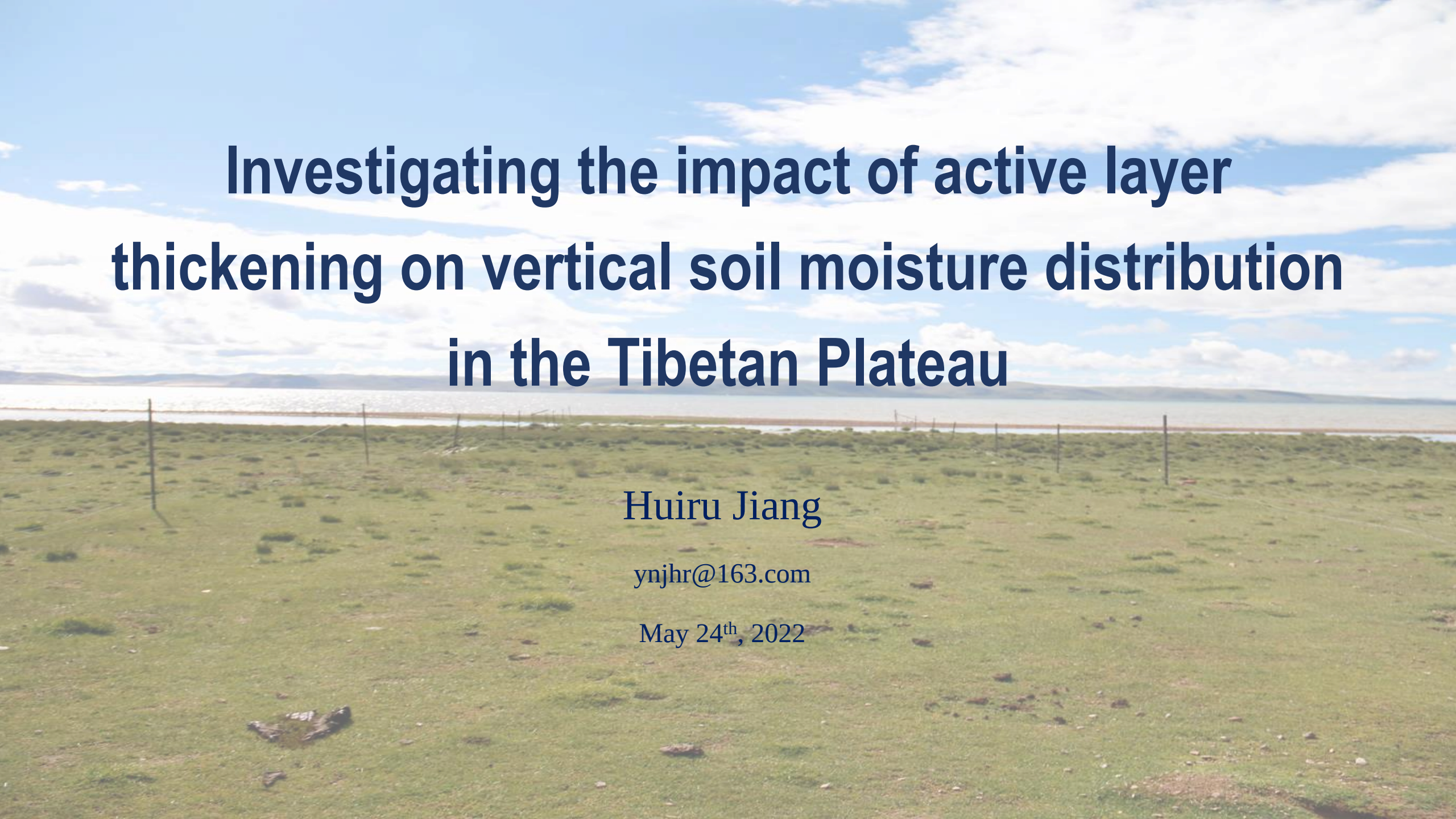

Investigating the impact of active layer thickening on vertical soil moisture distribution in the Tibetan Plateau

