

Status of the multi-layers snow model

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Differences between “single-layer” and “multi-layer” models

“Single layer”

“Multi-layer”

Implemented processes

- Heat conduction
- Melting when snow surface temperature $> 0^{\circ}\text{C}$ or when soil surface temperature $> 0^{\circ}\text{C}$

- Heat conduction
- Liquid water transport
- Gravitational compaction + metamorphosis
- Solar radiation penetration

Numerical schemes

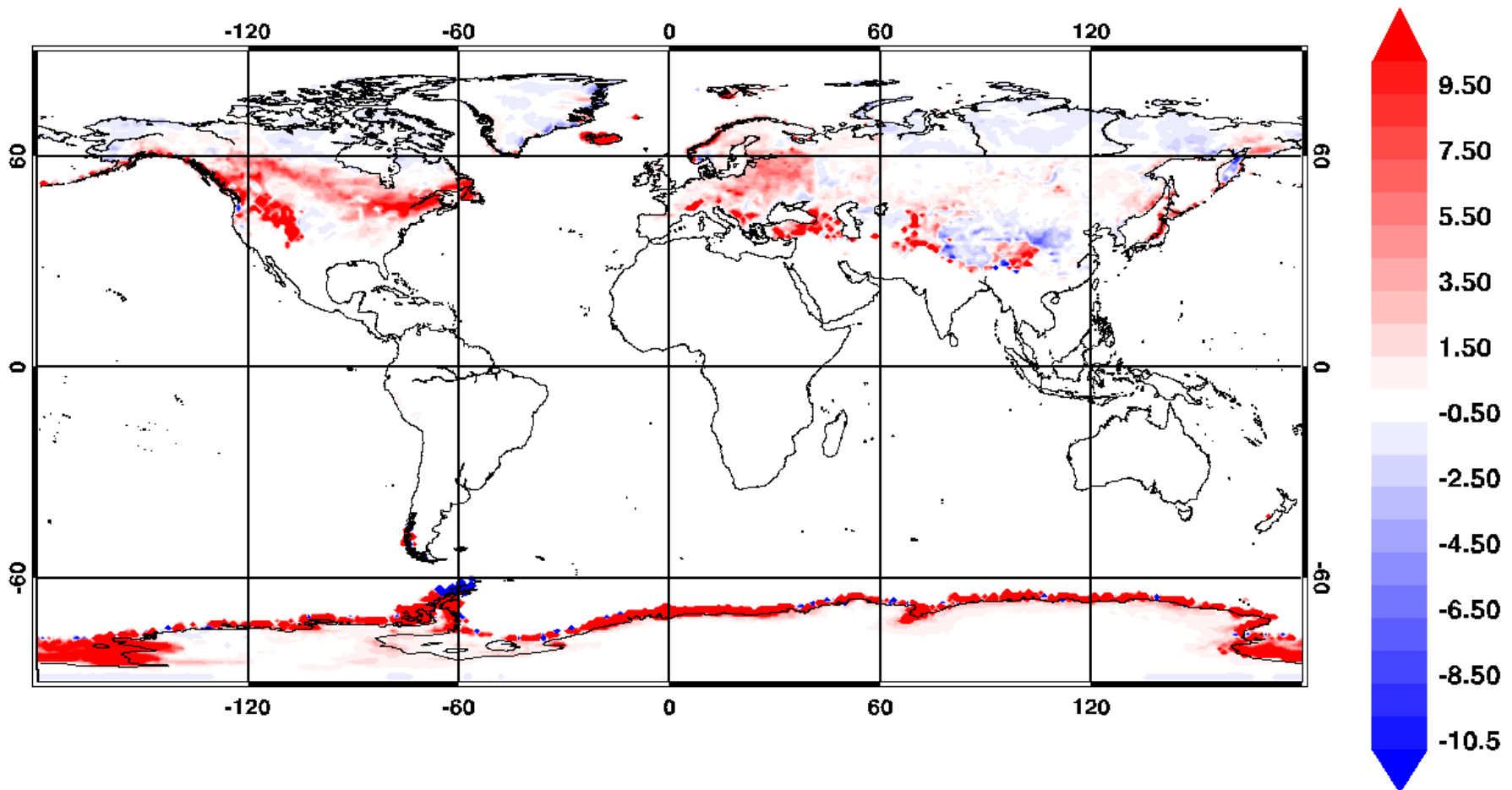
1 layer

- arbitrary number of layers
- heat conduction: implicit
- latent heat and solar radiation: source terms

