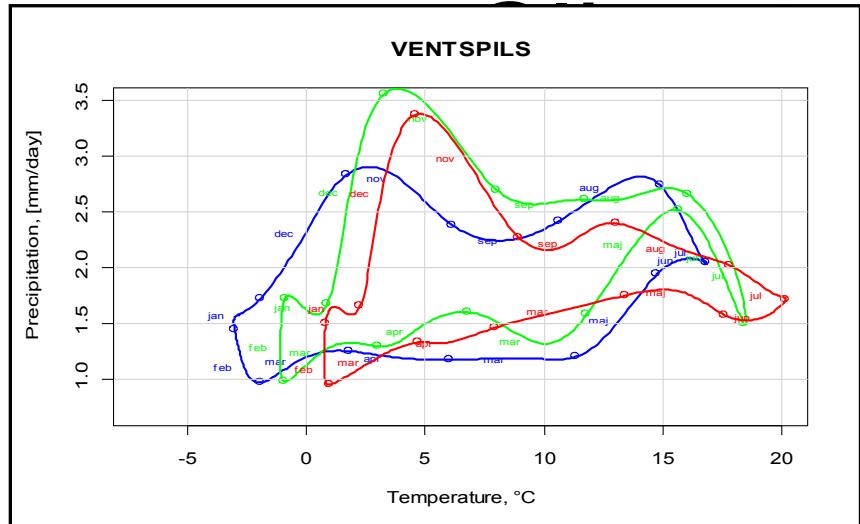


Salaca(NW)



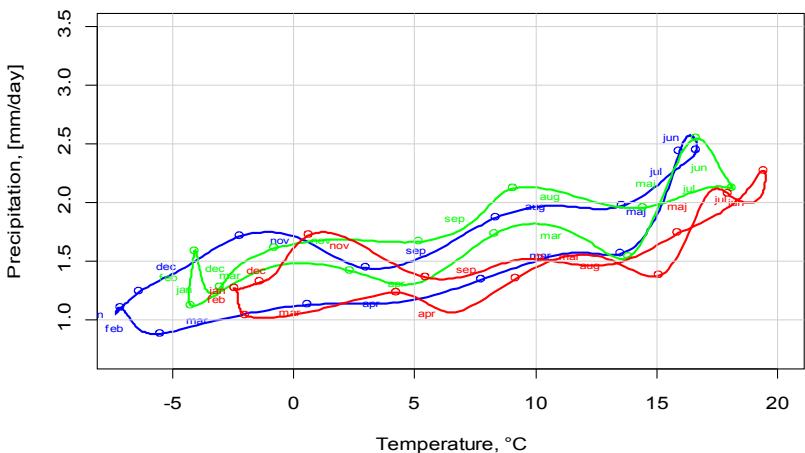
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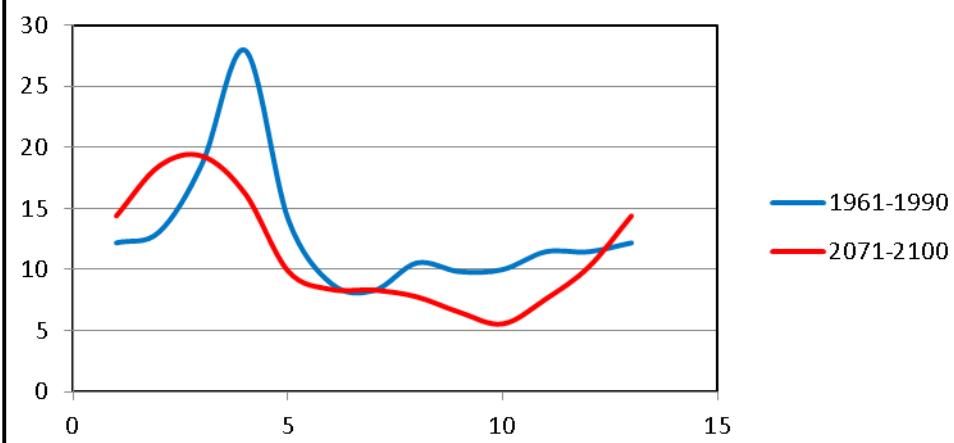


