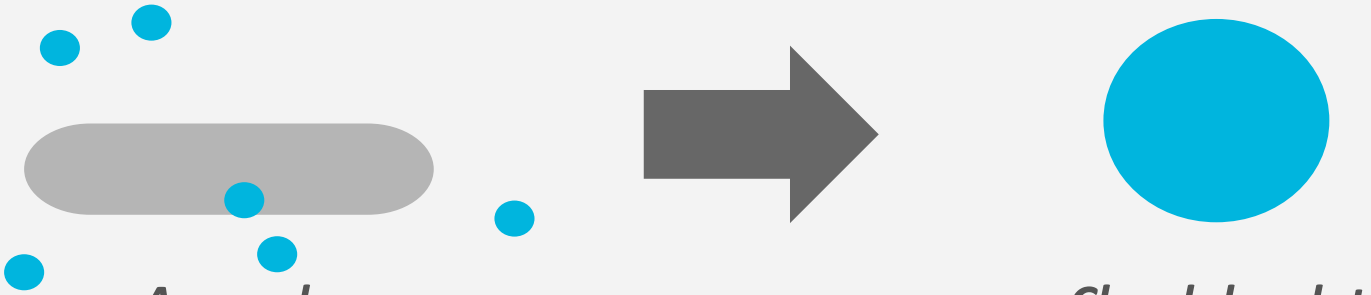
WCC 5: Clouds and precipitation

CTB3300WCx: Introduction to Water and Climate

Prof.dr.ir. Herman Russchenberg

