# Permafrost changes and the influence on cultural heritage

PCCH-Arctic – Polar Climate and Cultural Heritage
WP3 – Climate change and permafrost degradation

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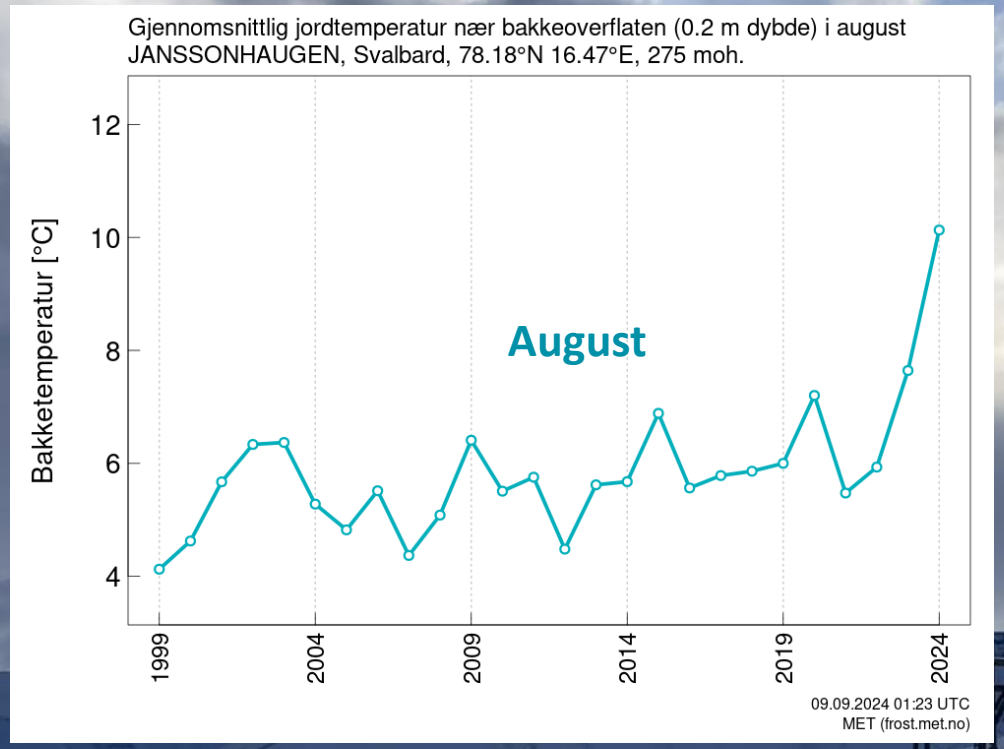
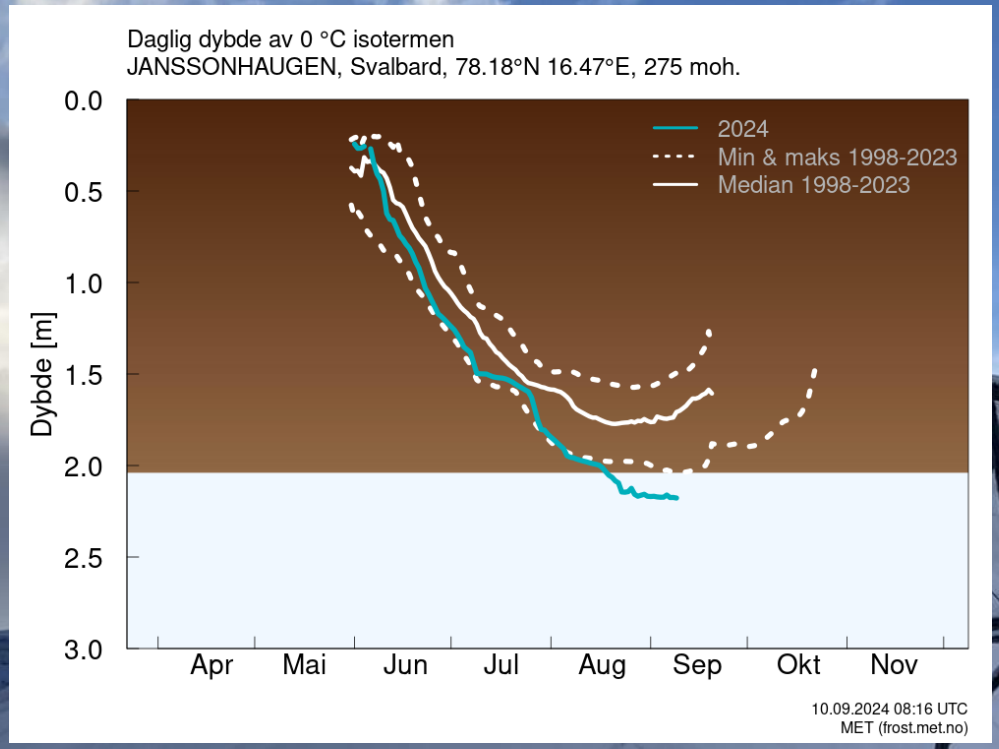
Svalbard Museum, onsdag 11. september 2024, Longyearbyen