Climato change

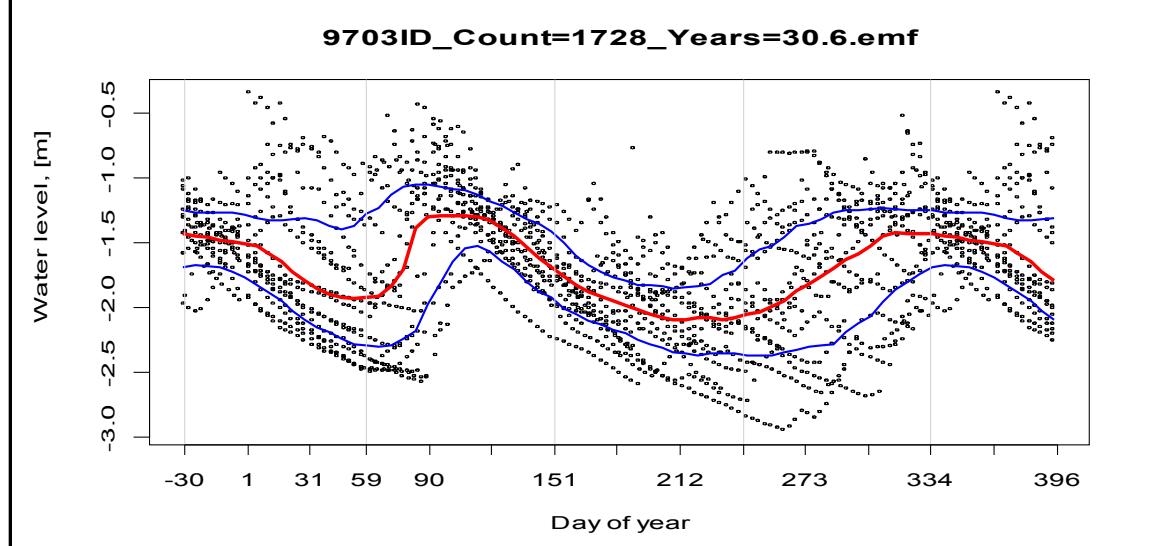
REZEKNE



Dubna(NE)