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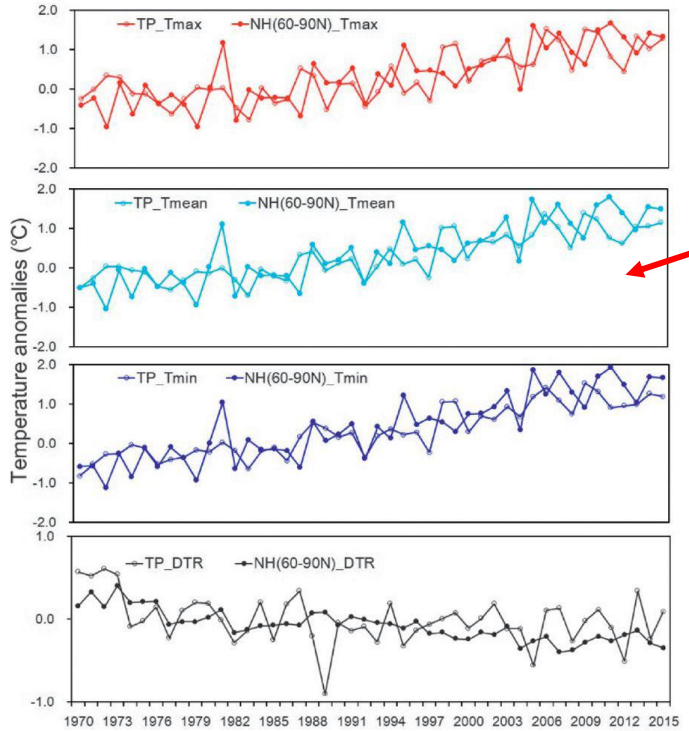
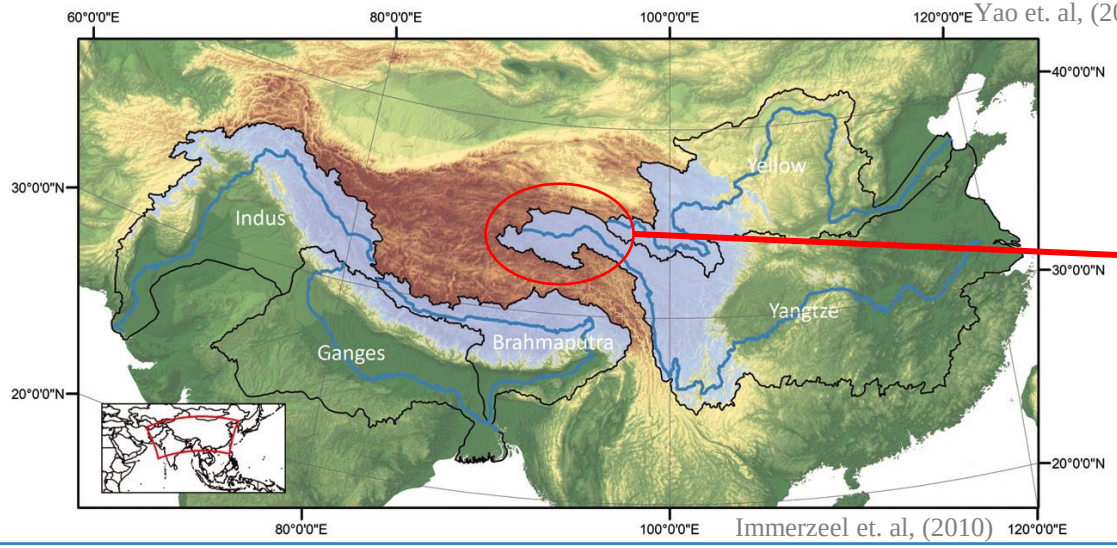
Background

Tibetan Plateau

Tibetan Plateau also known as the "Asia water Tower", having the largest areas of permafrost in the mid-latitude regions, is warming!