Differences between “single-layer” and “multi-layer” models

W_SNOW, monthly mean of 10 days forecasts, January 2012

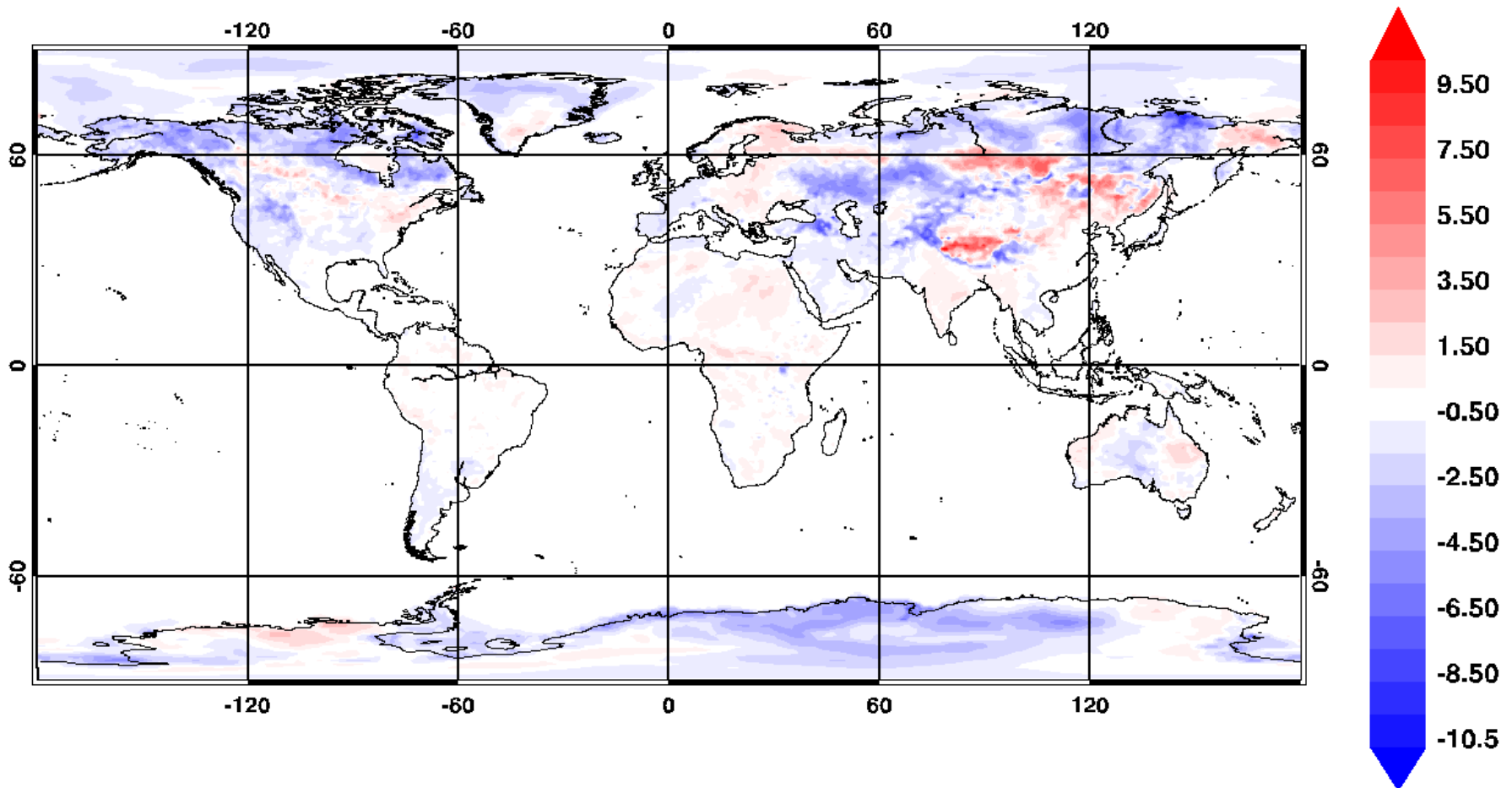
mean: 0.73 std: 73.51 min:-9238.50 max: 1693.50



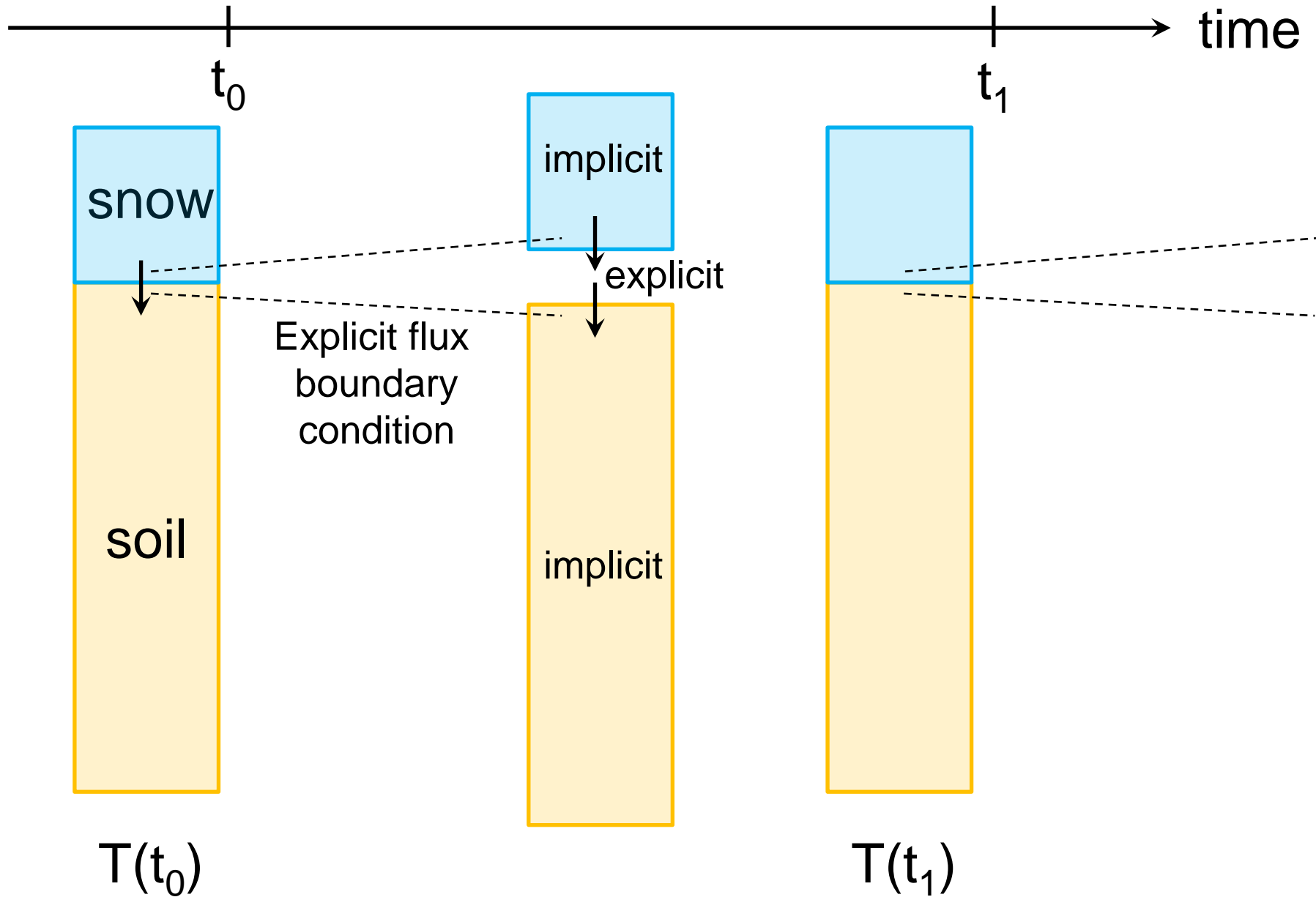
Differences between “single-layer” and “multi-layer” models