# How does permafrost affect cultural heritage?



# How does permafrost affect cultural heritage?

Not built for changing climatic conditions

→ Strongly affected by permafrost warming

→ Here focus on taubanebukker and historical buildings in Ny-Ålesund

# The effect on the taubanebukker

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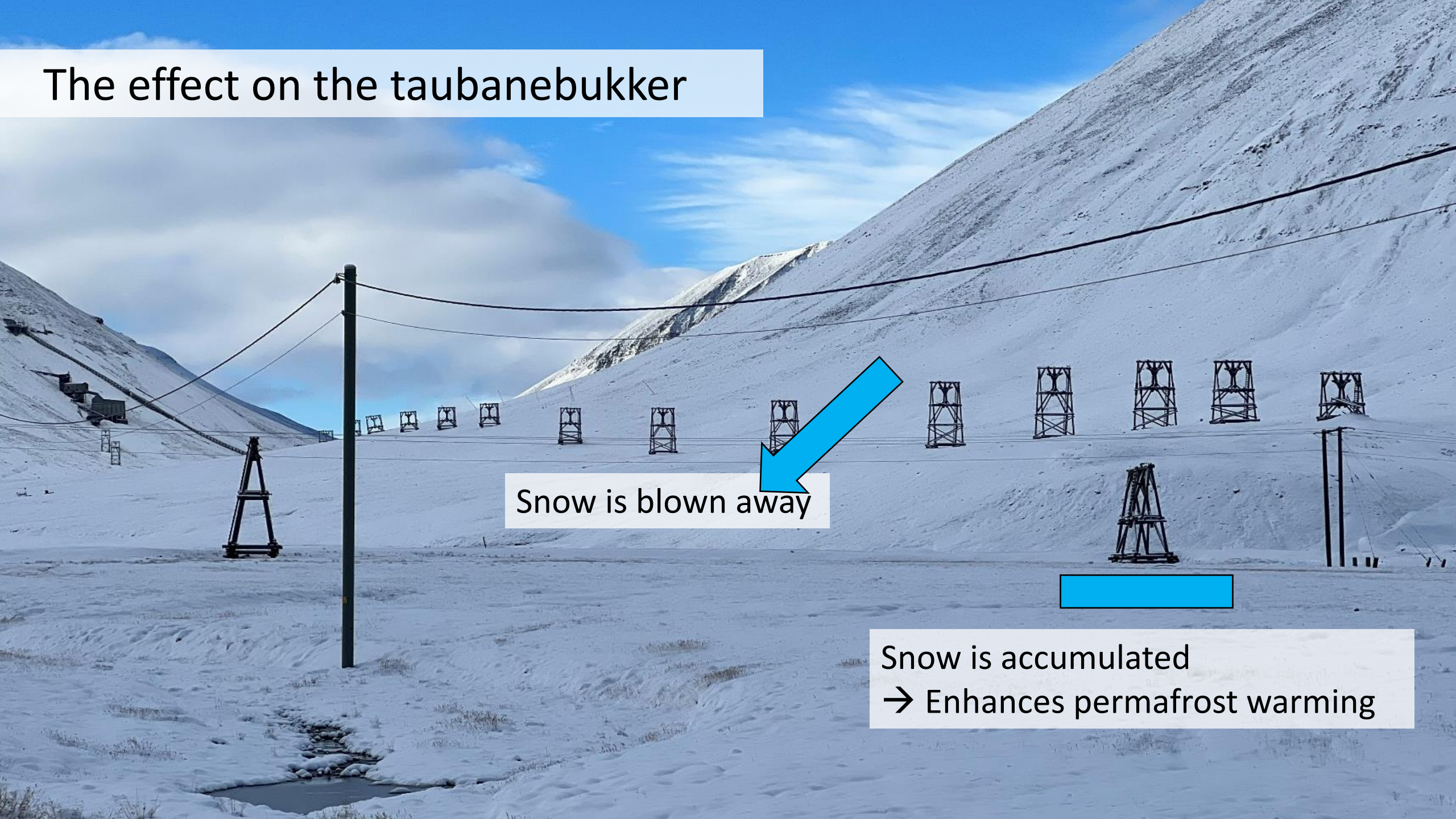
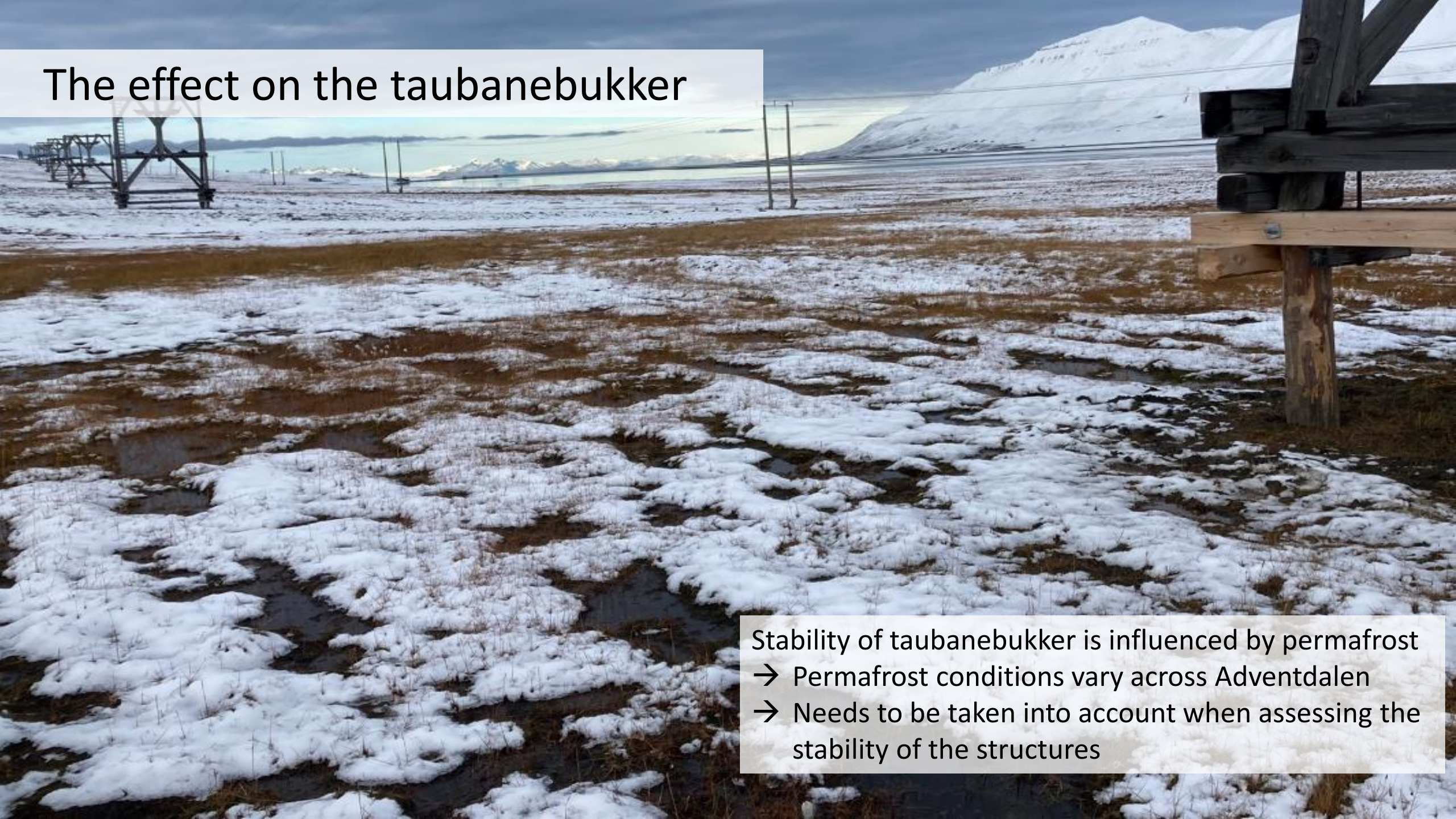


