Wind climate research in Svalbard – the relevance of local processes

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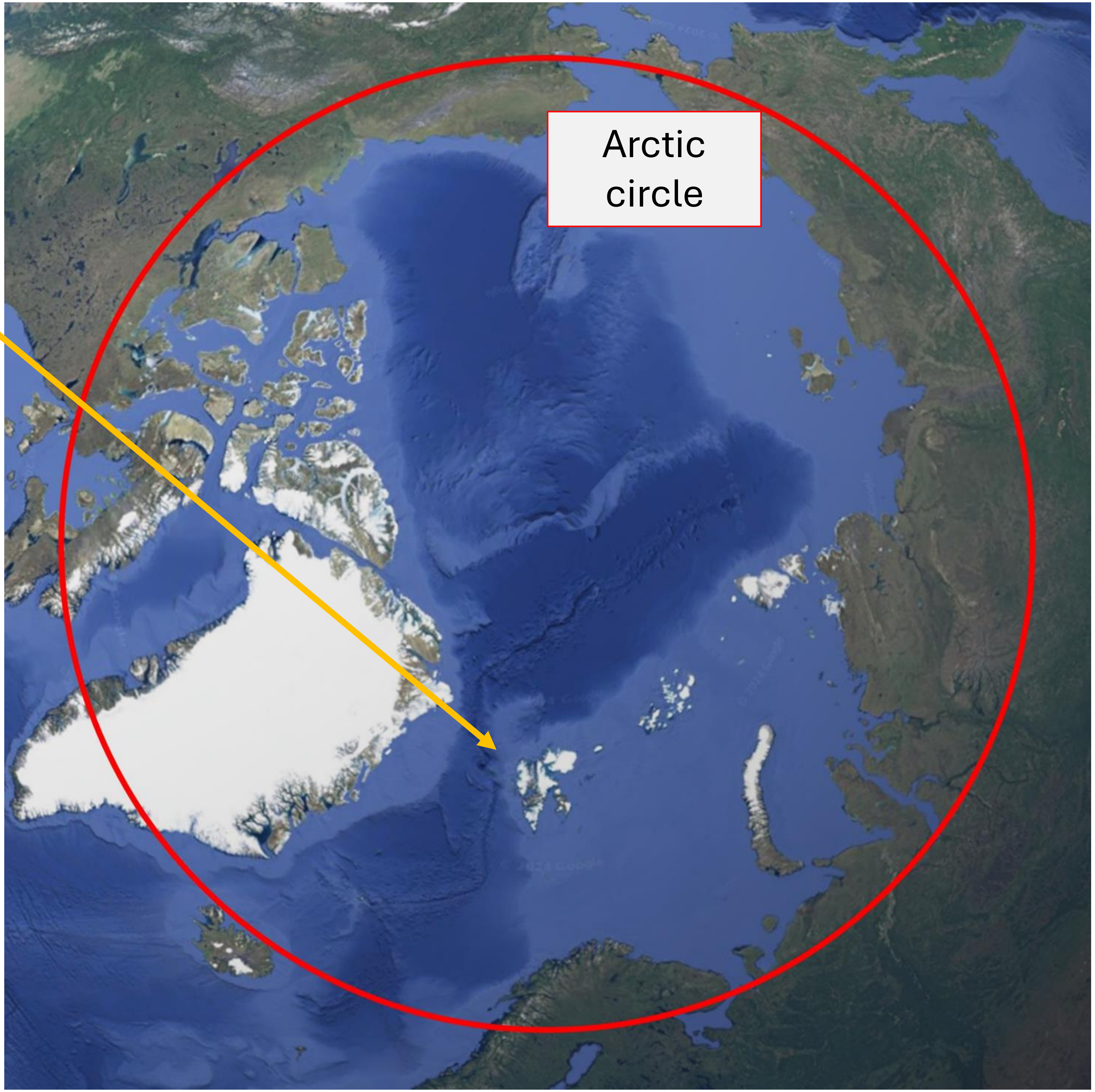
NTNU

