Is Climate Warming More Pronounced at High Elevations ?

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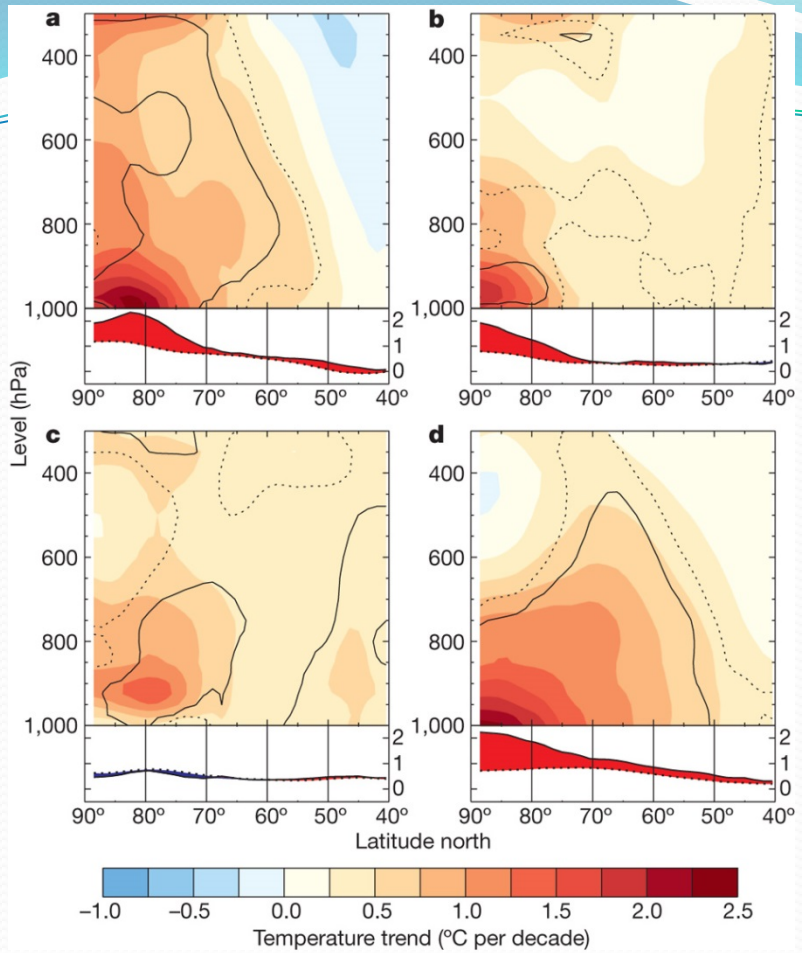

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Source: Screen et al. (2010)

Temperature trends averaged around circles of latitude for winter (December–February; **a**), spring (March–May; **b**), summer (June–August; **c**) and autumn (September–November; **d**). The black contours indicate where trends differ significantly from zero at the 99% (solid lines) and 95% (dotted lines) confidence levels. The line graphs show trends (same units as in colour plots) averaged over the lower part of the atmosphere (950–1,000 hPa; solid lines) and over the entire atmospheric column (300–1,000 hPa; dotted lines). Red shading indicates that the lower atmosphere has warmed faster than the atmospheric column as whole. Blue shading indicates that the lower atmosphere has warmed slower than the atmospheric column as a whole.

Arctic Amplification: Reasons

- Cryospheric Feedback: Albedo Decrease,
- Release of Heat from Ocean as Ice Melts (Increased Coupling)
- Greening and Poleward movement of Treeline

