

Cloud variation in the Arctic for UKESM-1-0-LL

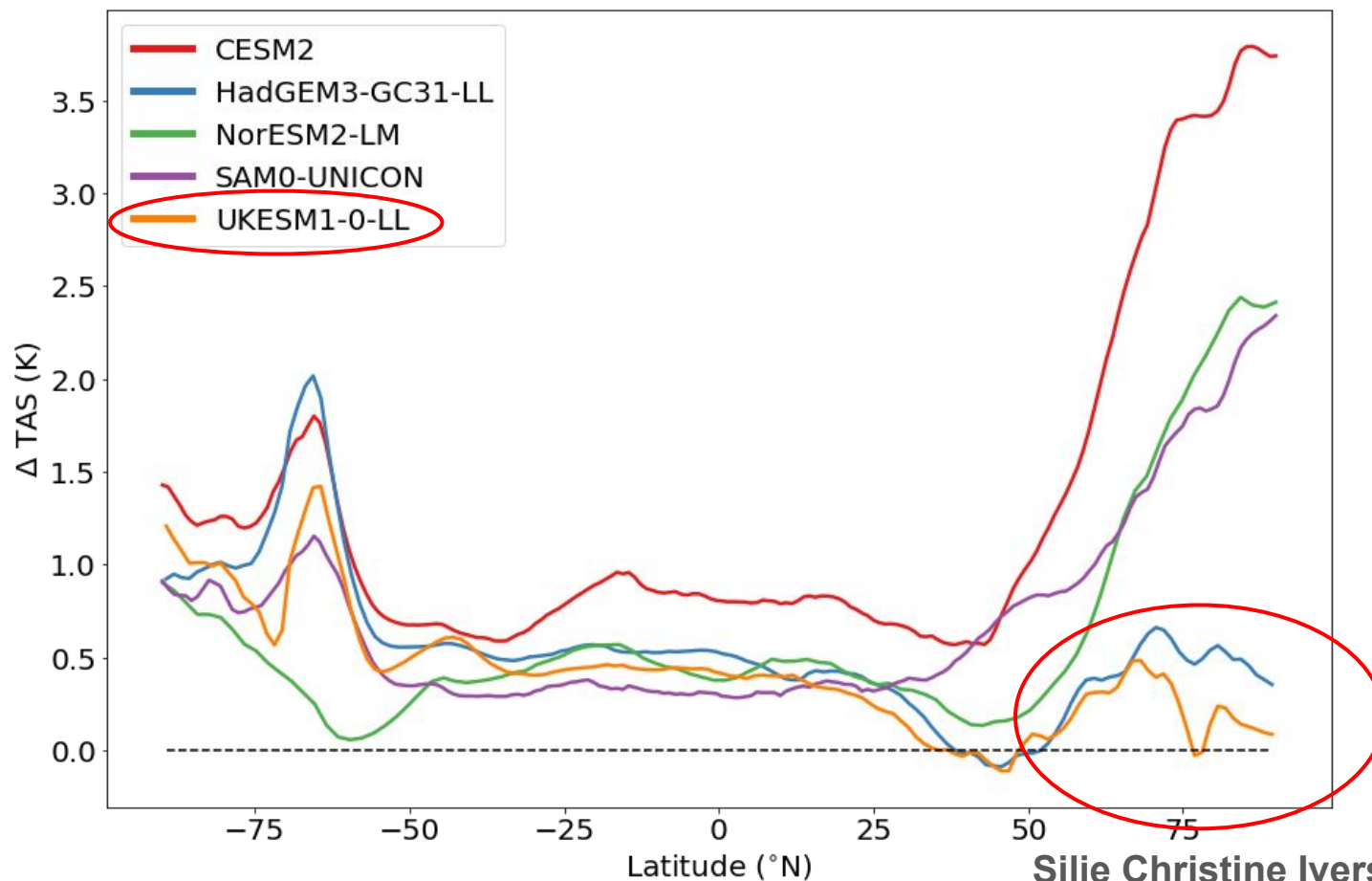
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under constant supervision of Paul Zieger

Motivation: Why look at cloud variation?