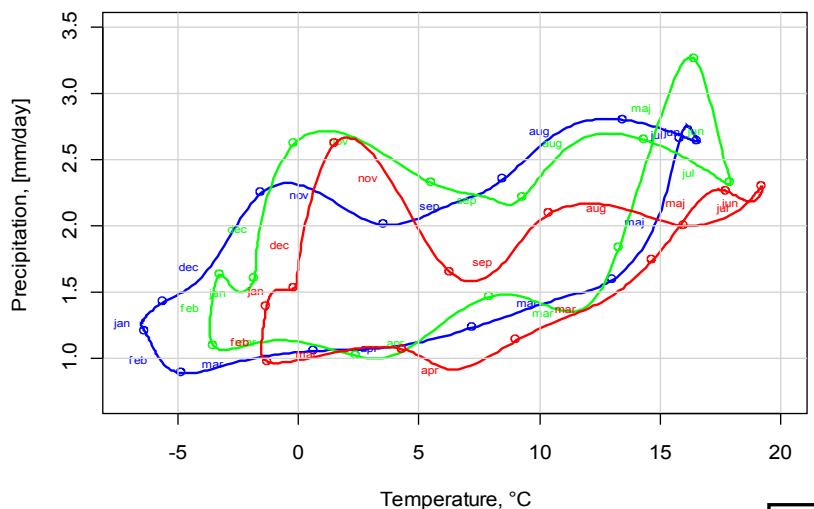


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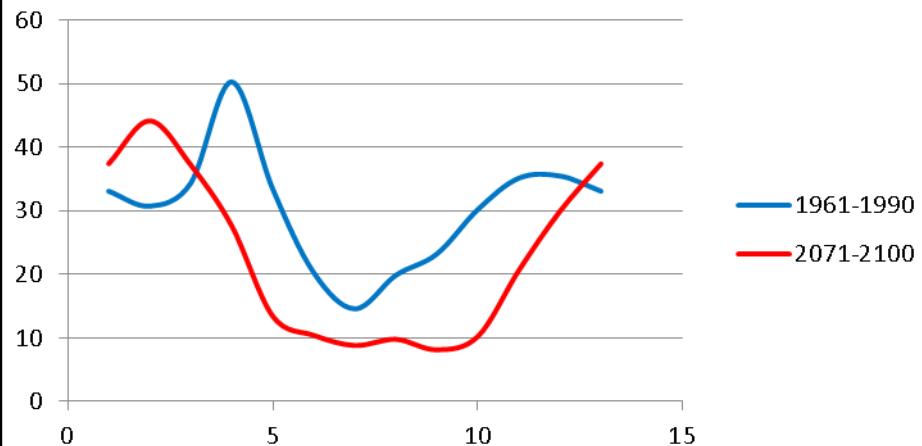