- These are SURFACE effects: amplify the signal at low elevations in Arctic

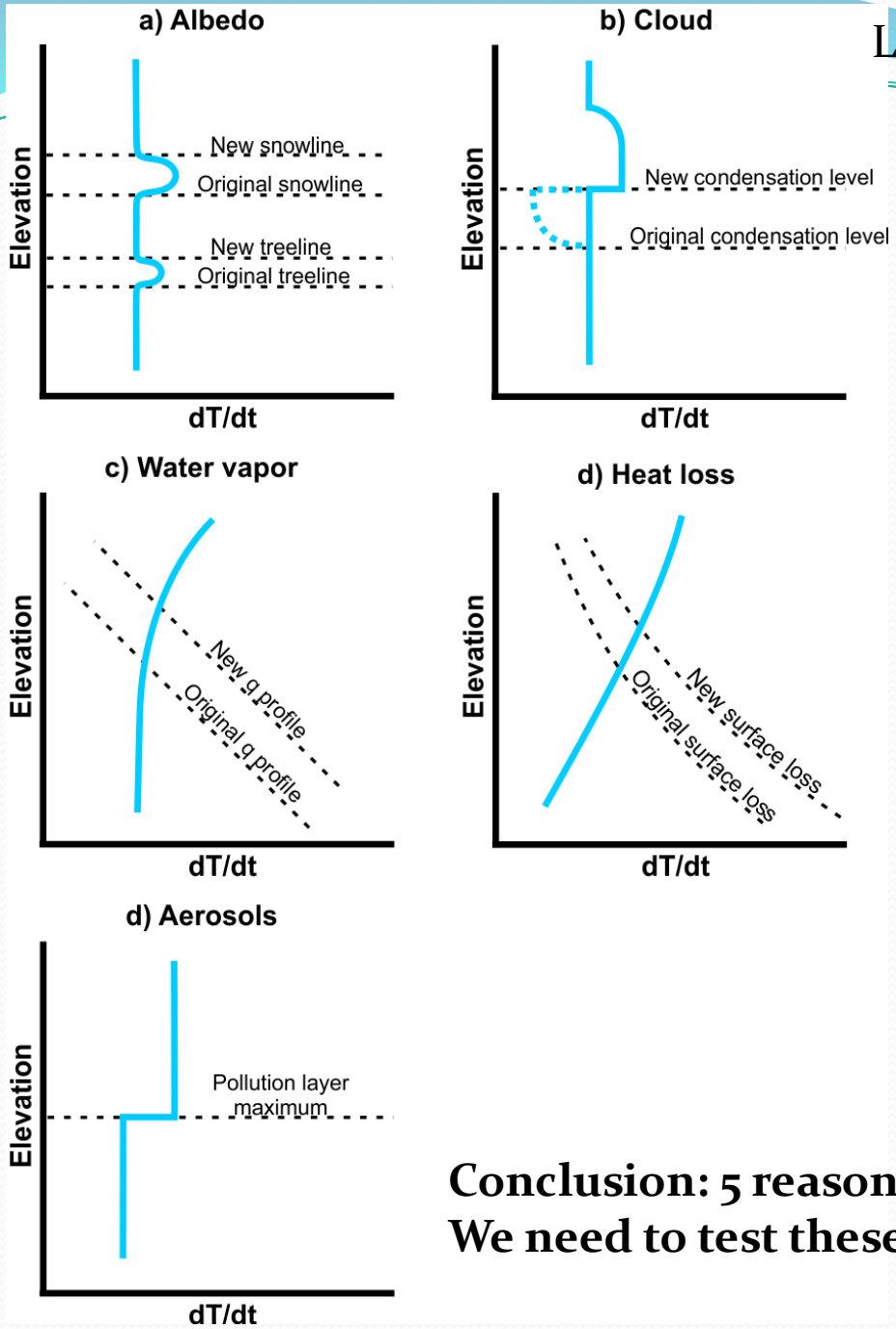
- Could these (or other effects) also apply in Mountains?

Arctic is simple: Mountains are complex

- Climate in mountains is complex – They are not "high flat places"
- So shouldn't climate change be complex as well?
- Is there a simplistic answer (i.e. yes/no) to the question: Is climate warming more pronounced at high elevations?

- Remember: mountain
- =not free atmosphere

- Complex mosaic
- Microclimates
- Extreme temporal variation
- Feedback loops:
- Snow/vegetation dynamics
- All "latitudes"
- All "synoptic climates"



Let us assume they are high flat places

How do these theoretical mechanisms work in the mountains?

Would we expect enhanced warming at high elevations?

Answer = yes (mostly)

a) Everywhere but seasonal (at snowline, treeline)
b) Particularly tropics
c) Wherever cold (high elev)
d) Wherever cold (high elev)
e) Mid-latitudes

Conclusion: 5 reasons that EDW might exist
We need to test these through observations and modelling