T_G, monthly mean of 10 days forecasts, January 2012

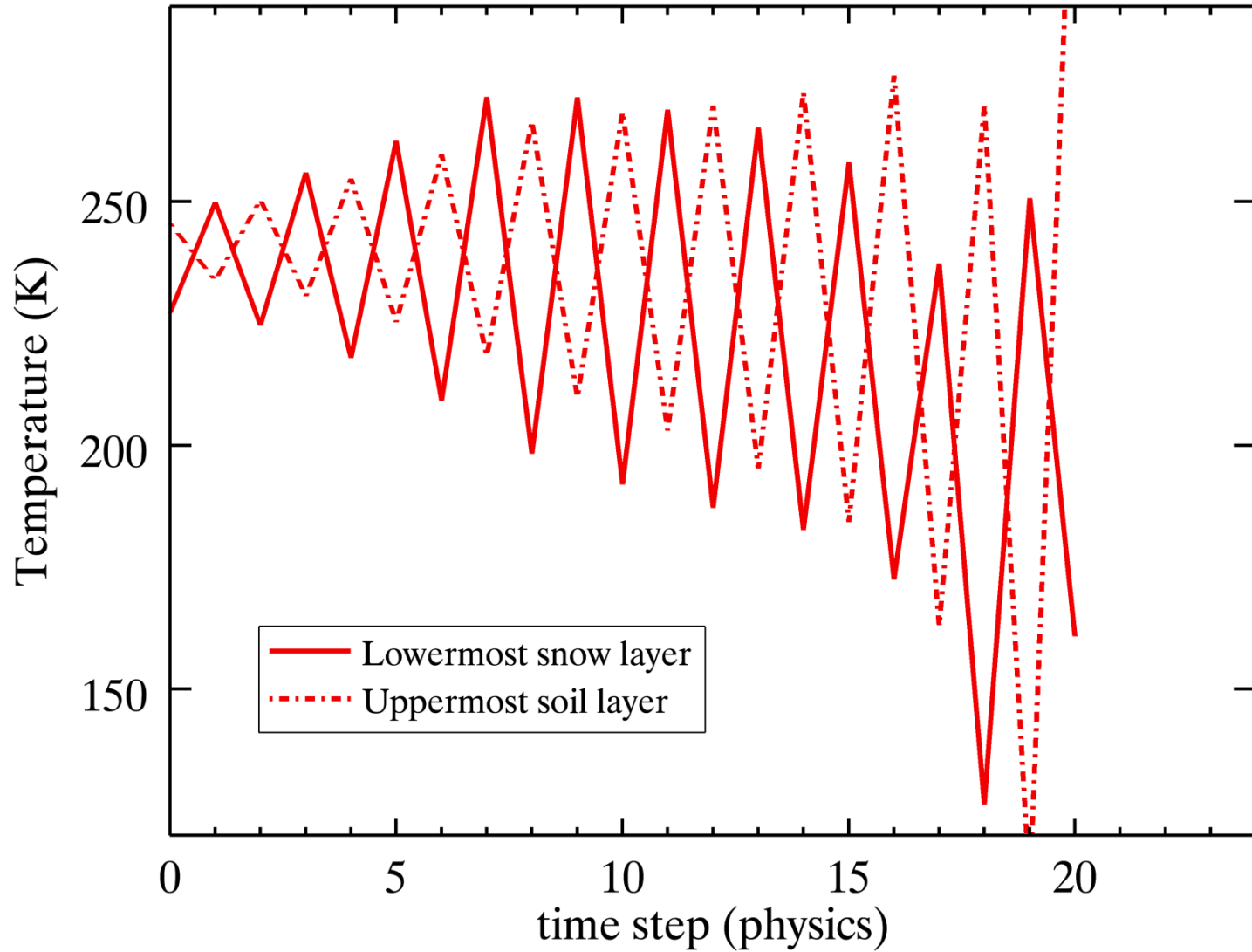
mean: -0.12 std: 1.07 min: -10.24 max: 15.20