# The effect on the taubanebukker



Stability of taubanebukker is influenced by permafrost

→ Permafrost conditions vary across Adventdalen

→ Needs to be taken into account when assessing the stability of the structures

# The effect on historical buildings in Ny-Ålesund

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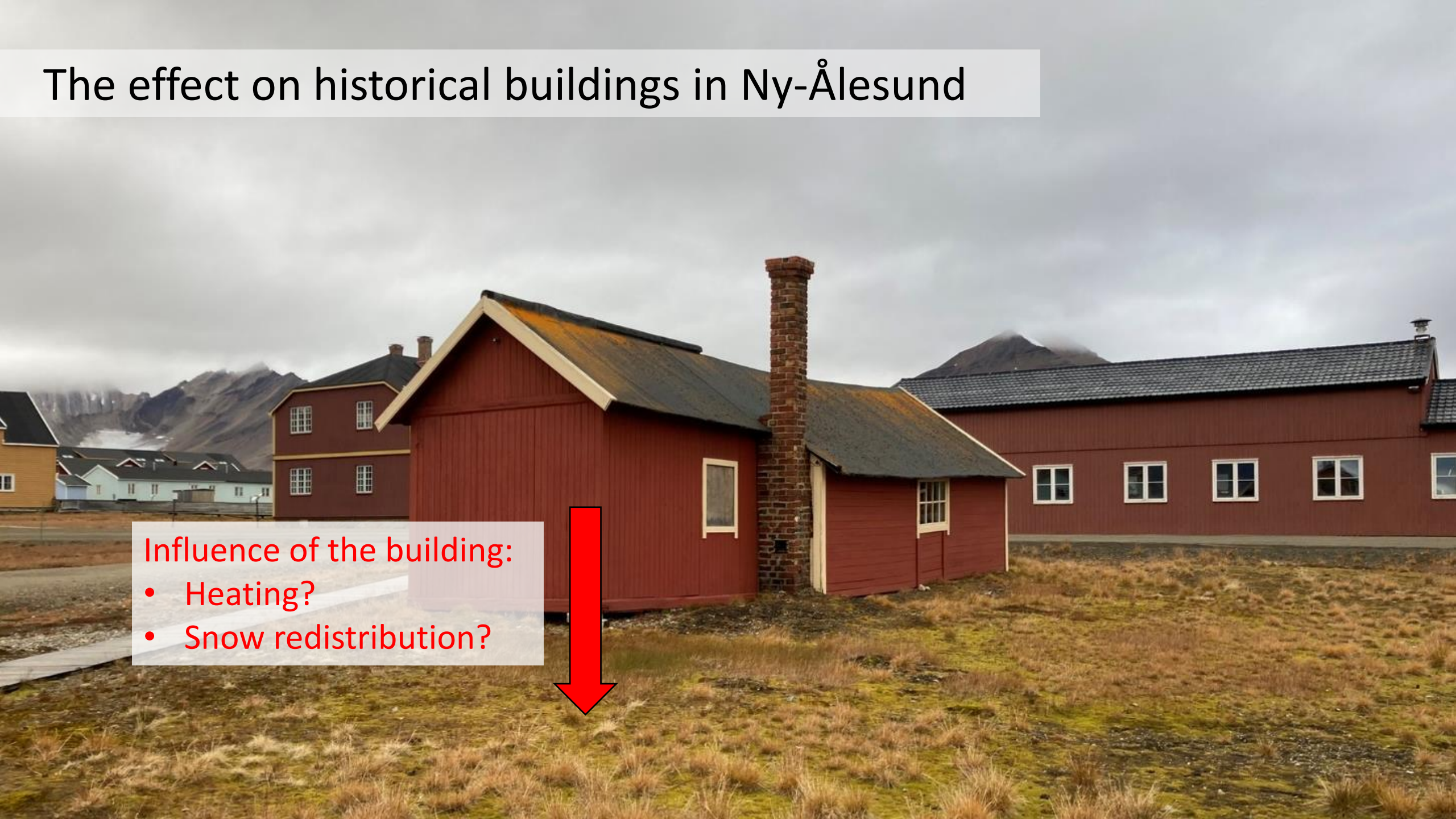
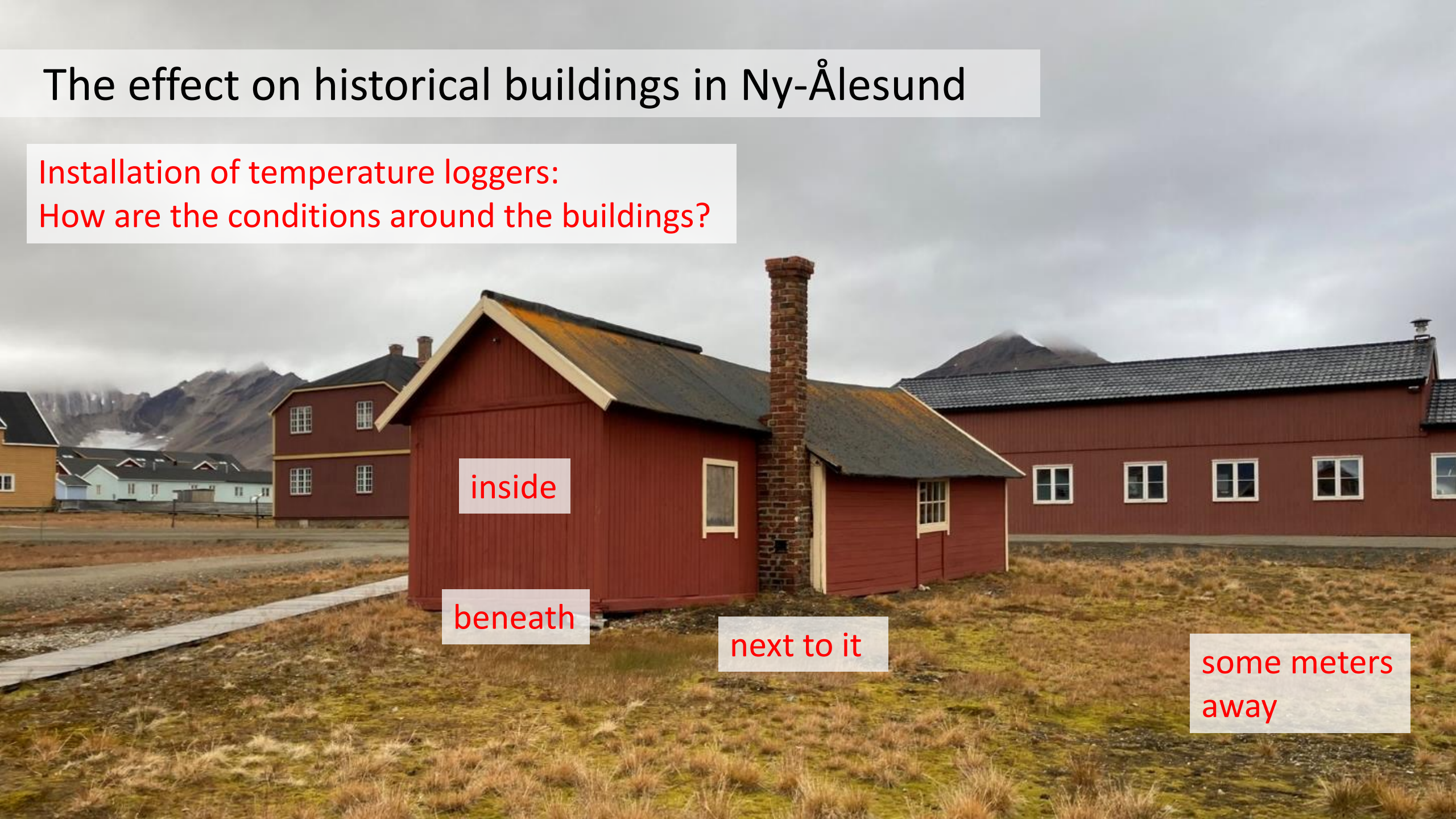


