A COMPARISON STUDY OF PROCESS COMPLEXITY IN PERMAFROST DOMINATED REGIONS

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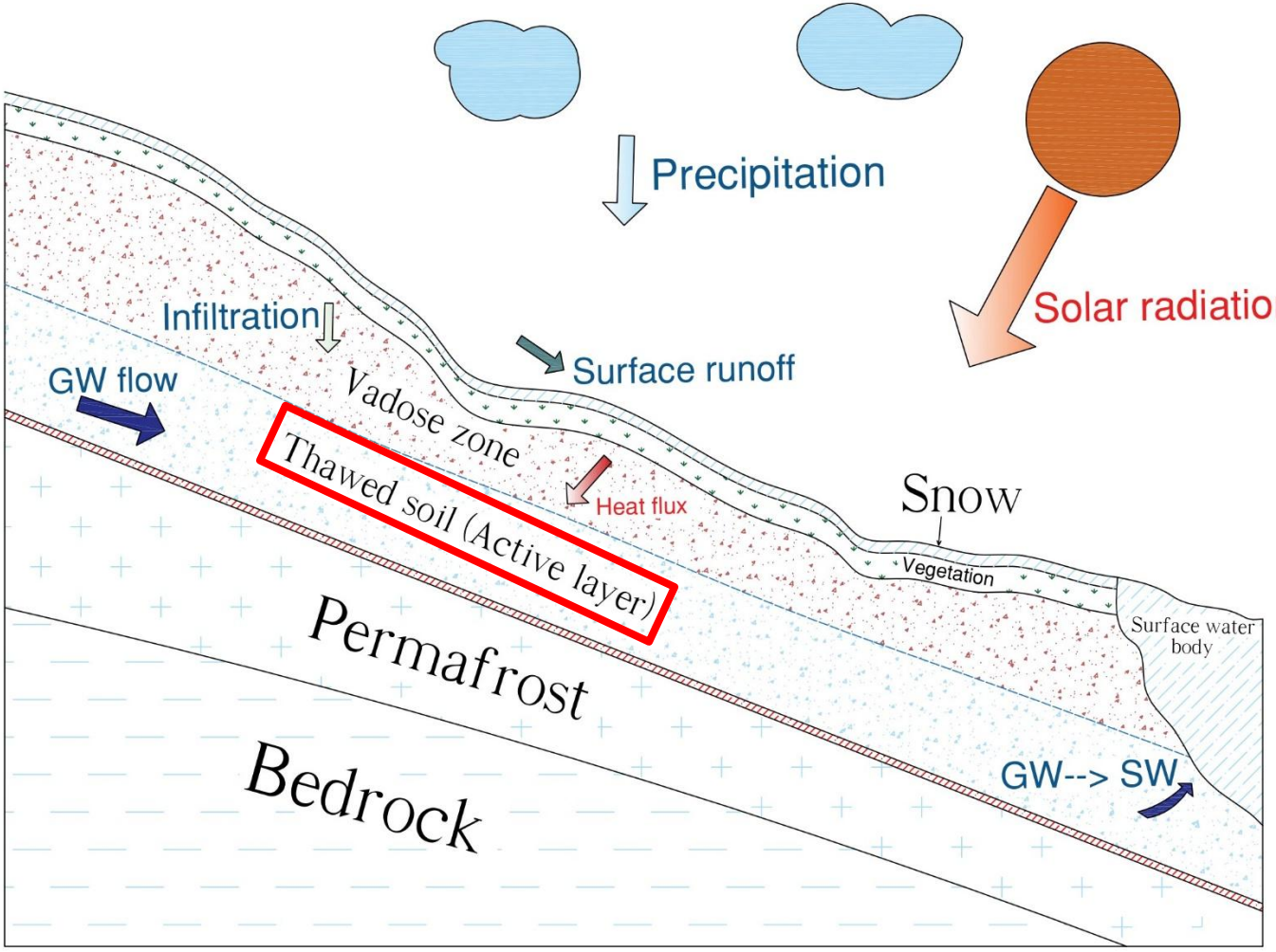
Conceptual Model - Processes