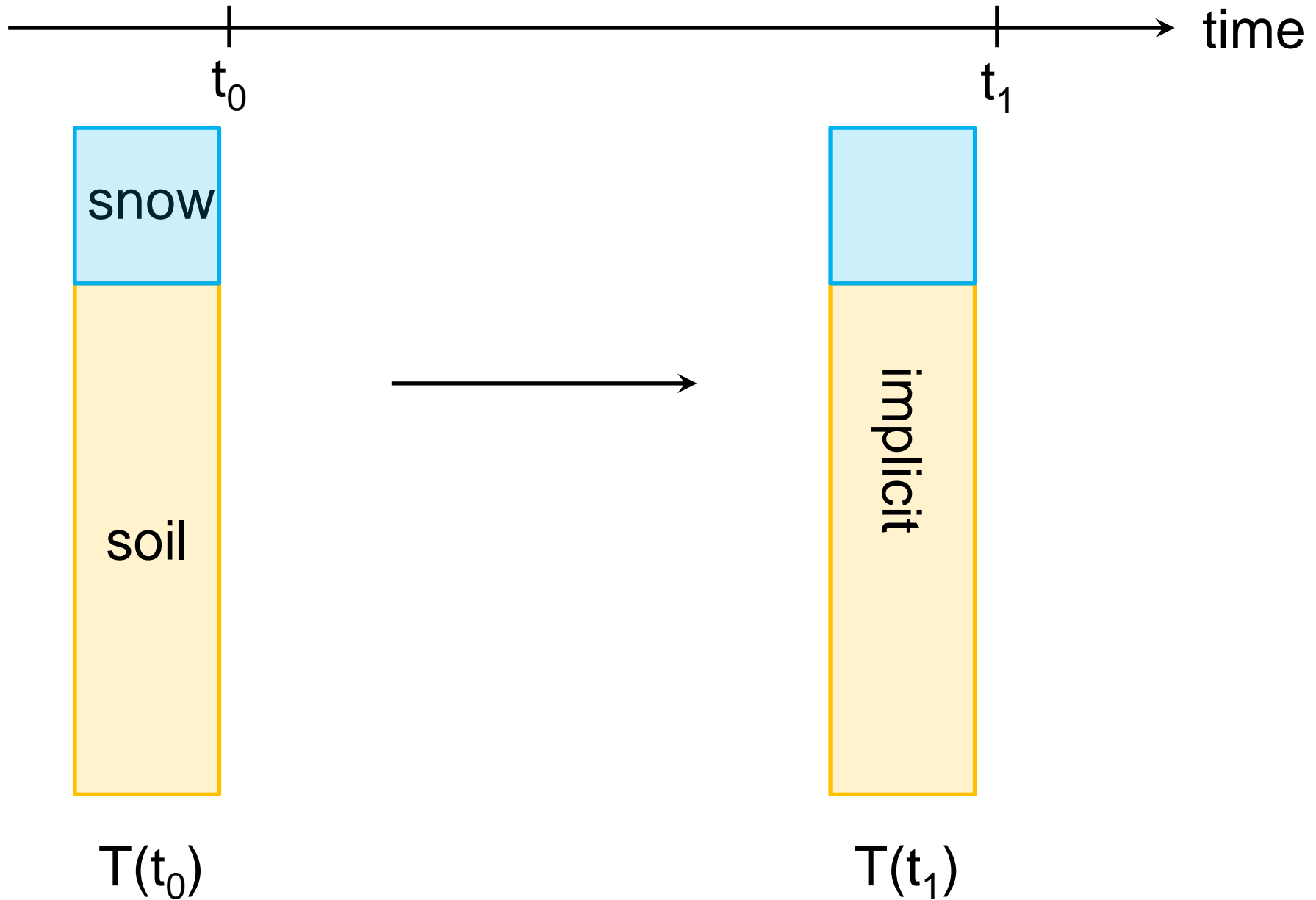
A Numerical Problem: Before



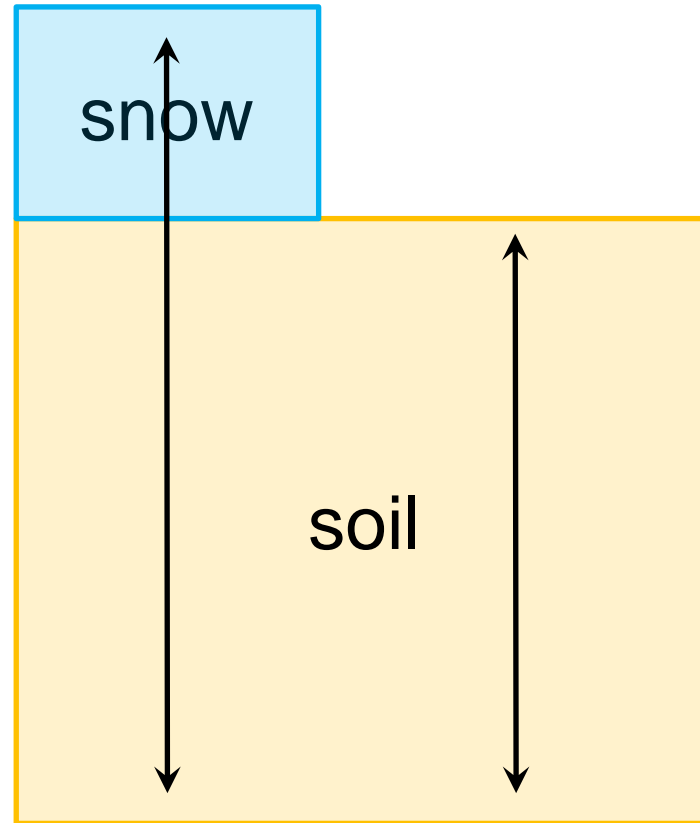
A Numerical Problem: Before