Svalbard

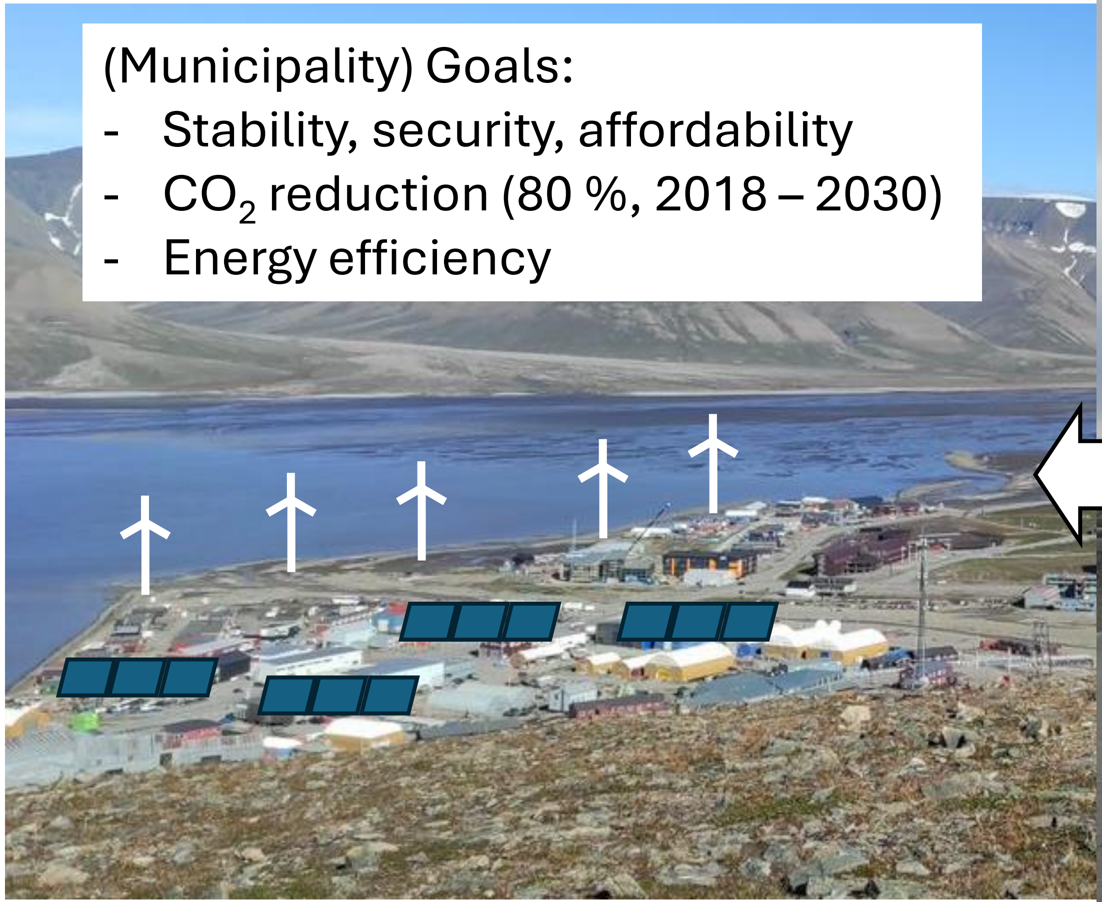


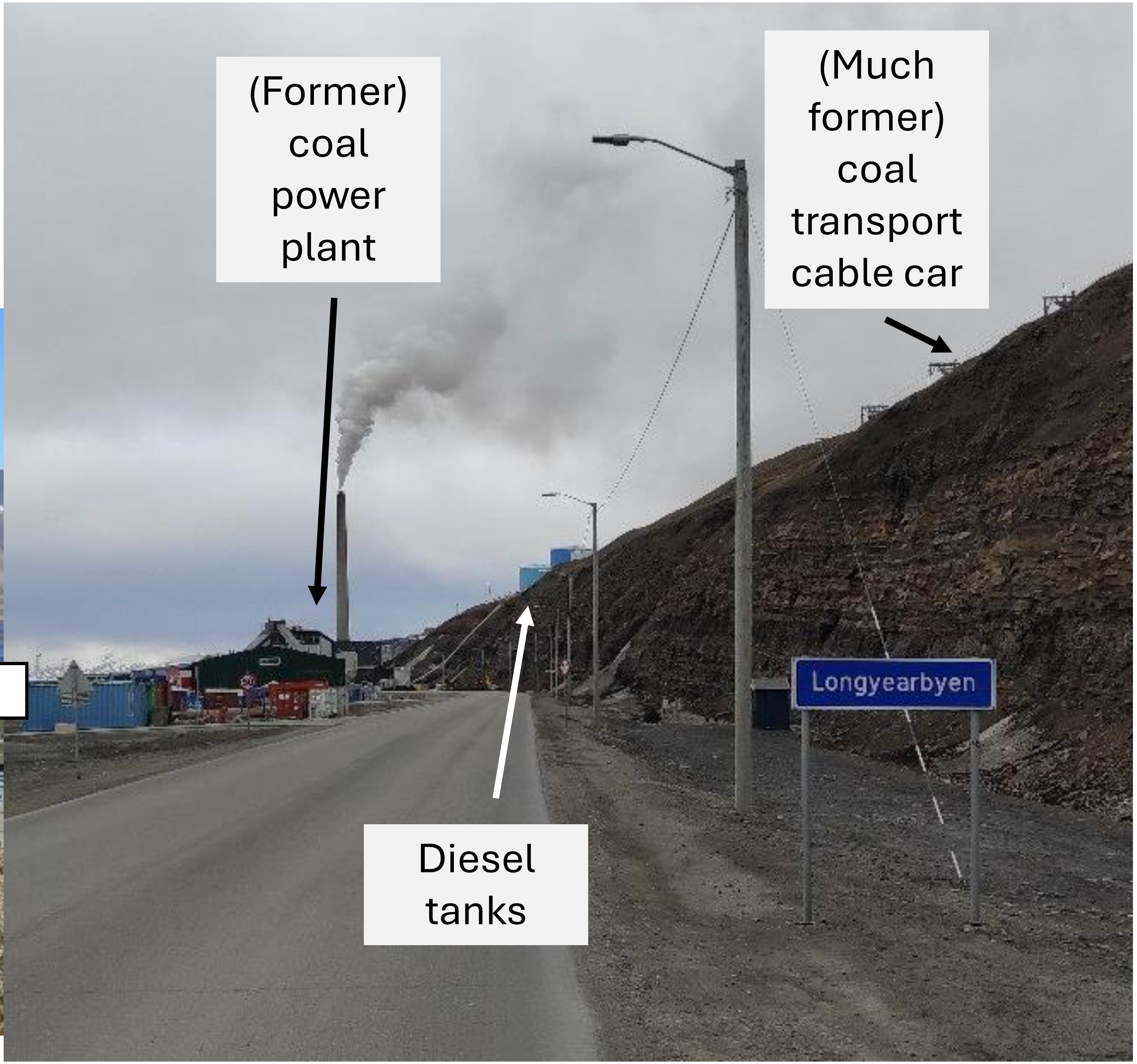
map data: Google, © 2024 Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Landsat / Copernicus, IBCAO, U.S. Geological Survey

Longyearbyen's Energy transition

(Municipality) Goals:

- Stability, security, affordability
- CO_2 reduction (80 %, 2018 – 2030)
- Energy efficiency





https://www.svalbard-energi.no/energiomstilling.589564.no.html

Longyearbyen's Energy transition

(Municipality) Goals:
- Stability, security, affordability
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The University Centre in Svalbard (UNIS)
https://www.unis.no
- Renewable energy is a prioritized theme.
- How to adapt renewable energy systems to Arctic conditions
- Together with local actors
- New courses (Master/PhD level), 6 weeks:
  - Arctic Renewable Energy Exploration and Development
  - Arctic Energy Meteorology
  - Arctic Renewable Energy Infrastructure: Construction and Operation