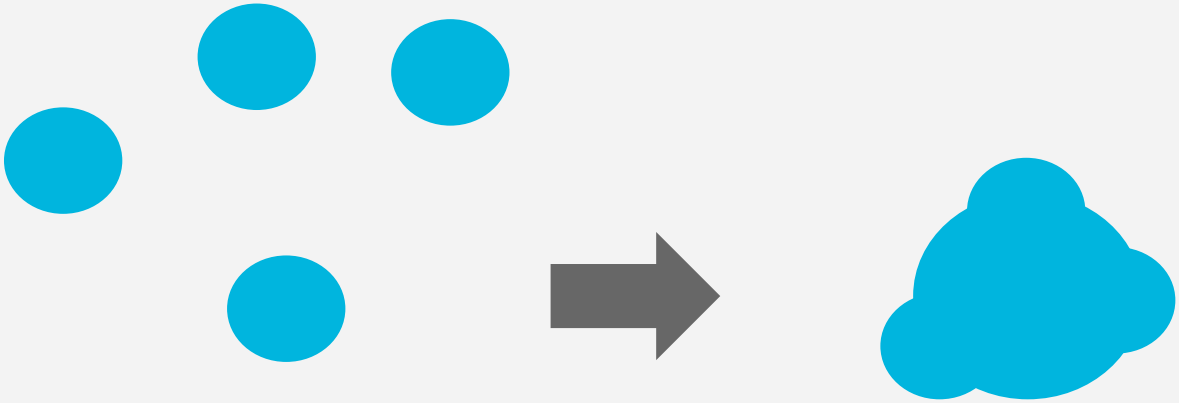
Cloud droplet growth



Aerosol
~ 1 micron

Cloud droplet
~ 10 micron

Raindrop droplet growth, process 1:
collision and coalescence