# The effect on historical buildings in Ny-Ålesund

Installation of temperature loggers:
How are the conditions around the buildings?

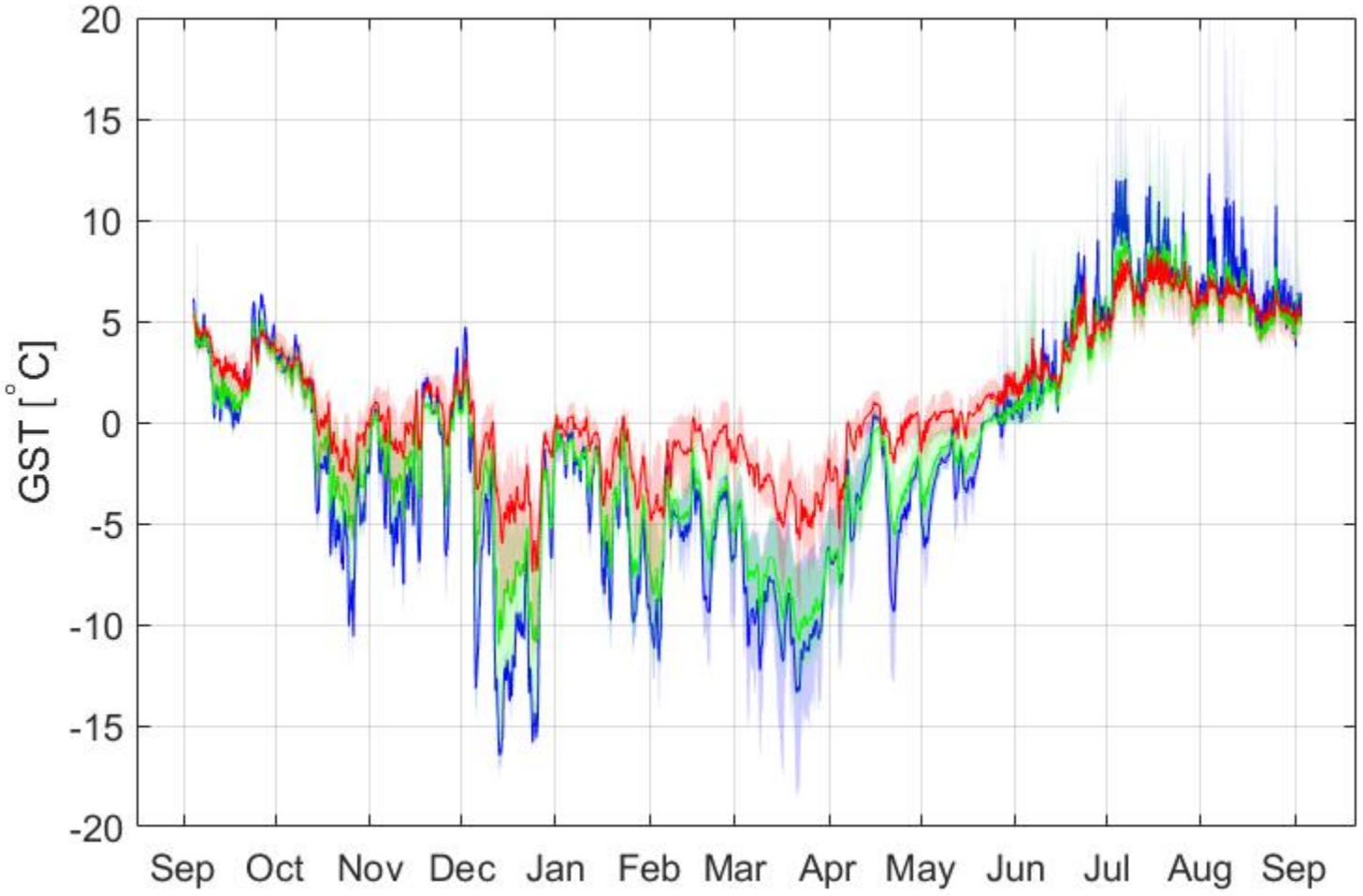


# The effect of air flow beneath the building

No air circulation beneath the building
→ Warm air is trapped
→ Ground is warmed during winter
→ Higher ground temperatures

Air circulation possible
→ Exchange with cold air temperature
→ Ground can cool during winter
→ Lower ground temperatures