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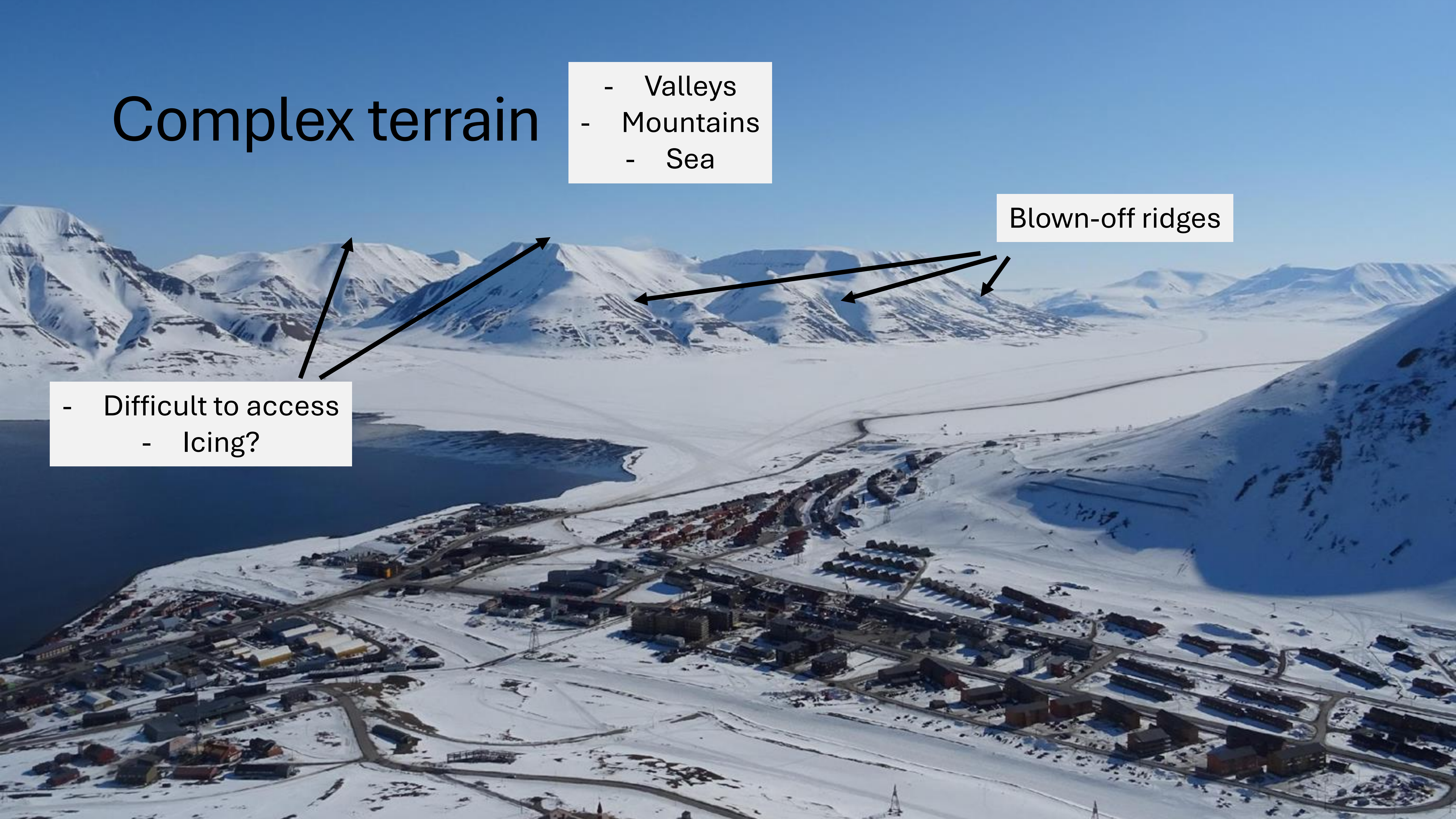
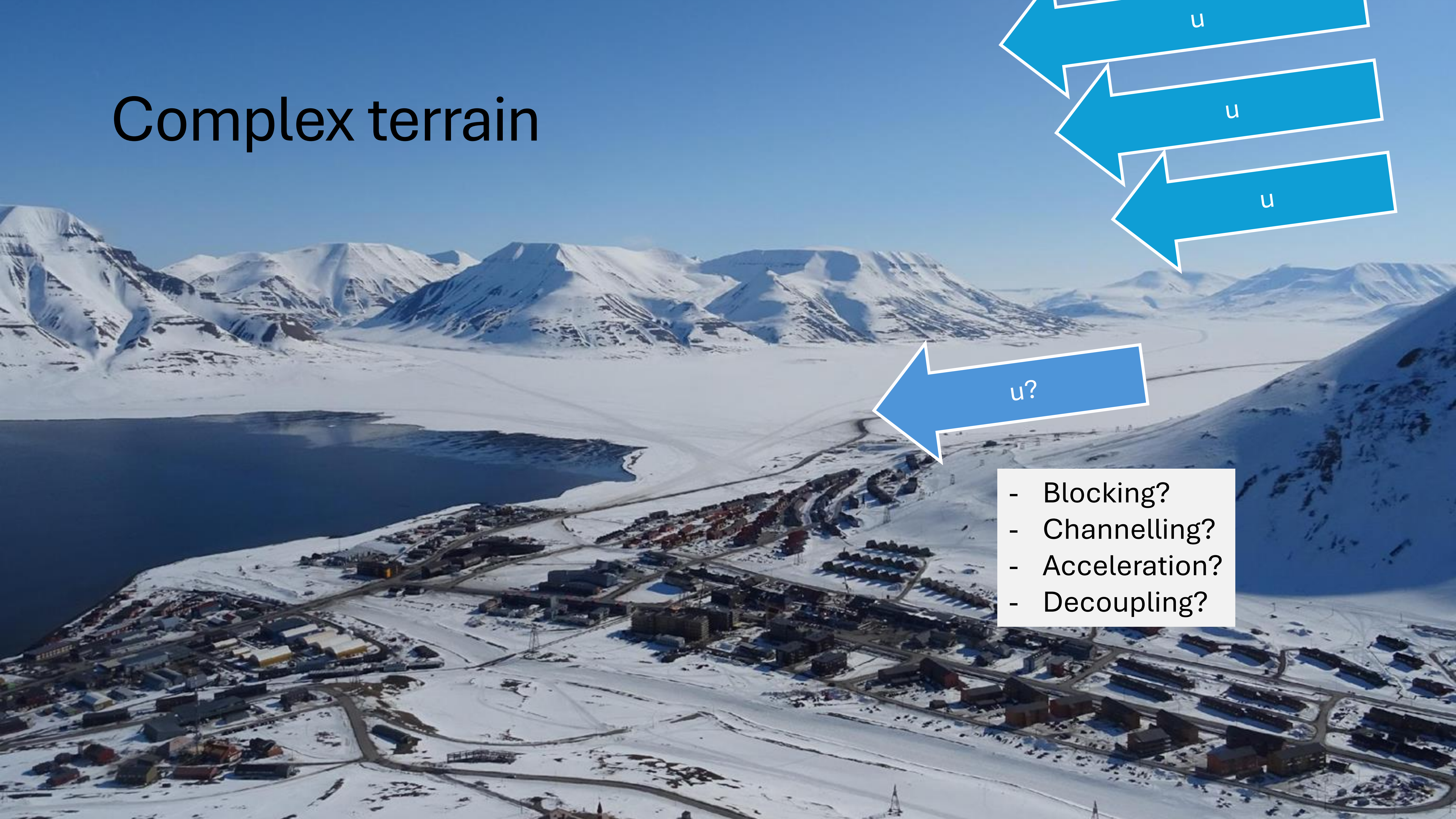