Atmospheric processes

Surface processes

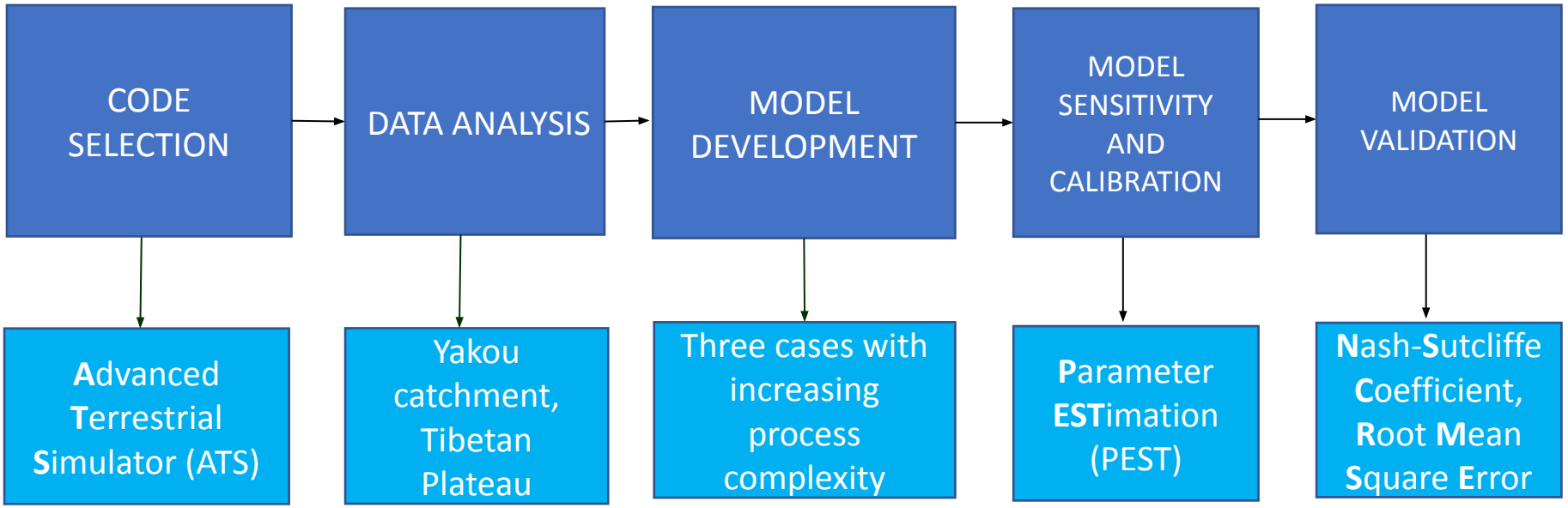
Subsurface processes

Research question

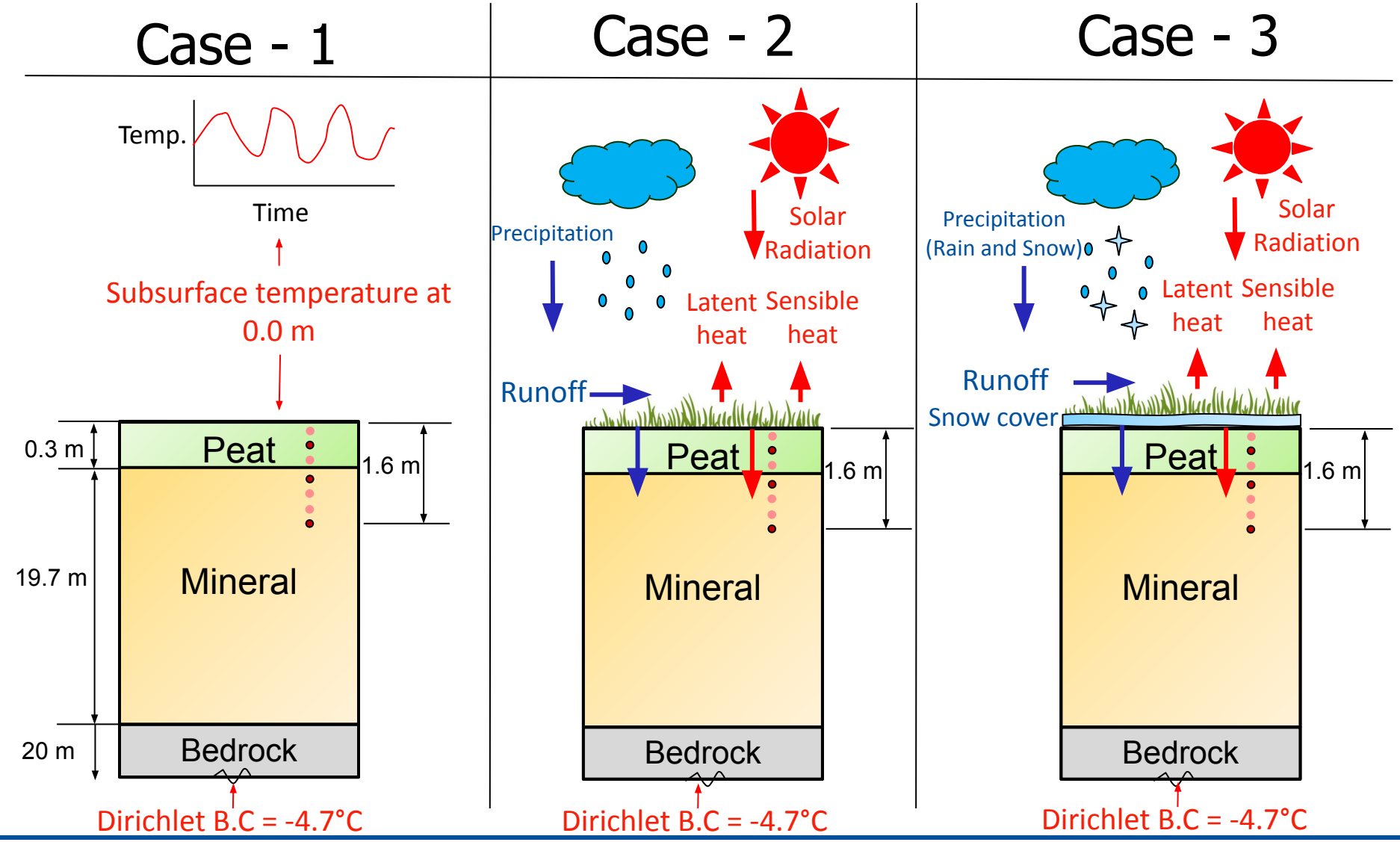
What are the main processes that needs to be considered in Permafrost dominated regions?

Which level of process complexity is required to estimate the active layer depth?