- Clouds are very important for the radiative budget
 - Clouds in the arctic has a warming effect throughout winter (less Outgoing Longwave Radiation)
- One of the most important cloud characteristics defining the radiative properties is cloud phase composition (T. Nomokonova et al,2019)

(T. Nomokonova et al, (2019), Statistics on clouds and their relation to thermodynamic conditions at Ny-Ålesund, Atmos. Chem. Phys., 19, 4105–4126, 2019)

Motivation: Why UKESM-1-0-LL?

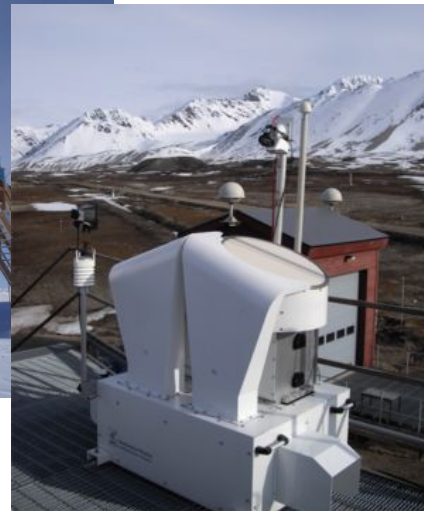


Silje Christine Iversen , 2019, Abisko

Could the differences in cloud representation be linked to differences in temperature changes?

Methods: (1) Radar-observation

- Observations from CLOUDNET @ Ny-Ålesund and Summit observatories



Methods: (1) Radar-observation

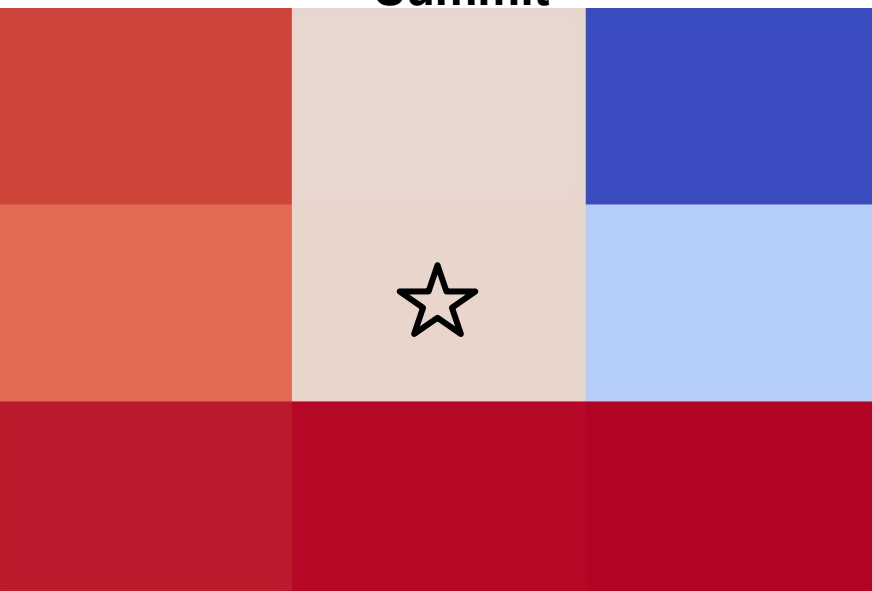
- Output from Radar-observation is categorical:
 - 0: Clear sky, 1: Cloud droplets only, 2: Drizzle or rain, 3: Drizzle/rain & cloud droplets, 4: Ice, 5: Ice & supercooled droplets, 6: Melting ice , 7: Melting ice & cloud droplets, 8: Aerosol, 9: Insects, 10: Aerosol & insects
- I use these to categorize both 1. column at each timestep, and 2. vertical levels for all timesteps as:
 - 0: Clear sky, 1: Water cloud, 2: Ice cloud, 3: Mixed cloud

Methods: (2) Cloud-variables from UKESM-1-0-LL

- cl - Cloud-cover (one value for each model-level at each model-cell)
- cli - Cloud Ice Mass fraction
- clw - Cloud Ice Mass fraction