# The effect of air flow beneath the building




No air circulation

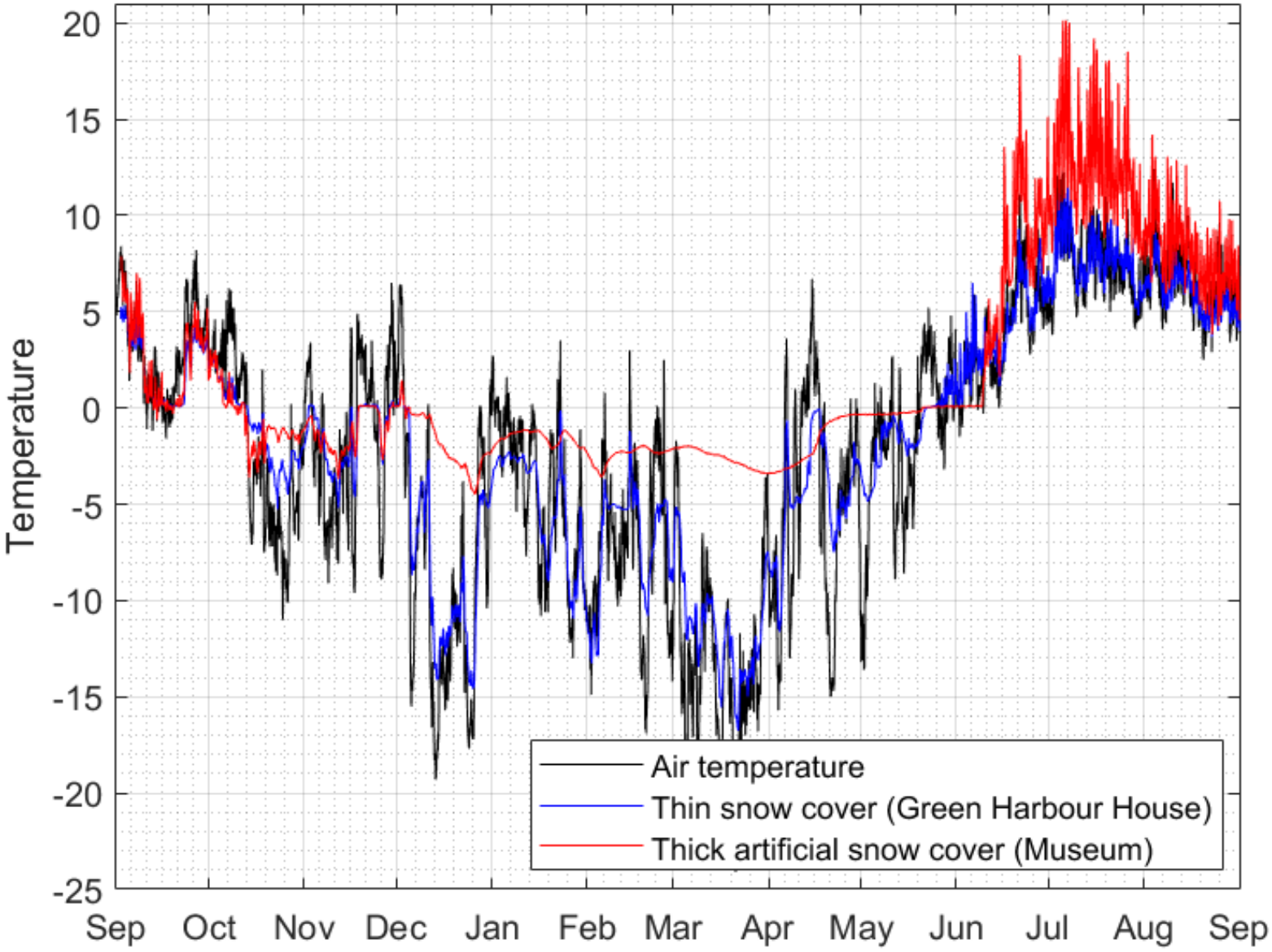
Air circulation enabled

# The effect of snow cover around the building

Thick snow cover:
→ Insulating effect
→ Ground stays warm during winter
→ Higher ground temperatures

Little snow around the building:
→ Direct exchange with cold air temperature
→ Ground can cool during winter
→ Lower ground temperatures

# The effect of snow cover around the building




Lower ground temperatures when snow is removed

Higher ground temperatures when snow is deposited

# How does permafrost affect cultural heritage?

- Changes in the permafrost are already measured today
- This trend is expected to continue in the next decade

- Permafrost warming endangers the stability of cultural heritage, including taubanebukker and historical buildings
- Snow conditions and other factors influence the warming of permafrost

→ Each taubanebukk is affected to a different degree

- Heated buildings can warm the ground beneath

→ Solution: allow air circulation beneath the building

- Snow accumulation can warm the ground

→ Solution: Snow removal around buildings