Climate change

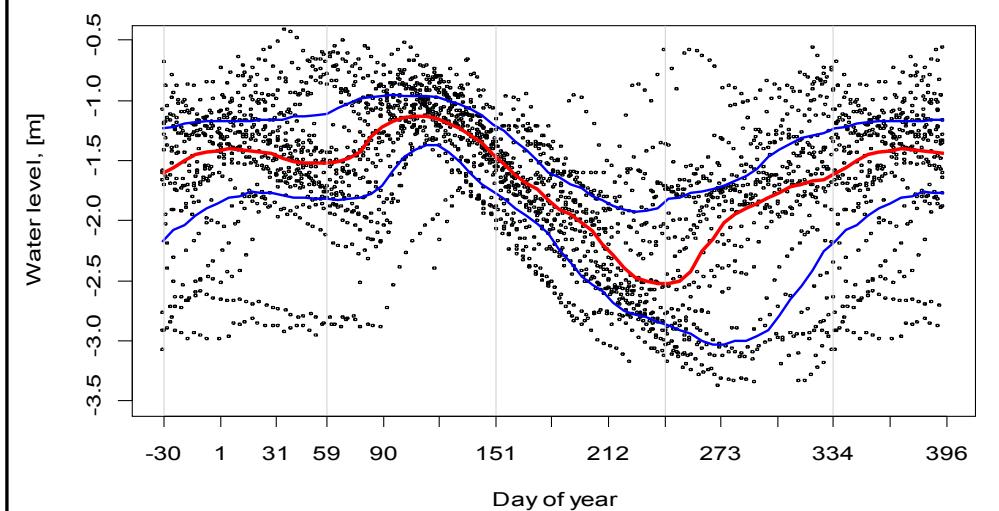
RUJIENA

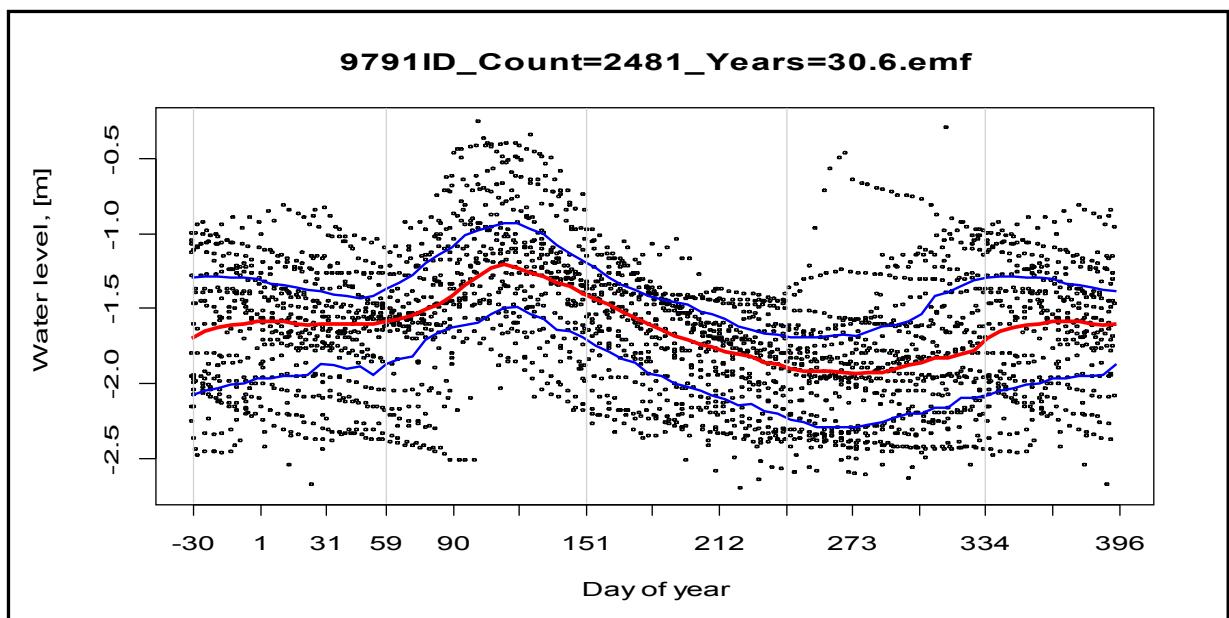
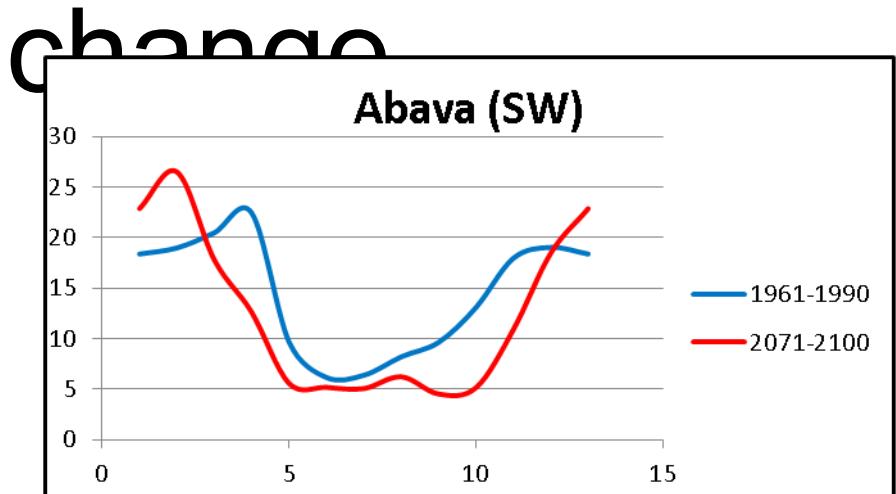
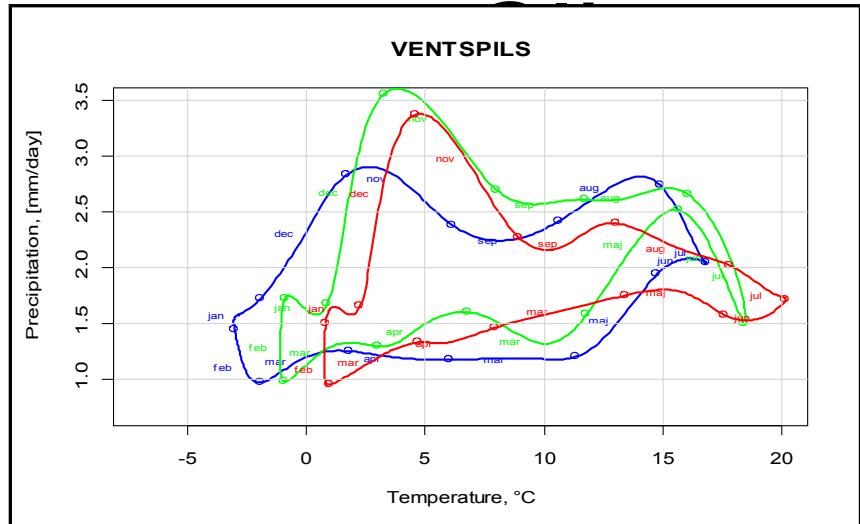