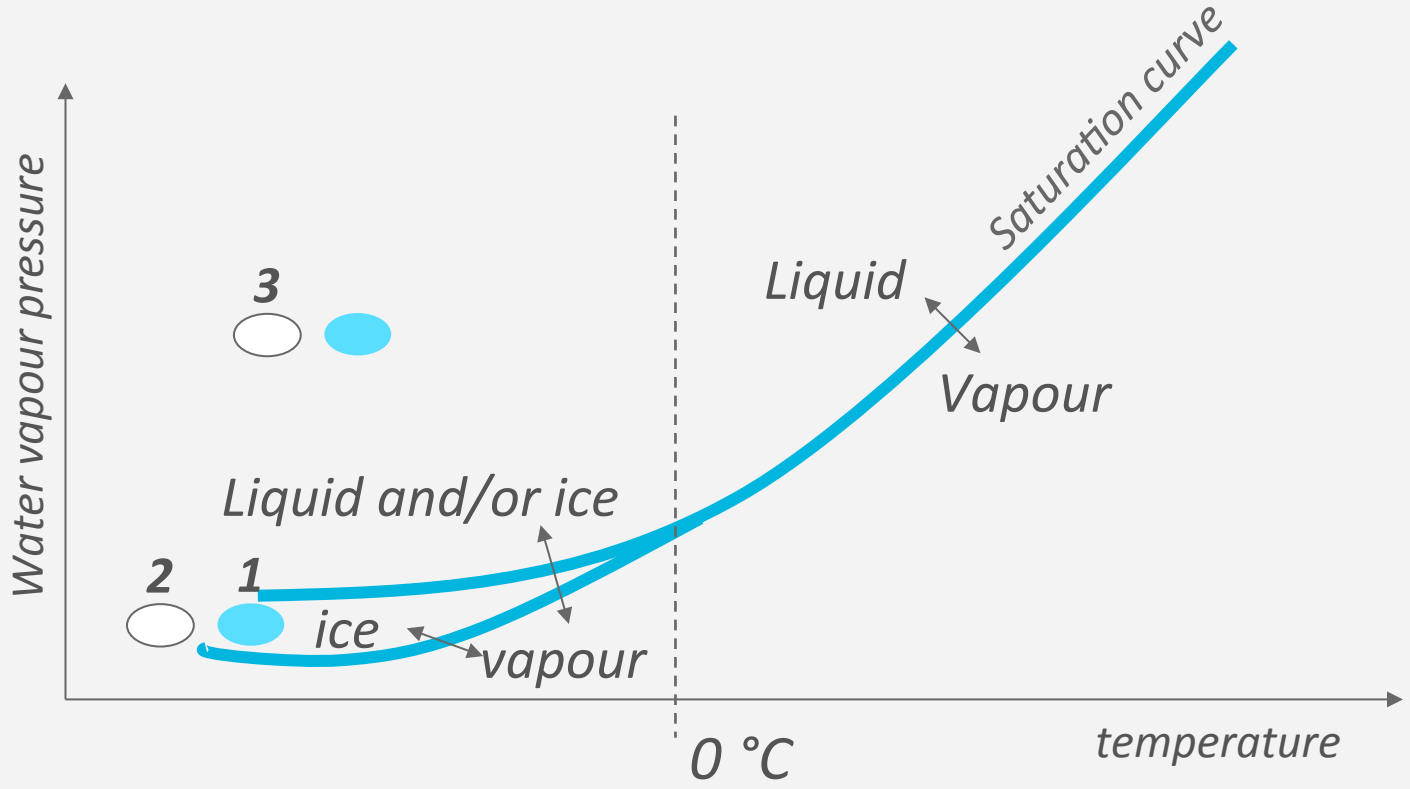


Cloud droplets
~ 10 micron

Rain drop
~ 1 mm

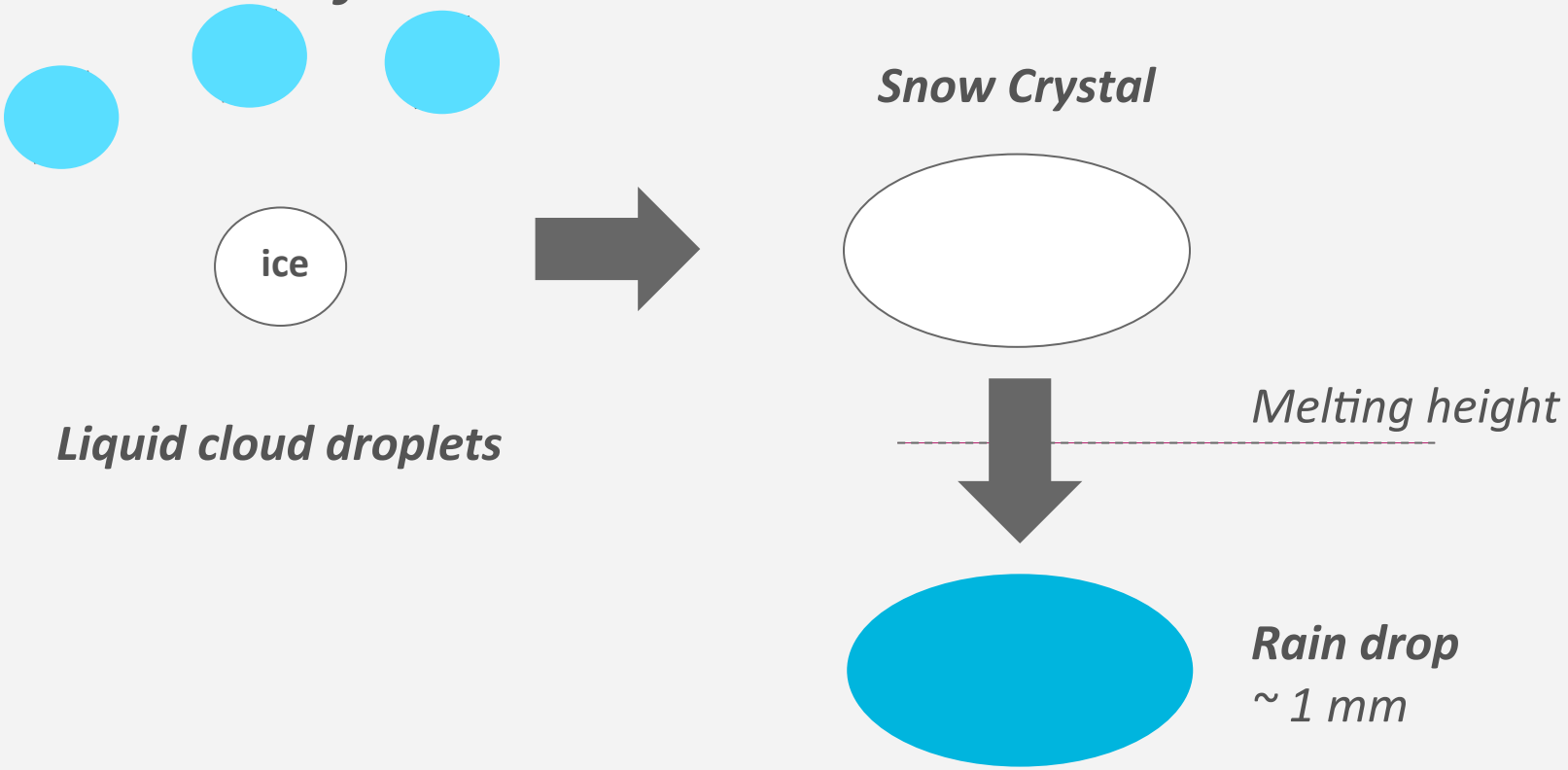
Raindrop droplet growth, process 2:

Bergeron-Findeisen



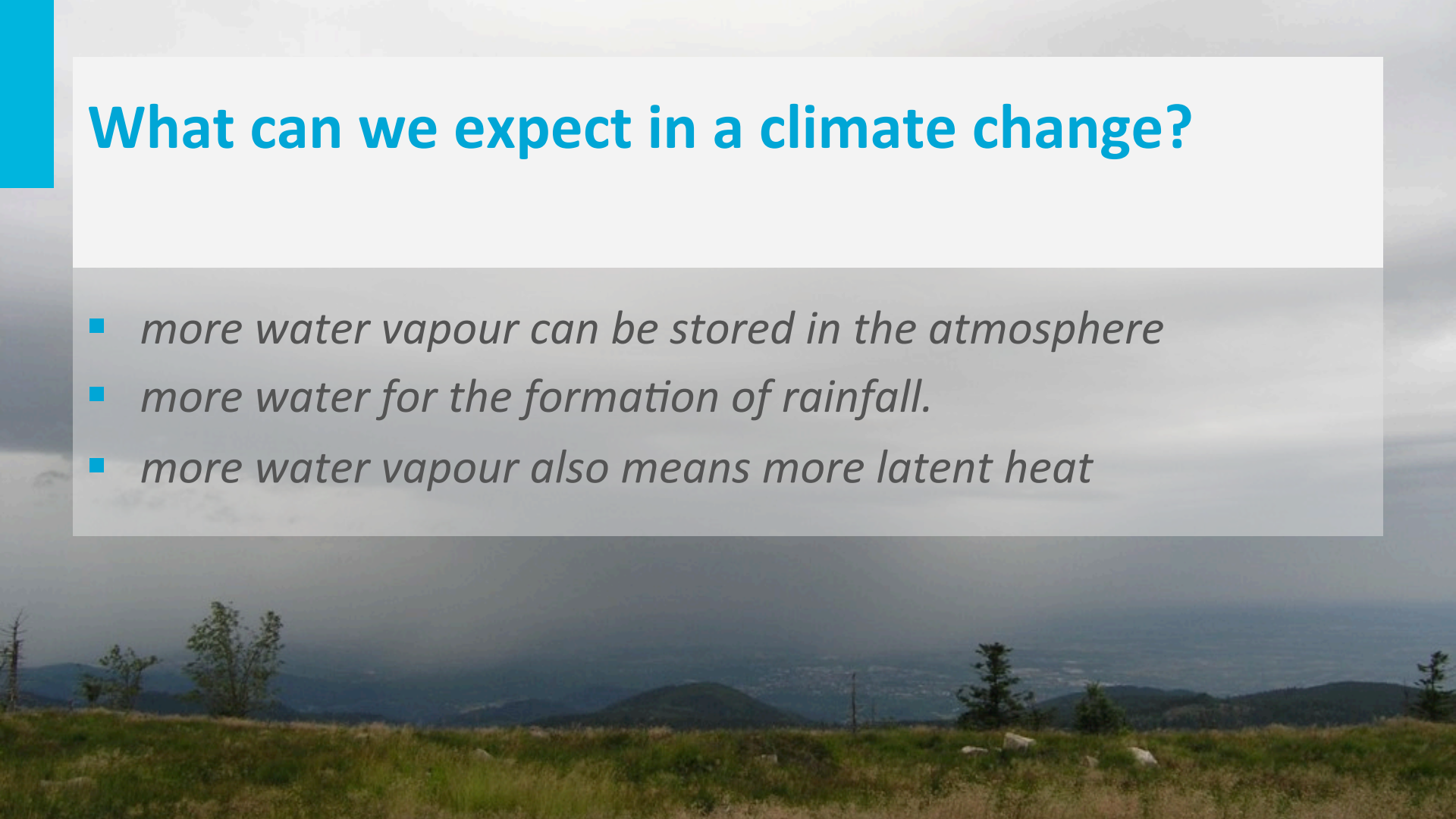
Raindrop droplet growth, process 2:

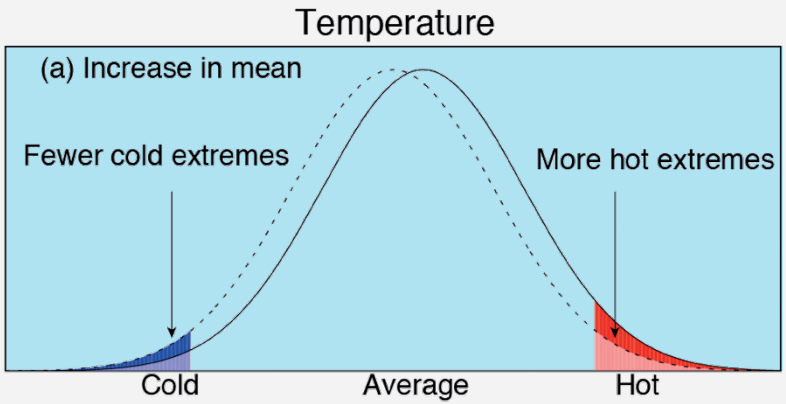
Cold rain formation

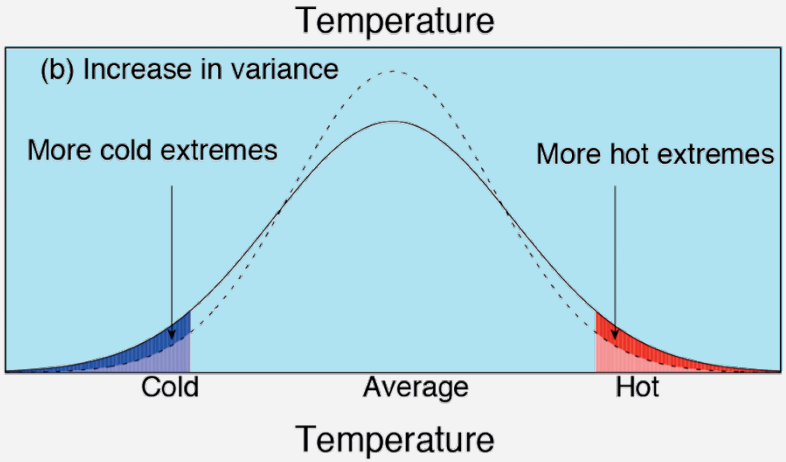


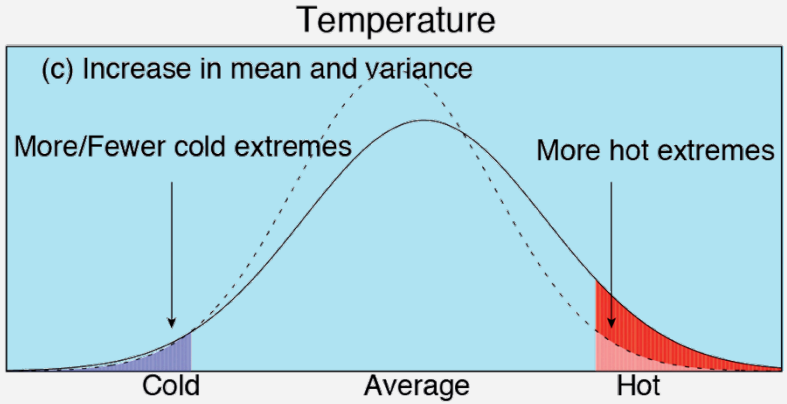
What can we expect in a climate change?

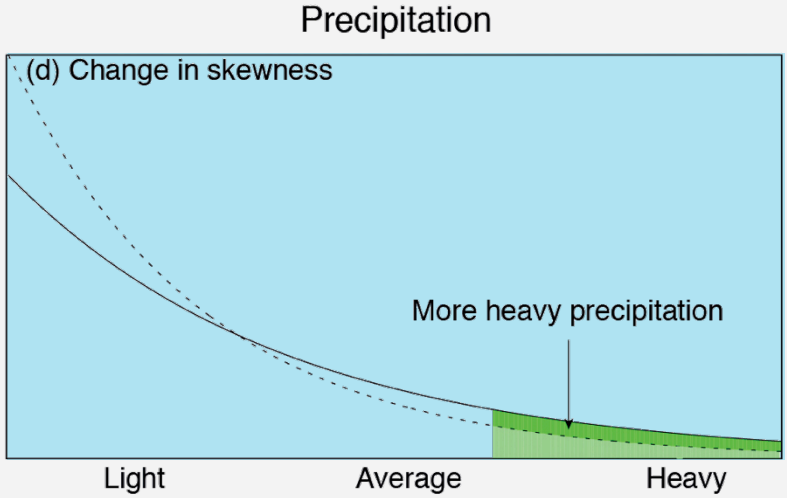
- *more water vapour can be stored in the atmosphere*
- *more water for the formation of rainfall.*
- *more water vapour also means more latent heat*