Yao et. al, (2019)



Immerzeel et. al, (2010)

Question

Warming trend

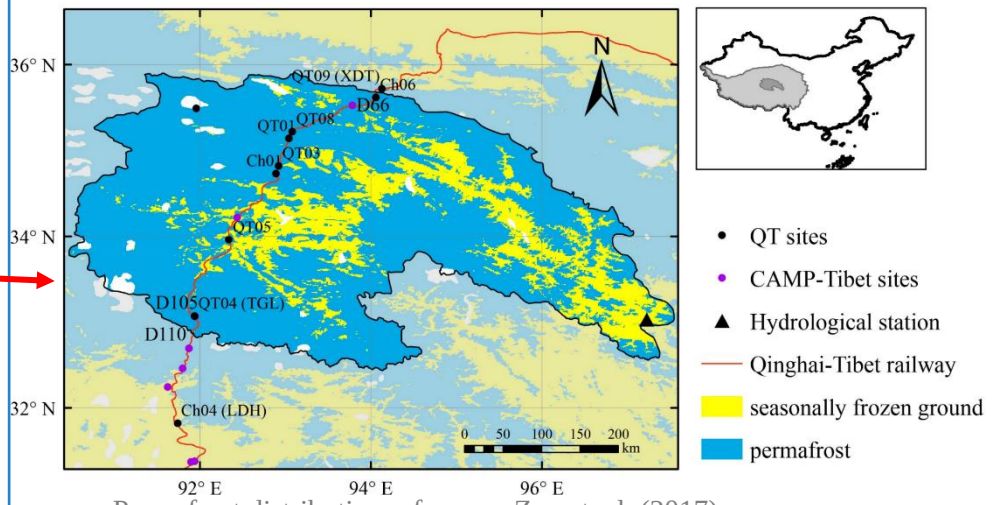
induced

Permafrost change (ALT change)

impact HOW?

Soil moisture/runoff

Source region of the Yangtze river



Permafrost distribution reference: Zou et. al, (2017)

Methodology

Hypothesis

hk_sat exponential decline along soil depth

⇩

Little recharge from deeper soils

⇩ *ALT increases*

Root-zone soil layer tends to lose water

A process-based model is needed!

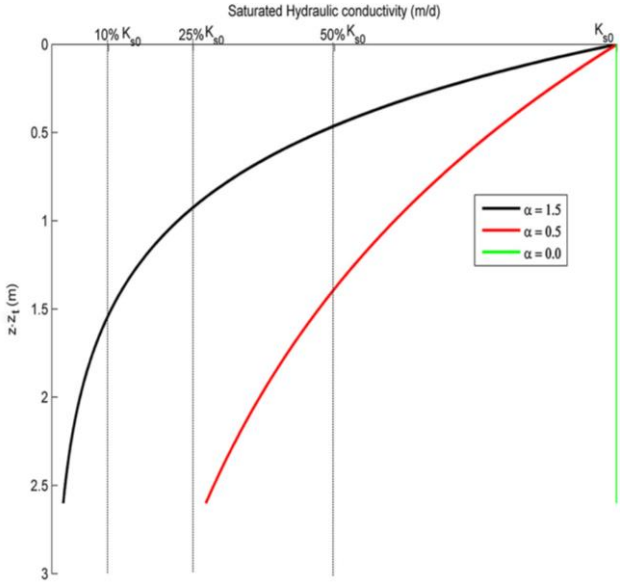
In-situ observations

modify

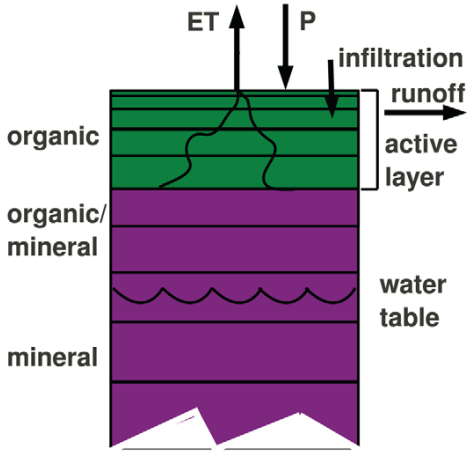
PWBM
(Permafrost water balance model)

Regional simulation
(ALT, soil moisture, runoff…)

Analyze the influence



Ameli et. al, (2015)