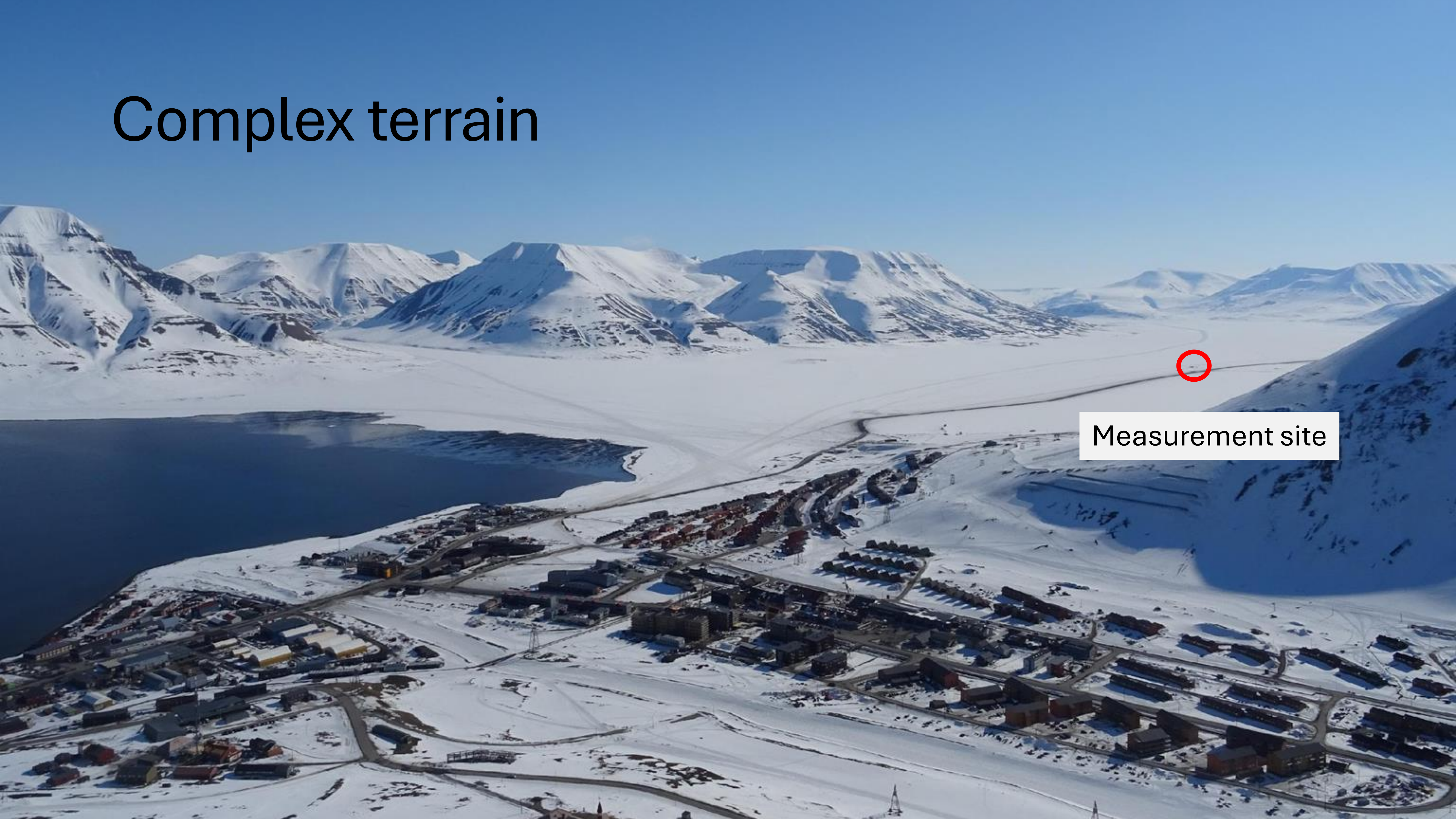