A Numerical Problem: After



A Numerical Problem: After

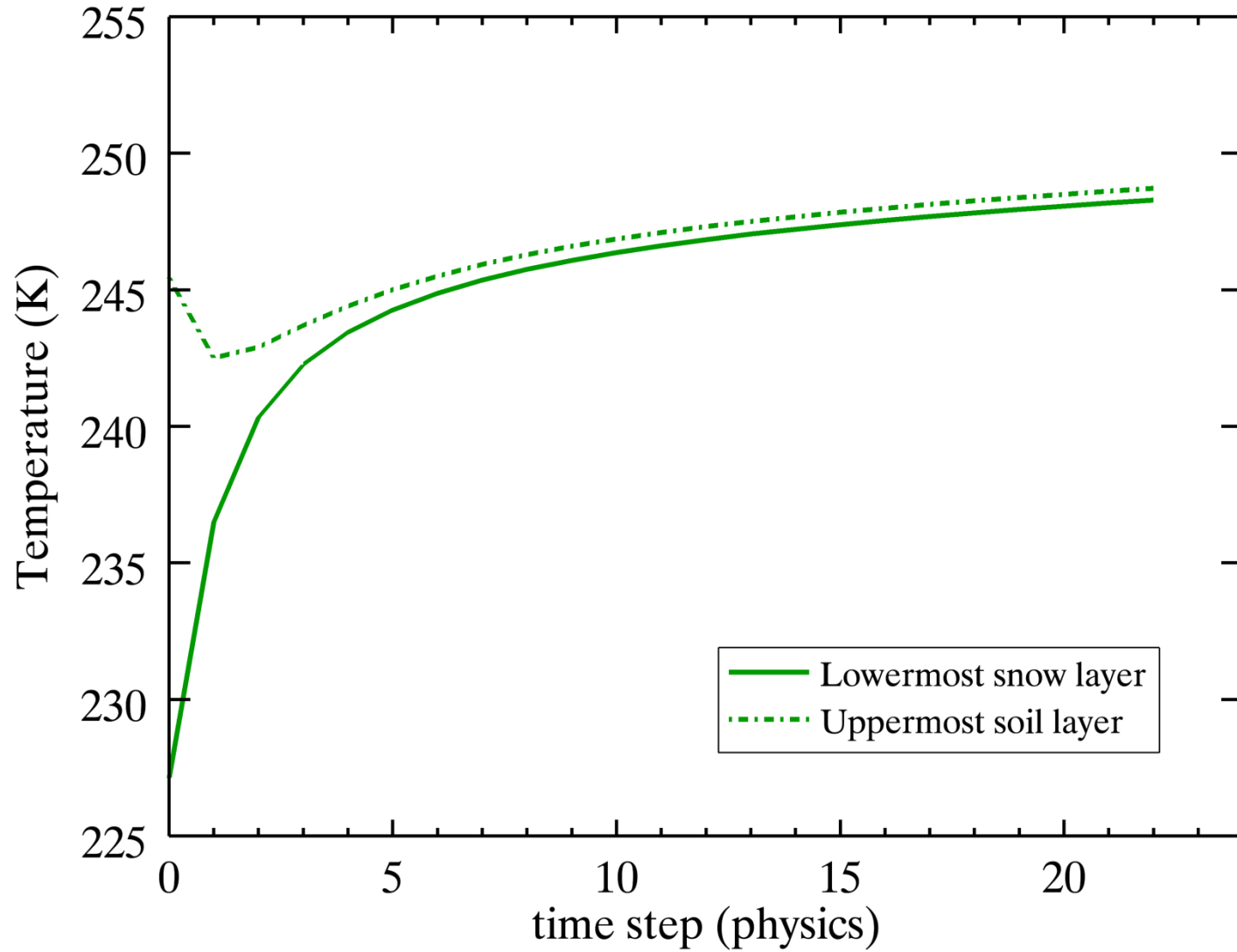


$T_1(z)$

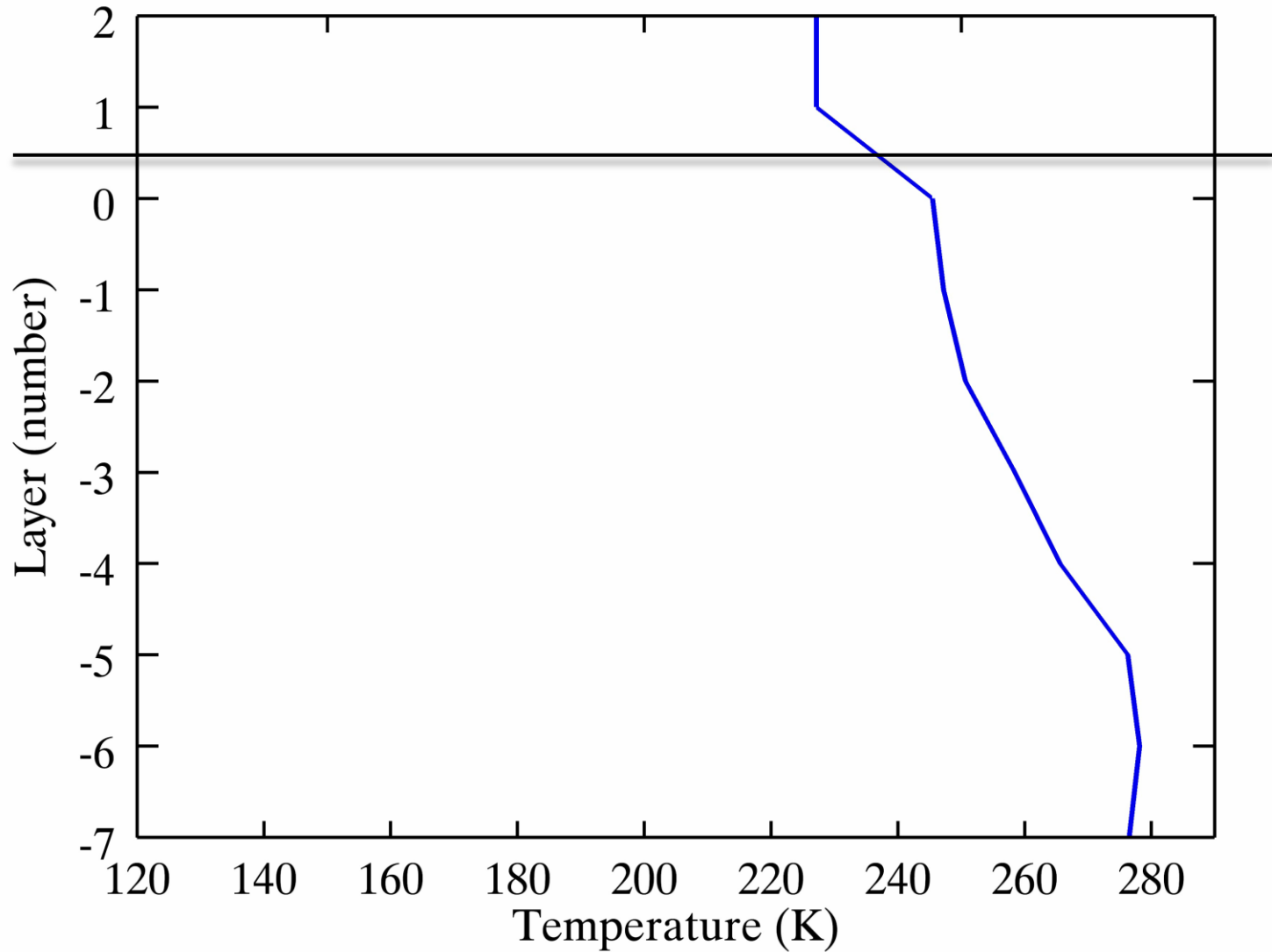
$T_2(z)$