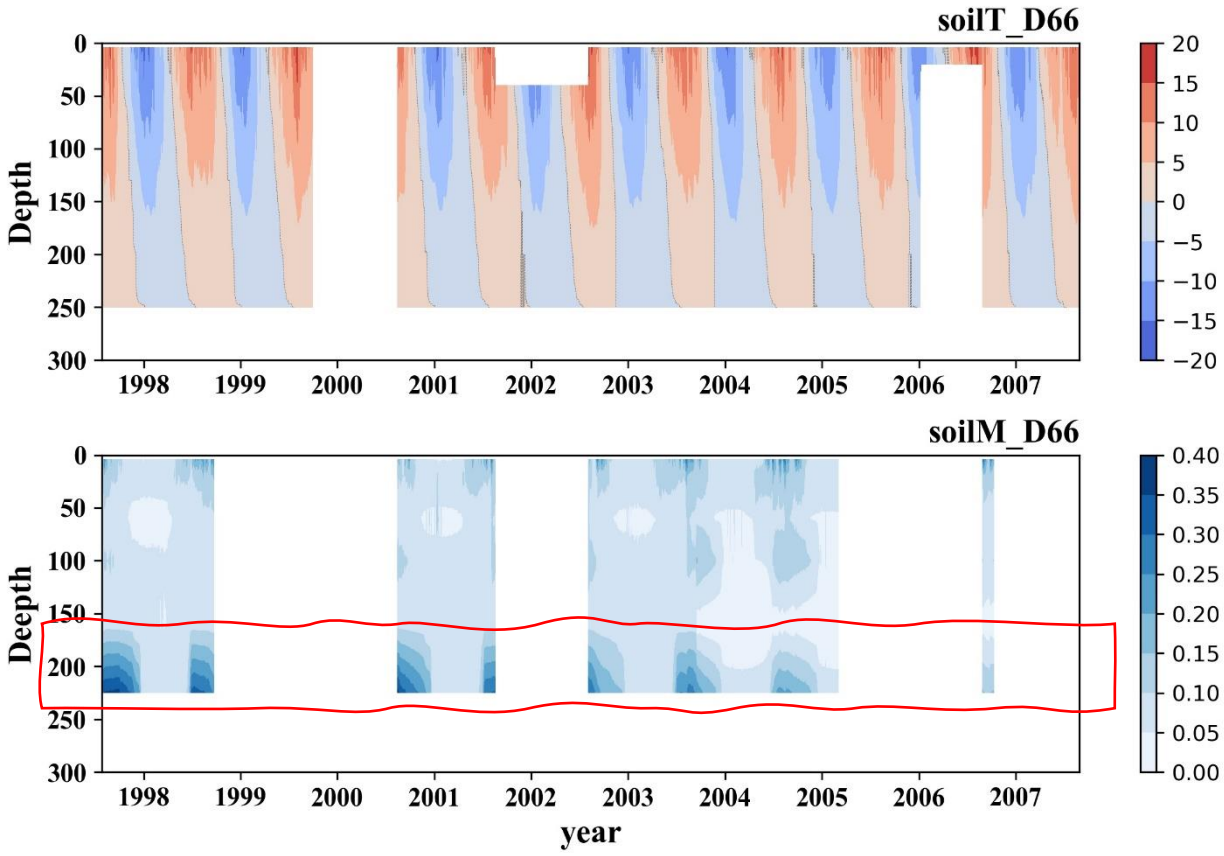
developed active layer

Part of the PWBM schematic from Rawlins et. al, (2013)