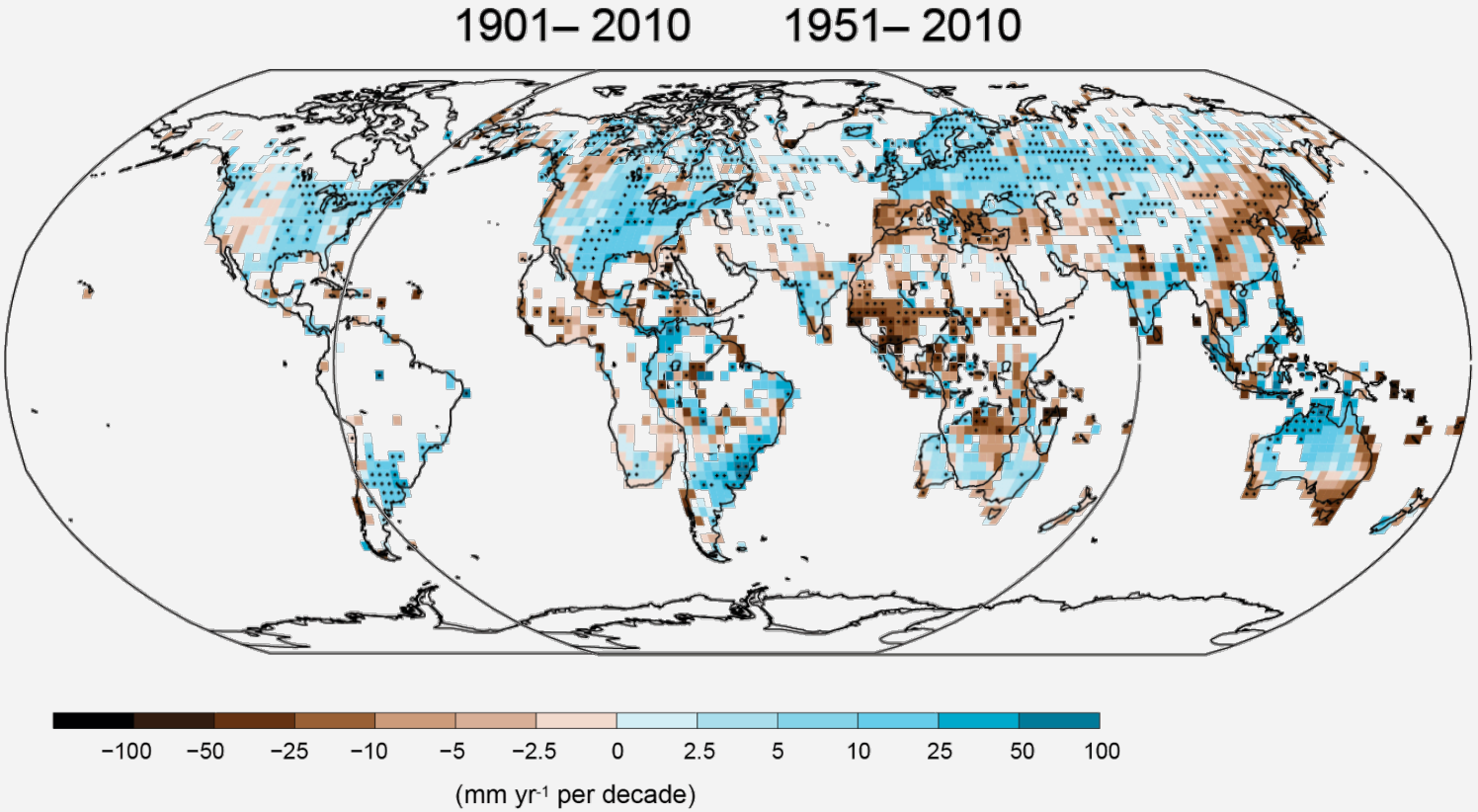

Temperature
(a) Increase in mean
Fewer cold extremes
More hot extremes
Cold
Average
Hot


Temperature
(b) Increase in variance
More cold extremes
More hot extremes
Cold
Average
Hot
Temperature

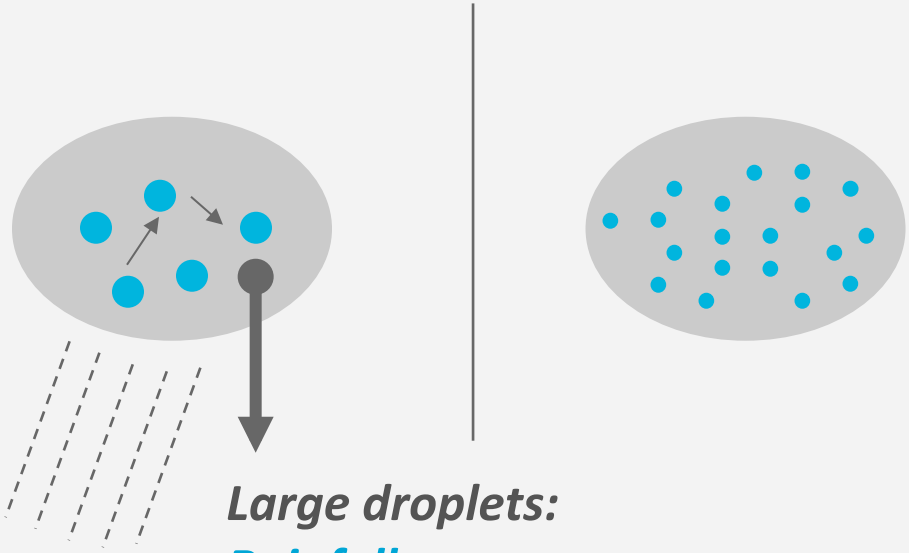

Temperature
(c) Increase in mean and variance
More/Fewer cold extremes
More hot extremes
Cold
Average
Hot


Precipitation
(d) Change in skewness
More heavy precipitation
Light
Average
Heavy

Observed change in annual precipitation over land



Rainfall formation



Large droplets:
Rainfall

More aerosols

Delayed rainfall

Longer cloud lifetime

More rainfall?


TU Delft

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