$$T(z) = f_{\text{sn}} T_1(z) + (1 - f_{\text{sn}}) T_2(z)$$

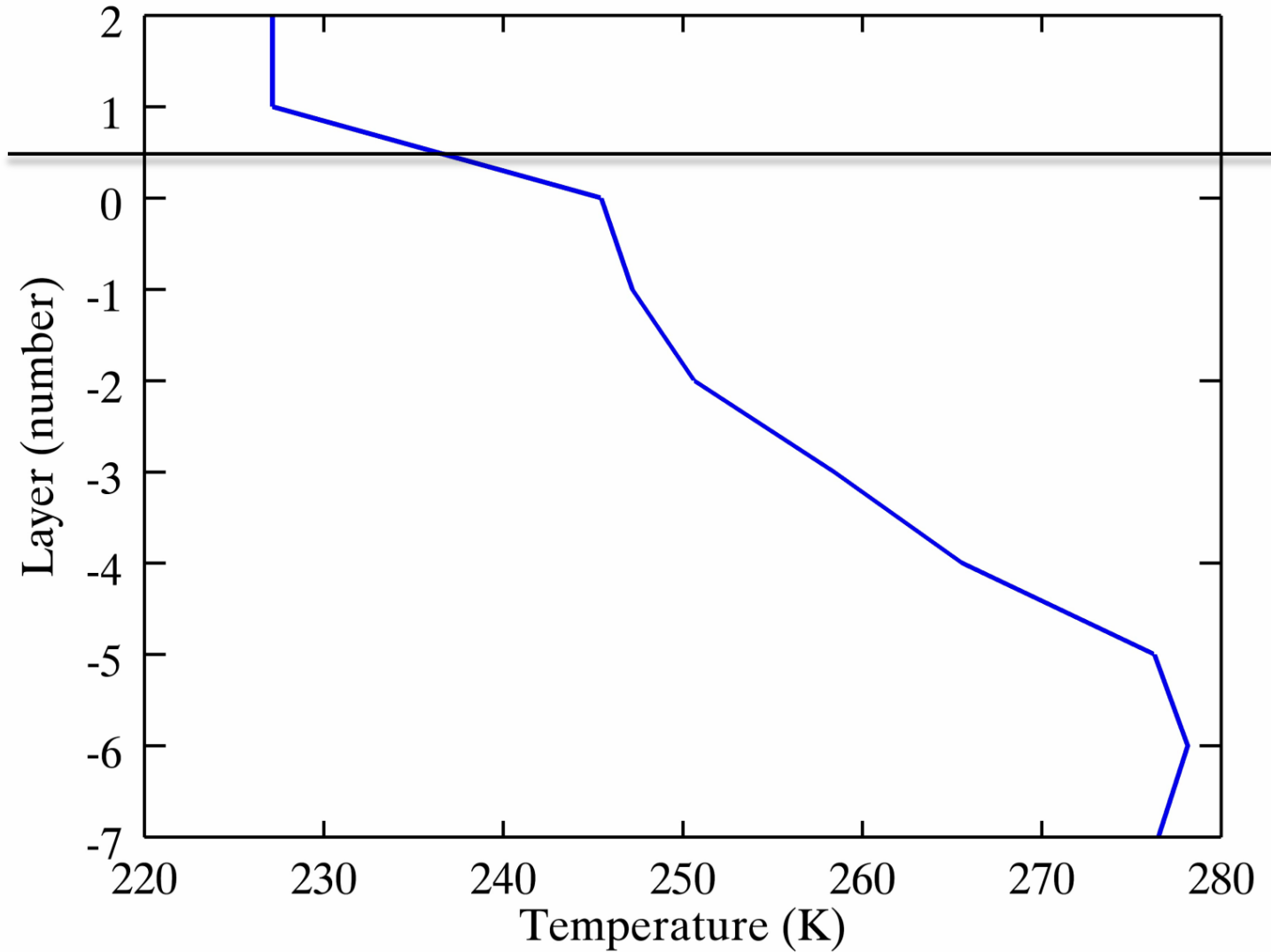
After



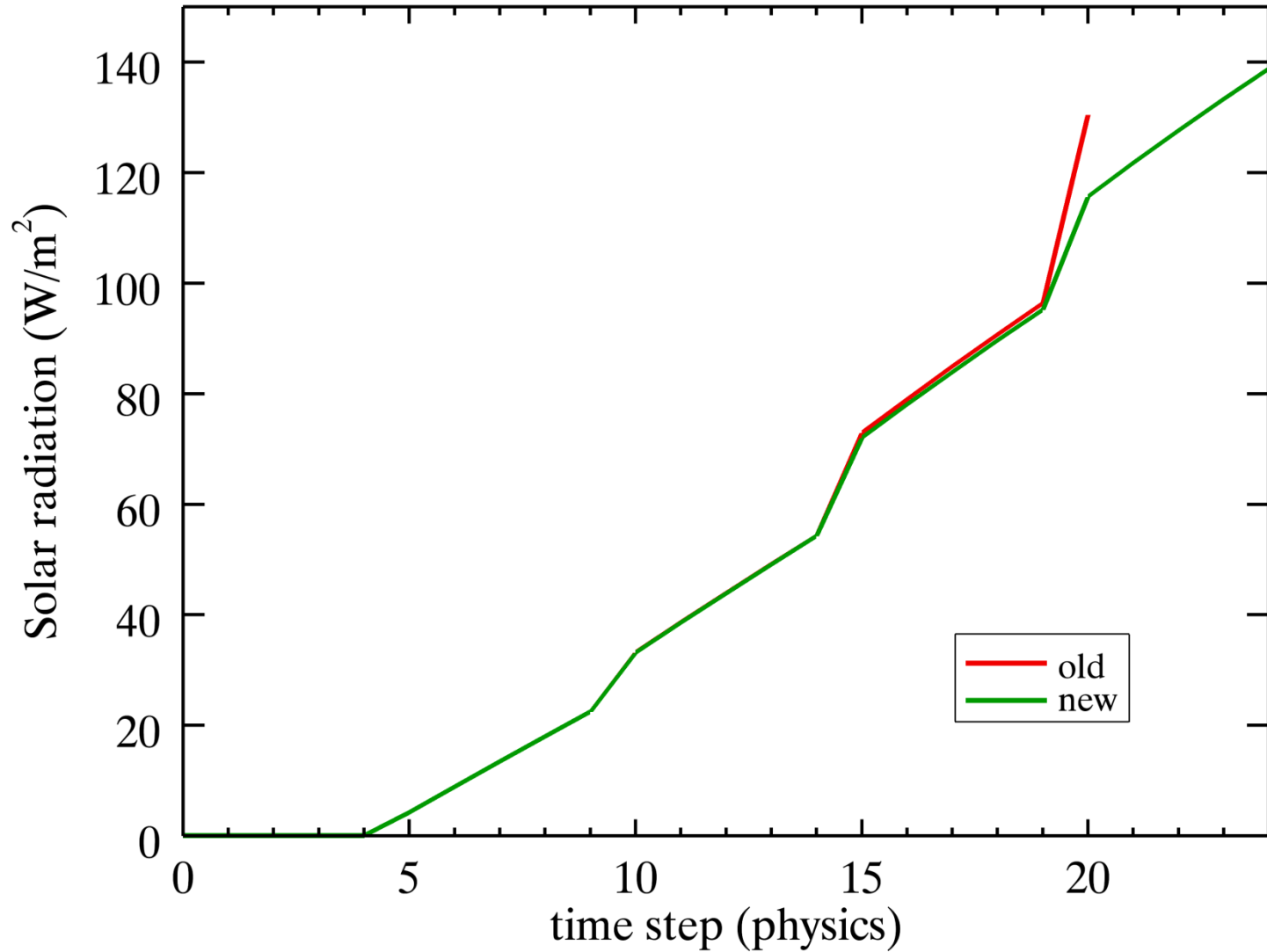