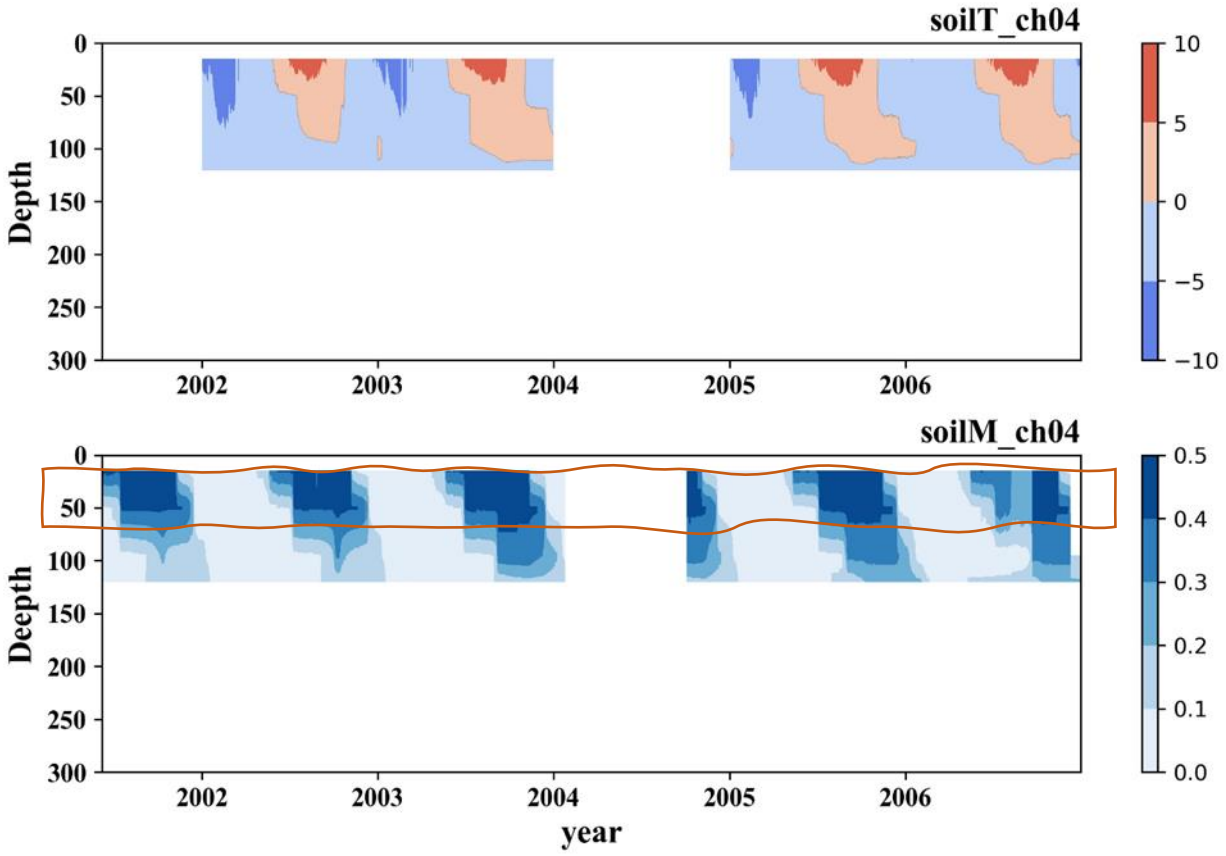
Observation results

a “water-rich zone” occurs around the bottom of the active layer

“soil water rich zone” occurs at the upper layer rather than at the bottom



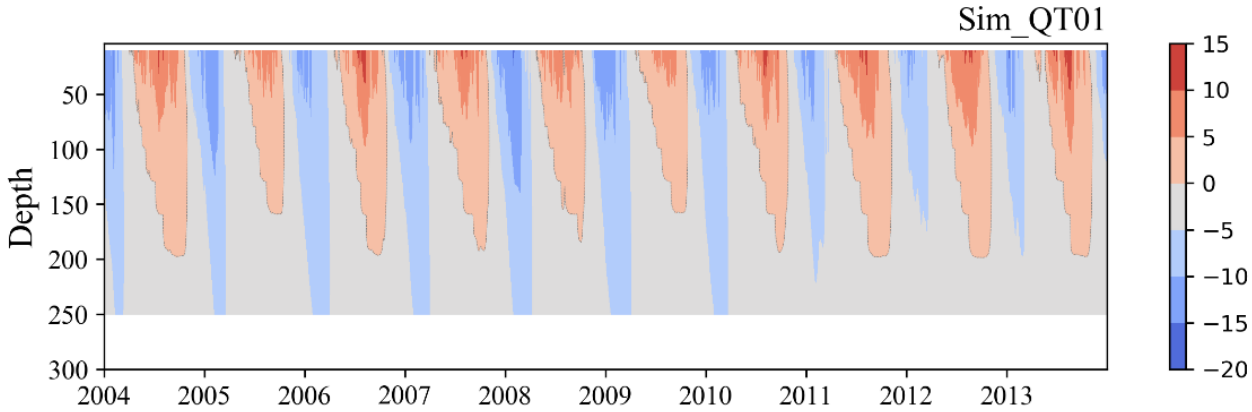
ALT > 2 m

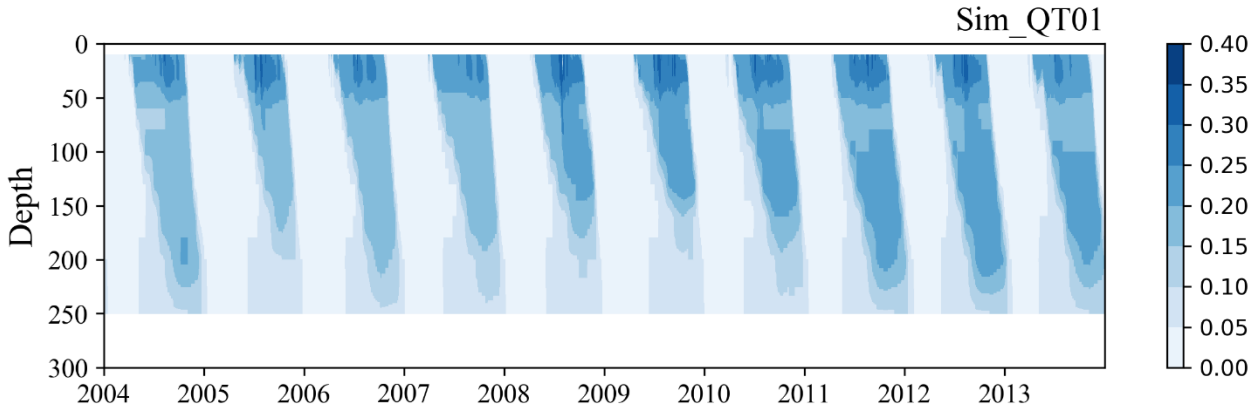