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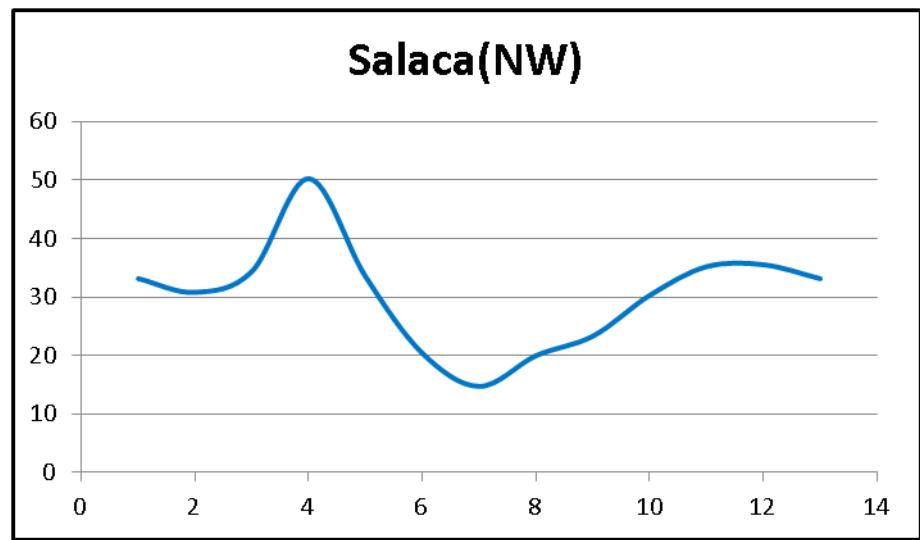
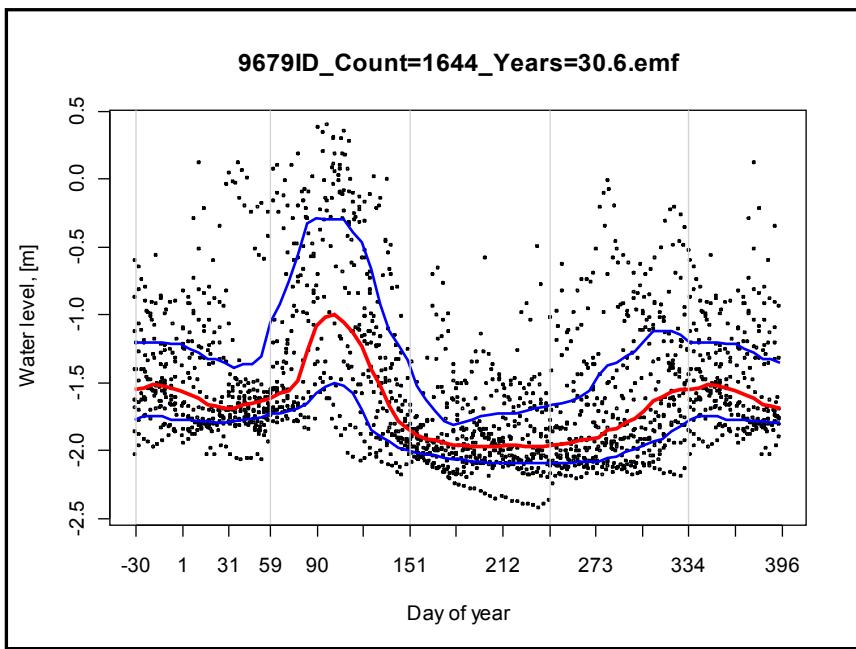