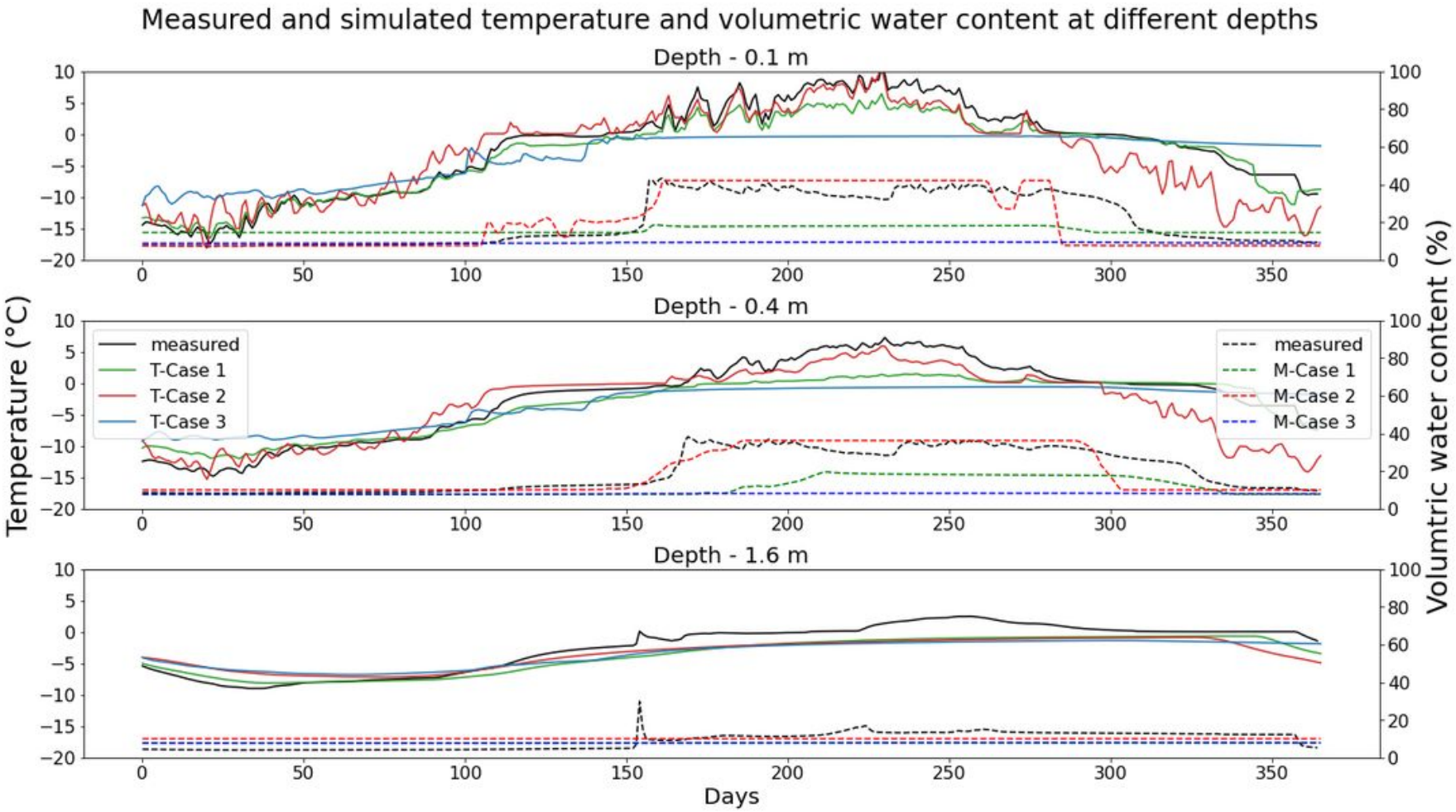
Methodology



Three cases – Boundary conditions



Results - Validation



Conclusion

- Considering only subsurface processes is not sufficient to represent permafrost dynamics.
- Rainfall plays a key role in the development of the active layer.
- Excess snowfall deposit is leading to zero-curtain effect.
- Other processes such as lateral groundwater flow and snow-drift need to be taken into account.

Conclusion

	Conditions	Case 1	Case 2	Case 3
Input	Data requirement	Excellent	Poor	Very poor
	Parameters	Good	Average	Average
Calibration	Simulation time	Excellent	Average	Very poor
Validation	Mean NSE - Temperature	Good	Good	Average
	Mean NSE - Moisture	Poor	Average	Very poor
Physical representation	Temperature	Average	Good	Poor
	Moisture	Very poor	Good	Very poor

Source: https://www.formpl.us/blog/point-likert-scale

Researcher satisfaction

Sources

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Code availability

- **ATS** - Advanced Terrestrial Simulator (ATS) is an open-source code for solving ecosystem-based, integrated, distributed hydrology, and available at https://github.com/amanzi/ats
- **PESTPP** - White, Jeremy T., et al. Approaches to highly parameterized inversion: PEST++ Version 5, a software suite for parameter estimation, uncertainty analysis, management optimization and sensitivity analysis. No. 7-C26. US Geological Survey, 2020. The code is available at https://github.com/usgs/pestpp
- **PEST** - Doherty, John. Calibration and uncertainty analysis for complex environmental models. Brisbane, Australia: Watermark Numerical Computing, 2015. The code is available at https://pesthomepage.org/downloads

Data availability

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OSPP Award

Thank you all for listening!

Questions/Suggestions/Comments?

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