Evolution of the temperature profile in soil and snow (before)



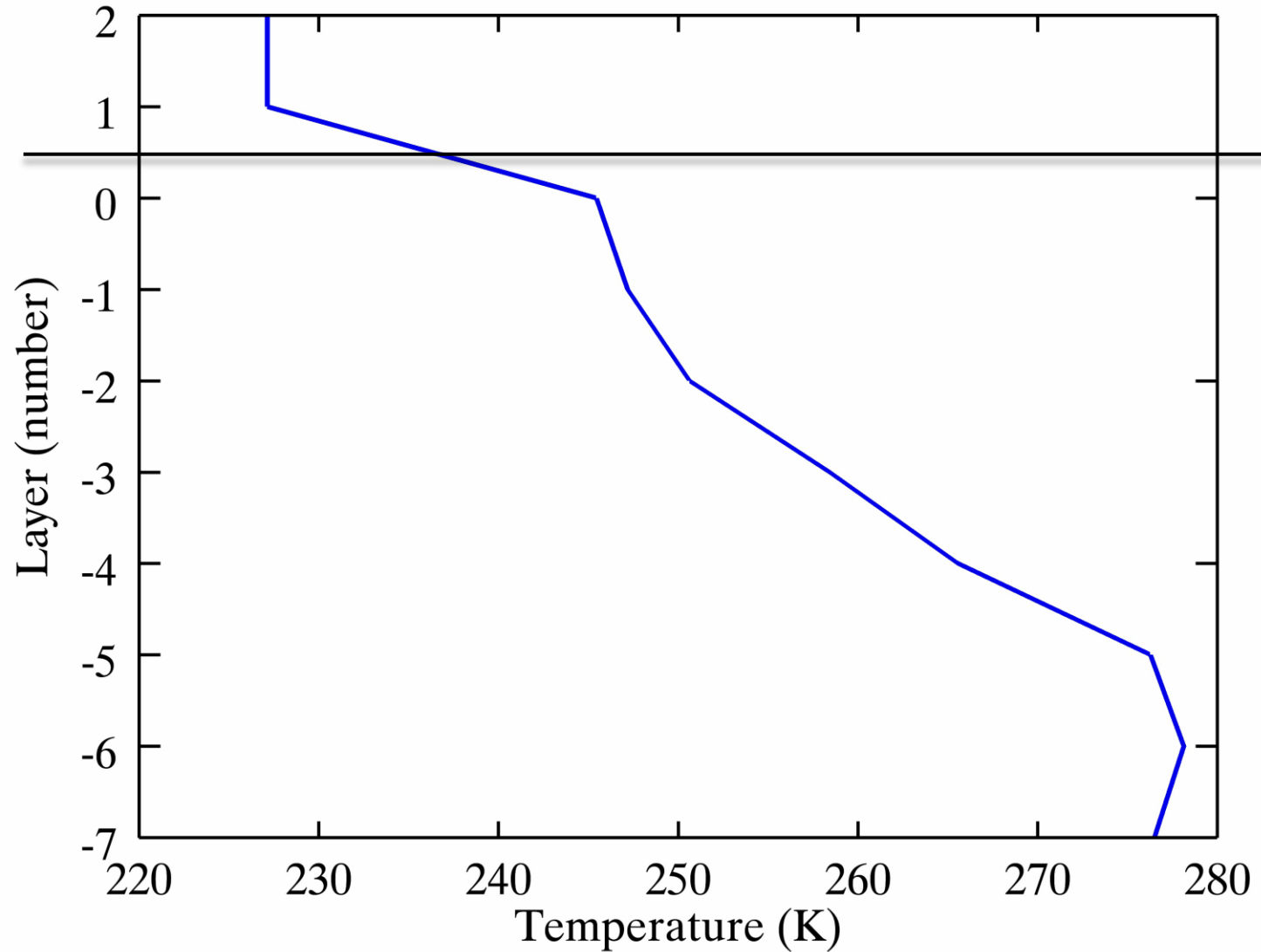
Evolution of the temperature profile in soil and snow (after)