Complex terrain
- Valleys
- Mountains
- Sea
Blown-off ridges
- Difficult to access
- Icing?

Complex terrain



Complex terrain



Wind profile

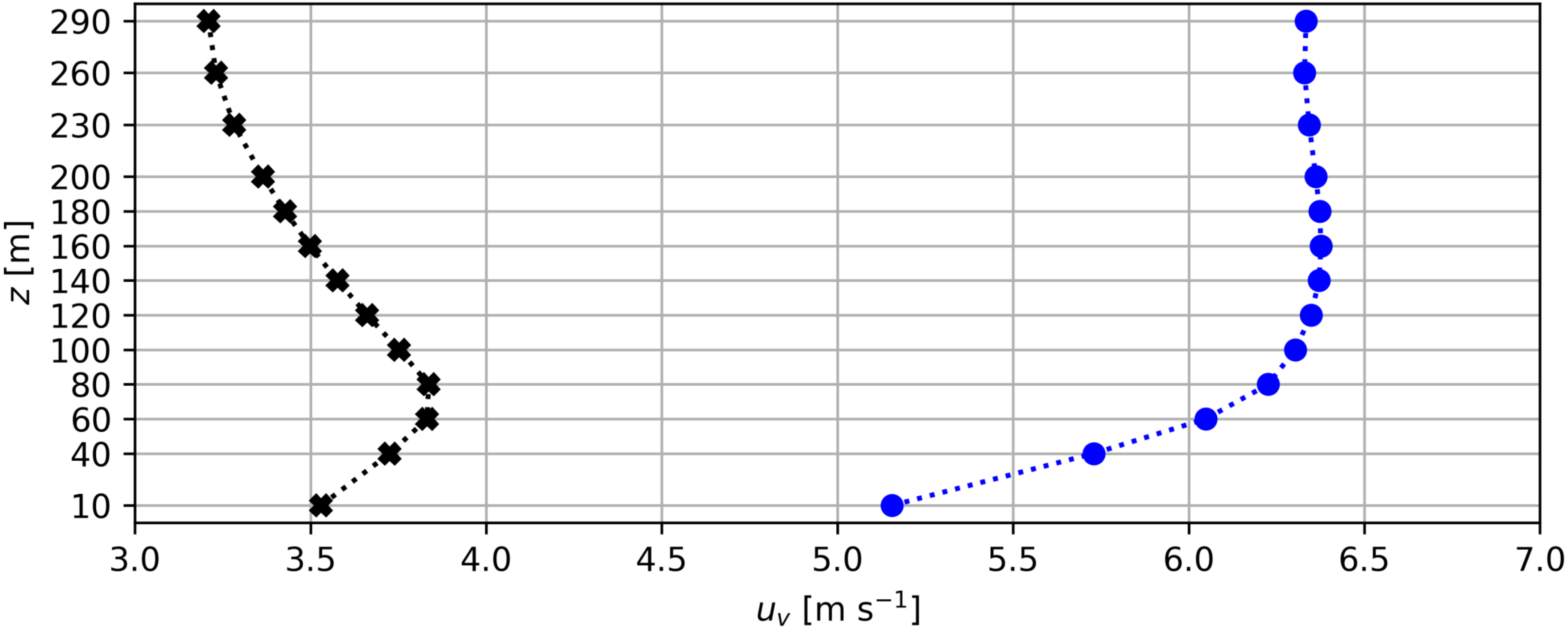
Why?