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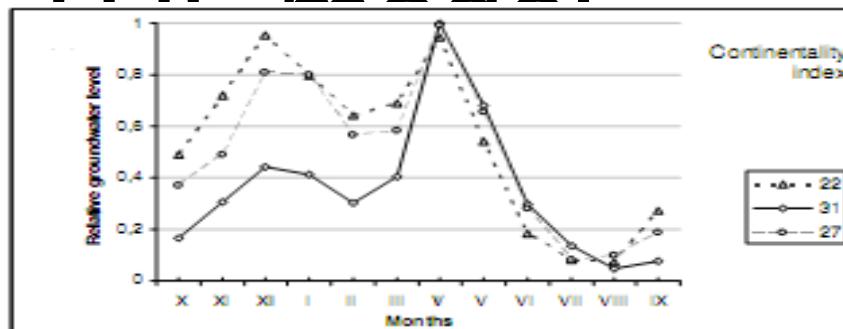


River level or groundwater level

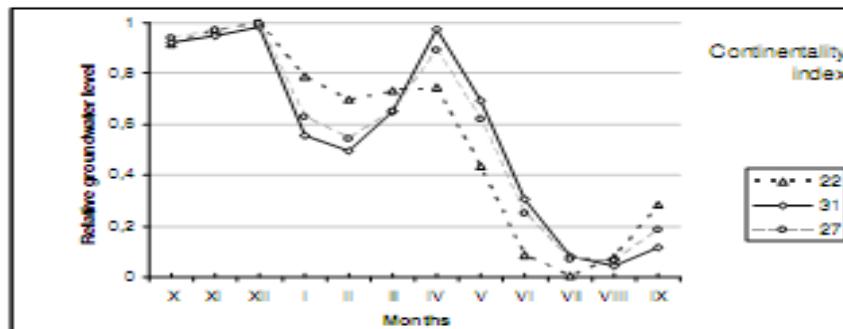


1D METU model

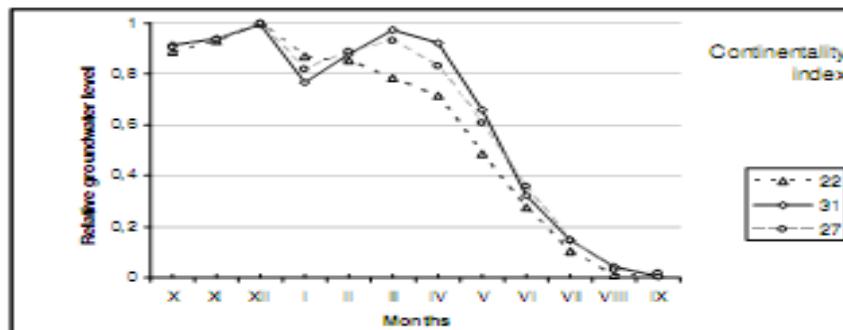
Observed 1961-1990



Modelled 2021-2050



Far future 2071-2100



Summary

- Run-off module gives us an option to distribute infiltration rates
- The groundwater pattern will change from a two peak system (in autumn and spring) to a one peak pattern.
- Overall the groundwater level will decline.
- The biggest change in groundwater seasonal cycle will come from the fact that the ground won't freeze in the winter.
- This work allows non-steady state

Thank You
for attention!