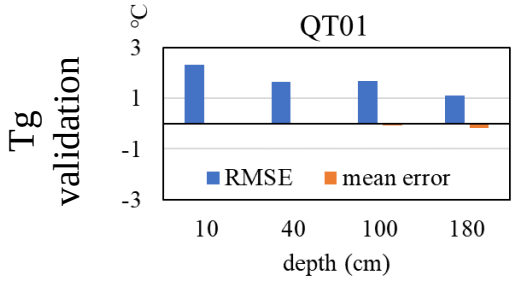
ALT ≈ 1.2 m

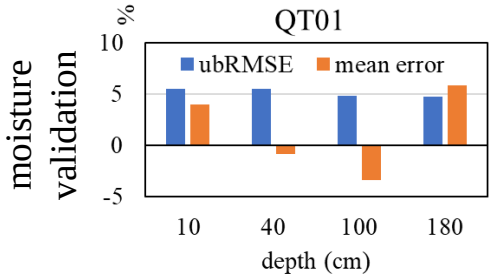
Preliminary results and further work

Current run:
ALT <2 m

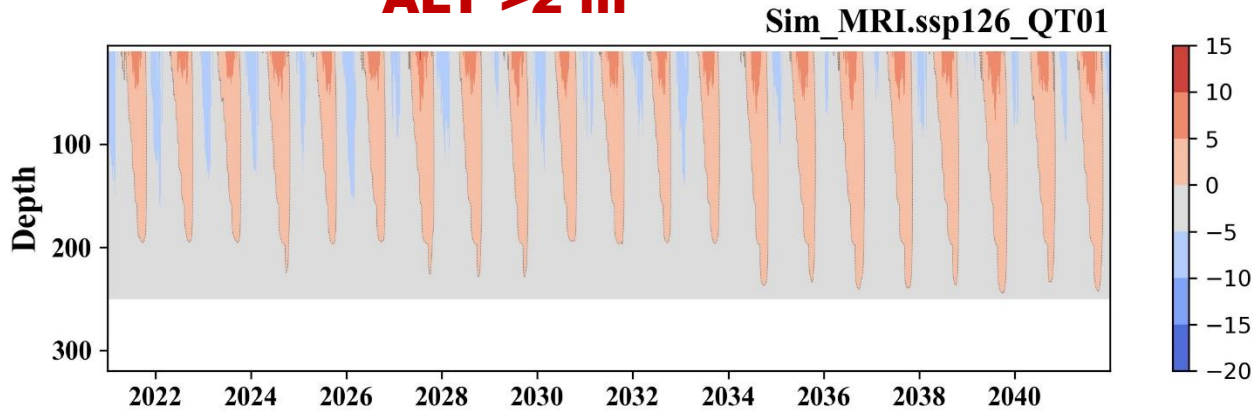


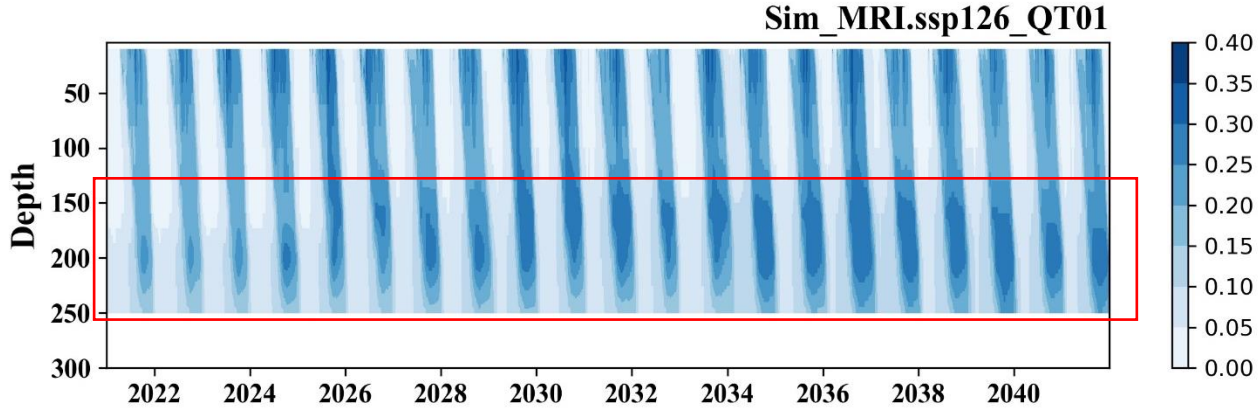






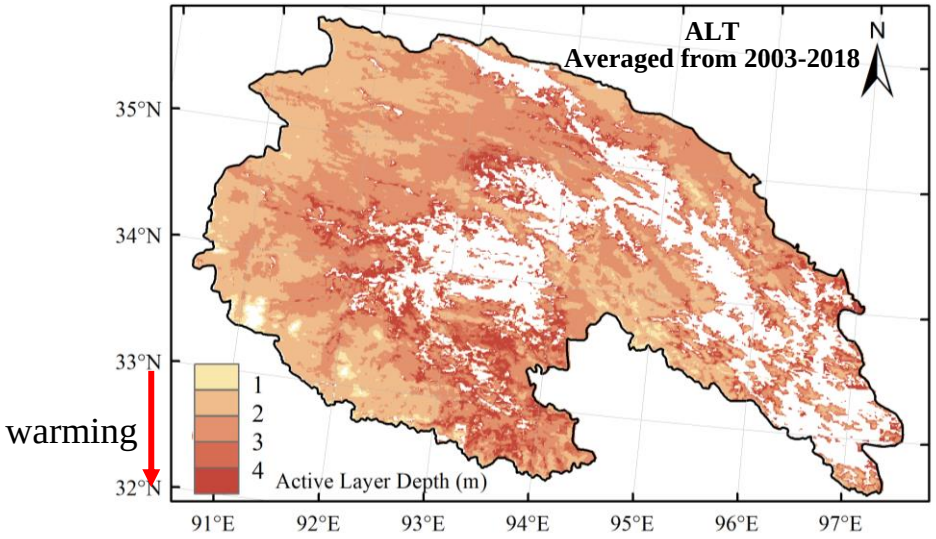