Decoupled
(weak or opposite large-scale wind)
6131 h

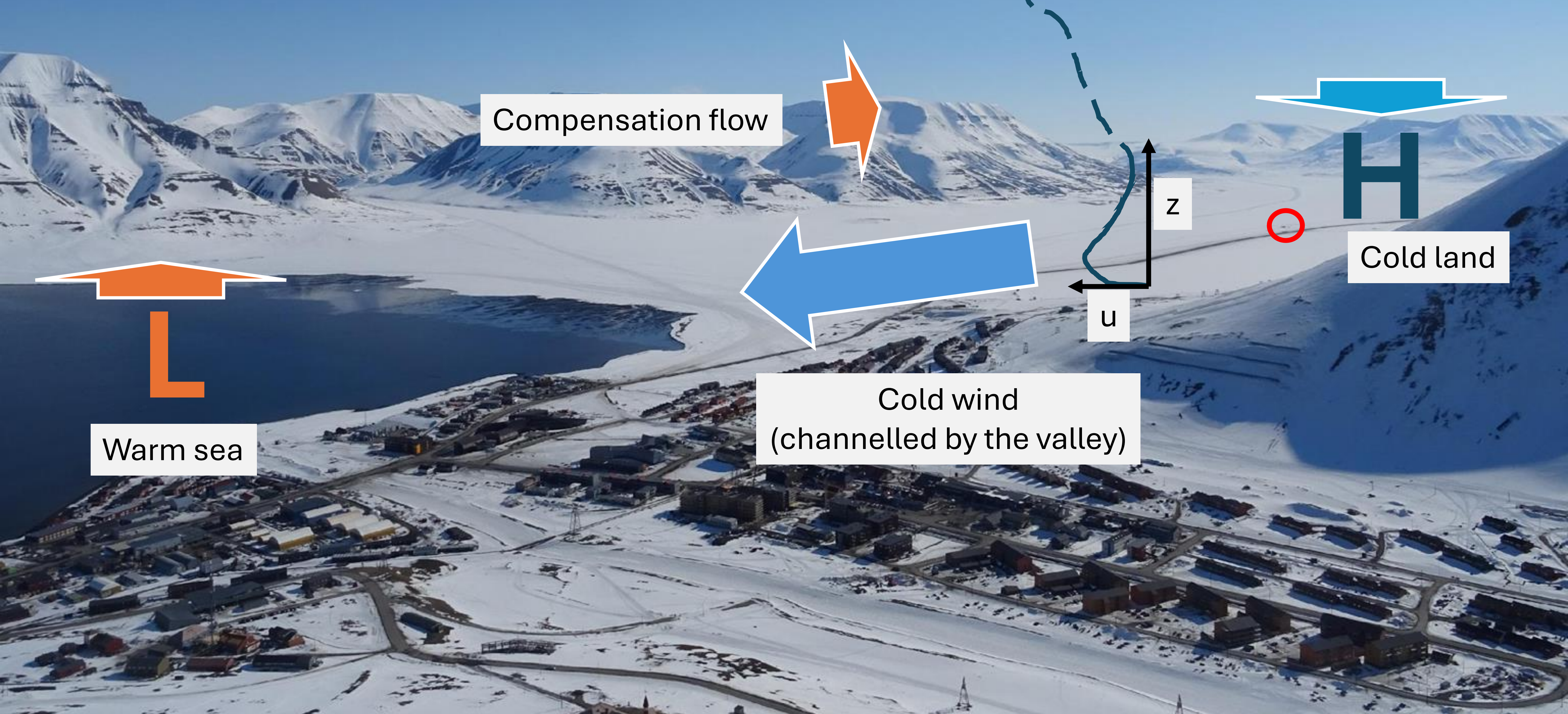
- Wind speed decrease above 80 m
- Untypical

Other
6379 h

More normal wind profile



Thermally-driven wind (winter case)



Thermally-driven wind (summer case)

“Arctic Fjord Breeze”

(Henkies et al., 2023, Boundary Layer Meteorology)

https://doi.org/10.1007/s10546-023-00840-y

Conclusions

- Frequent decoupling in this complex terrain
- Thermally-driven wind and channelling
- Wind speed increase at low levels
- Wind power potential in valleys might not be as bad as some models suggest.

- A combination of locations could shorten the periods without wind.