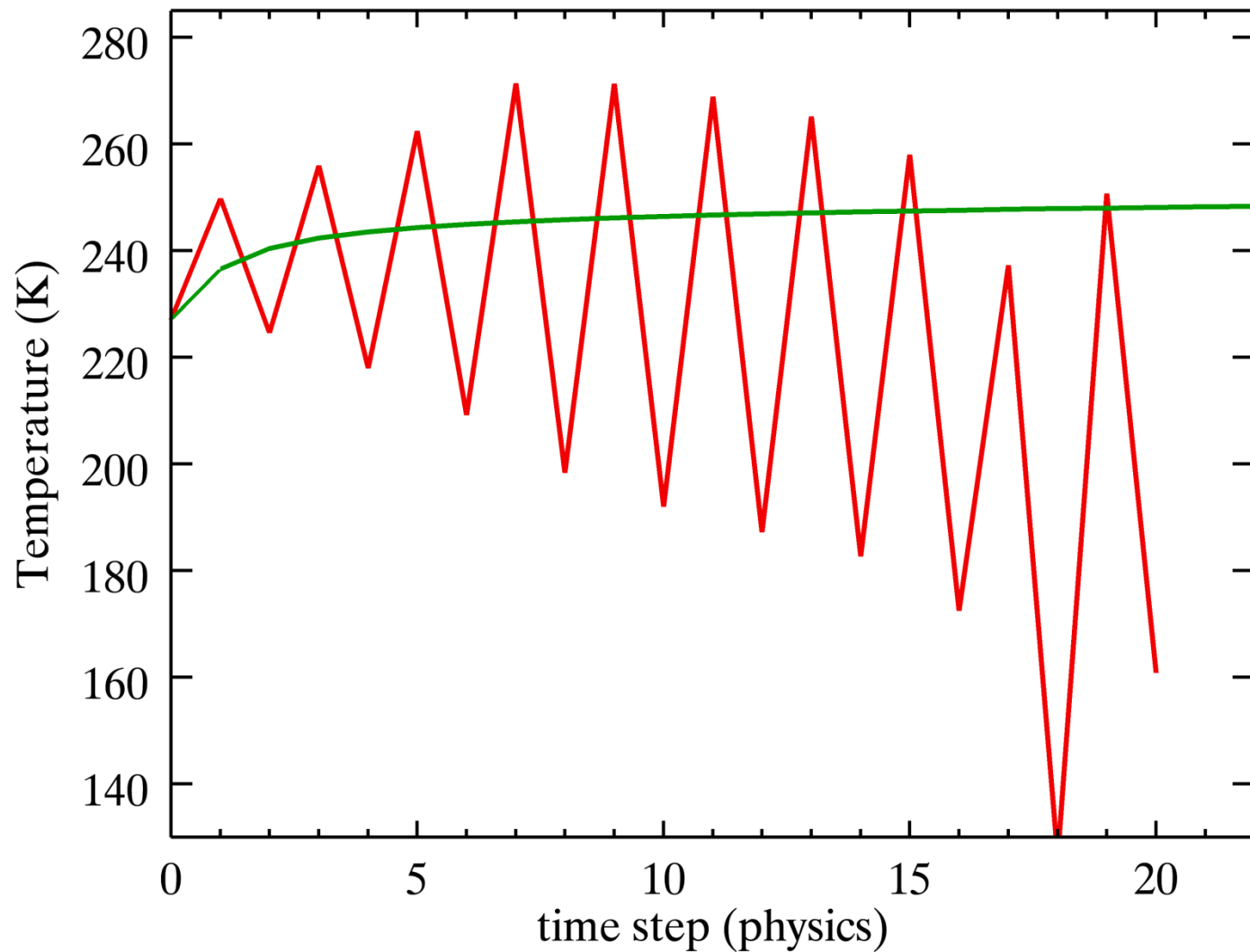
Time series of the incoming solar radiation



Evolution of the temperature profile in soil and snow (after)



Evolution of the temperature of the lowermost snow layer



Temperature profile in soil and snow