Future scenario run:
ALT >2 m

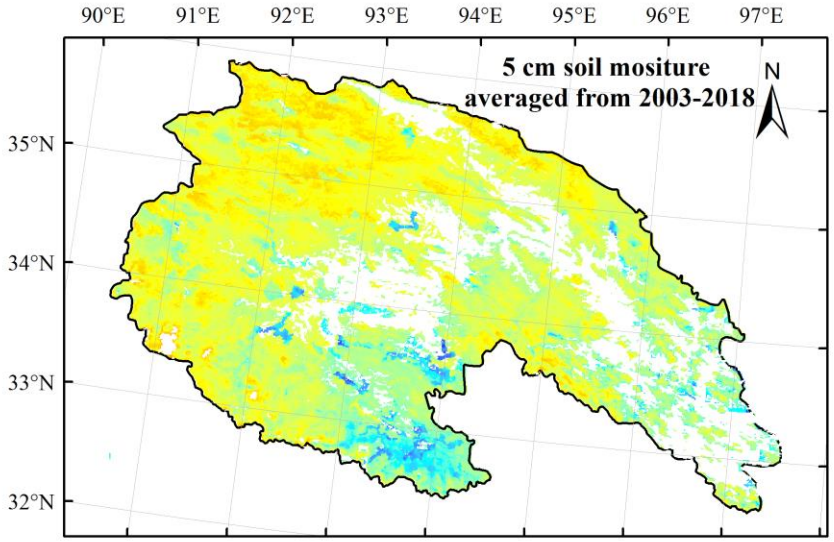




When ALT increased, “water-rich zone” occurs around the bottom of the active layer

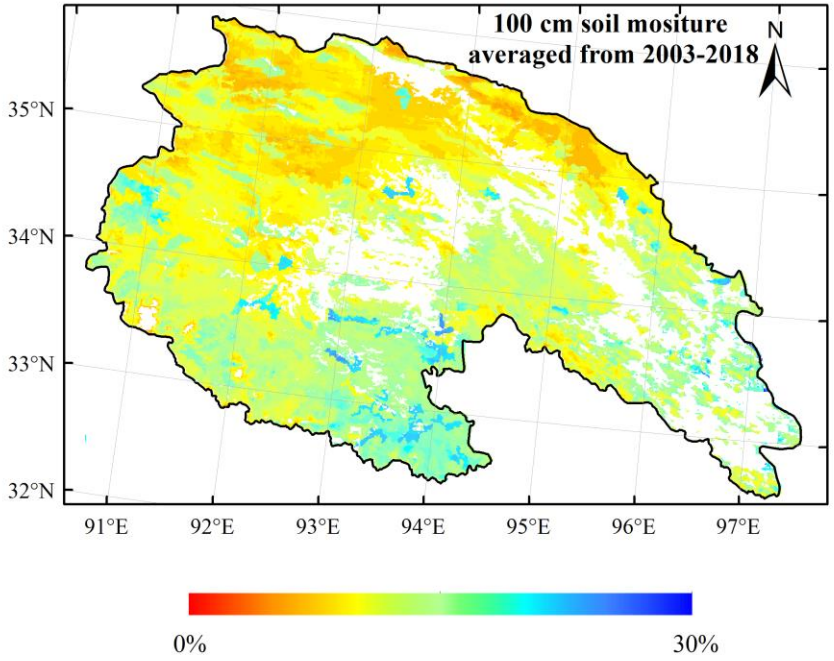
Preliminary results and further work





Plans

- Simulate the runoff at the source of Yangtze River region (SYR)
- Further investigate the impacts of ALT variation on soil moisture transfer and runoff



Special thanks to the collaborators:

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Thanks for your attention!

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