I will use these variables to classify the phase of clouds represented at model heights and columns (Same as for the observational data). Ratio between cli and clw (clw = 0 is ice, cli = 0 is water, obviously)

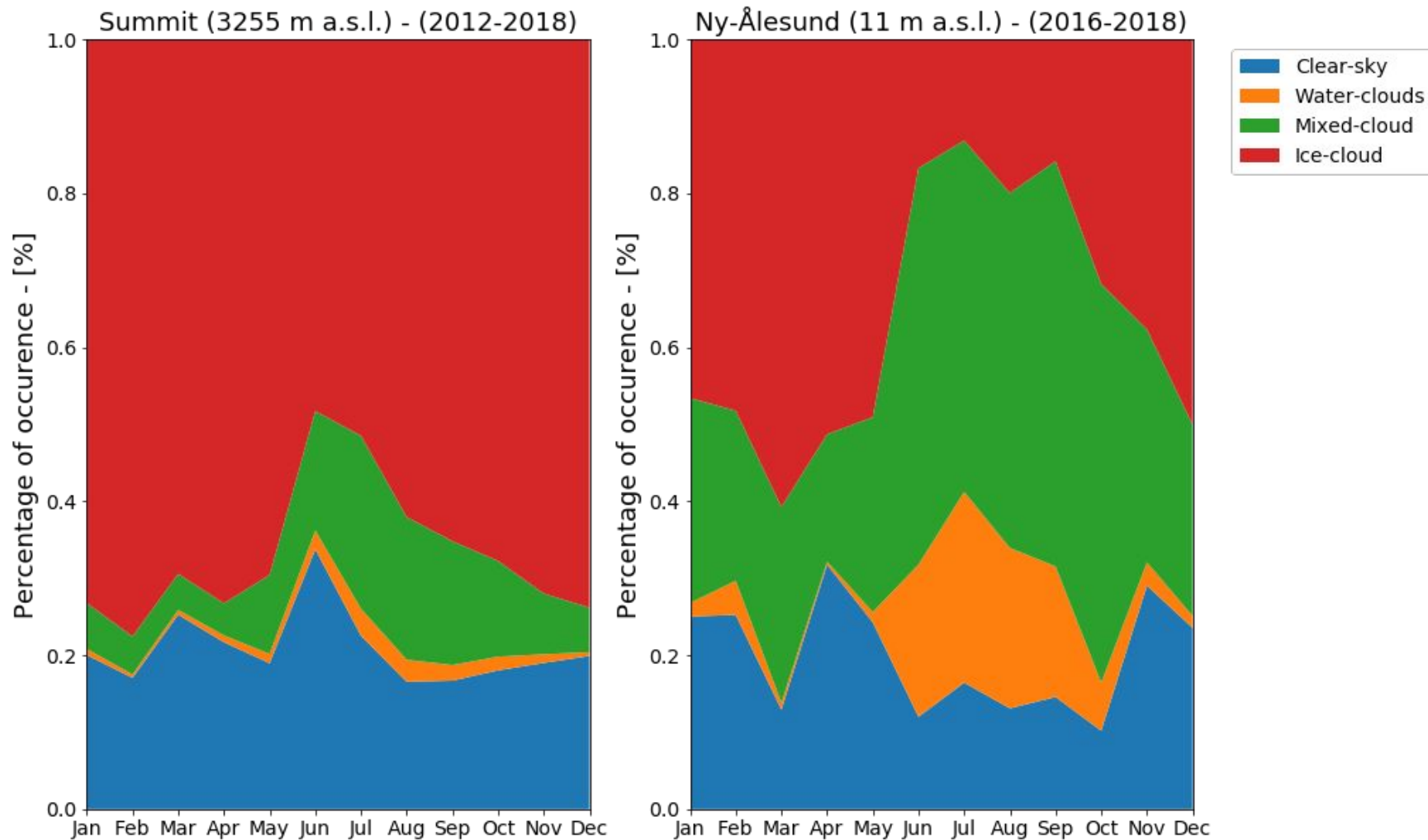
Summit



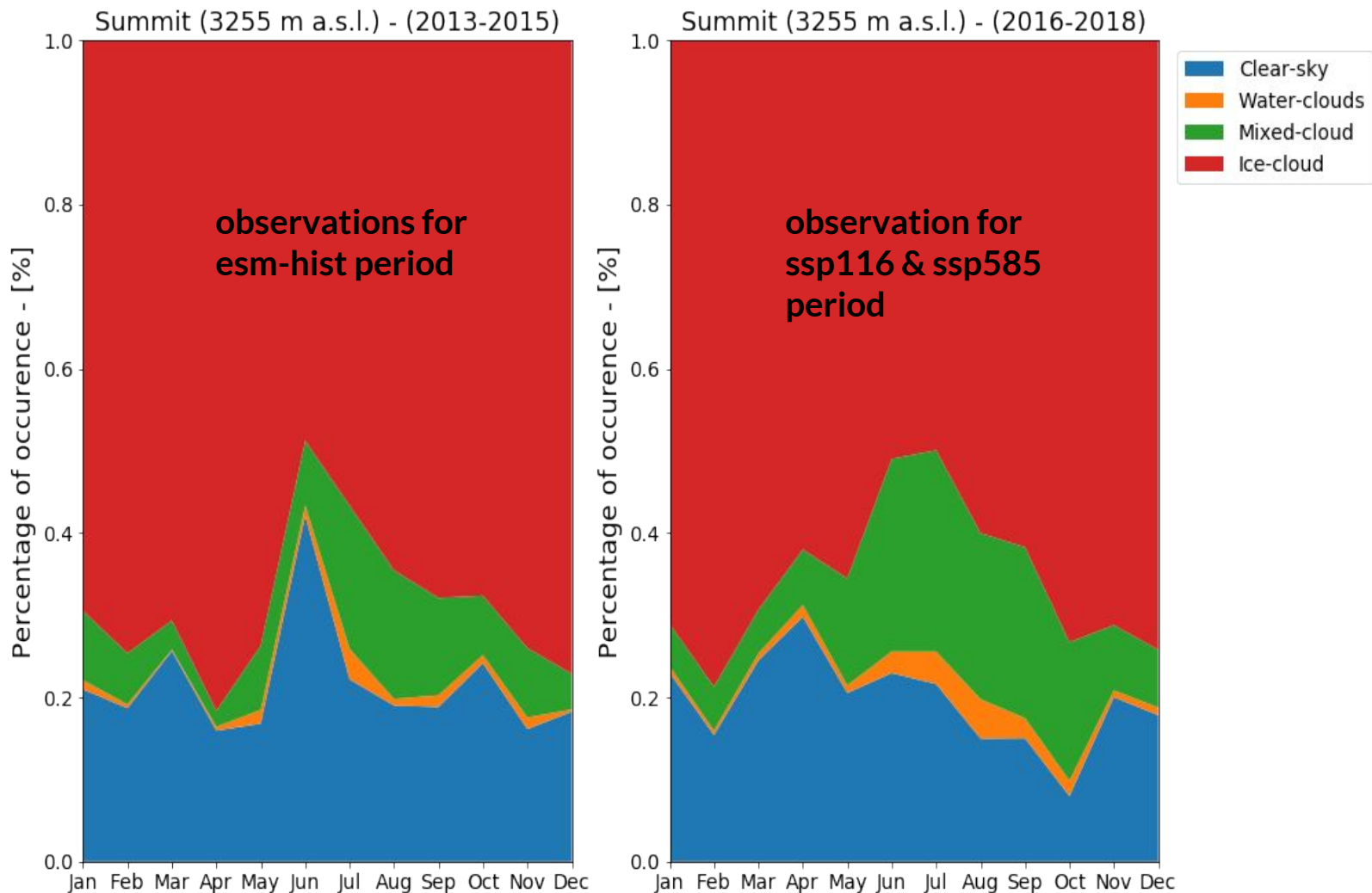
Ny-Ålesund



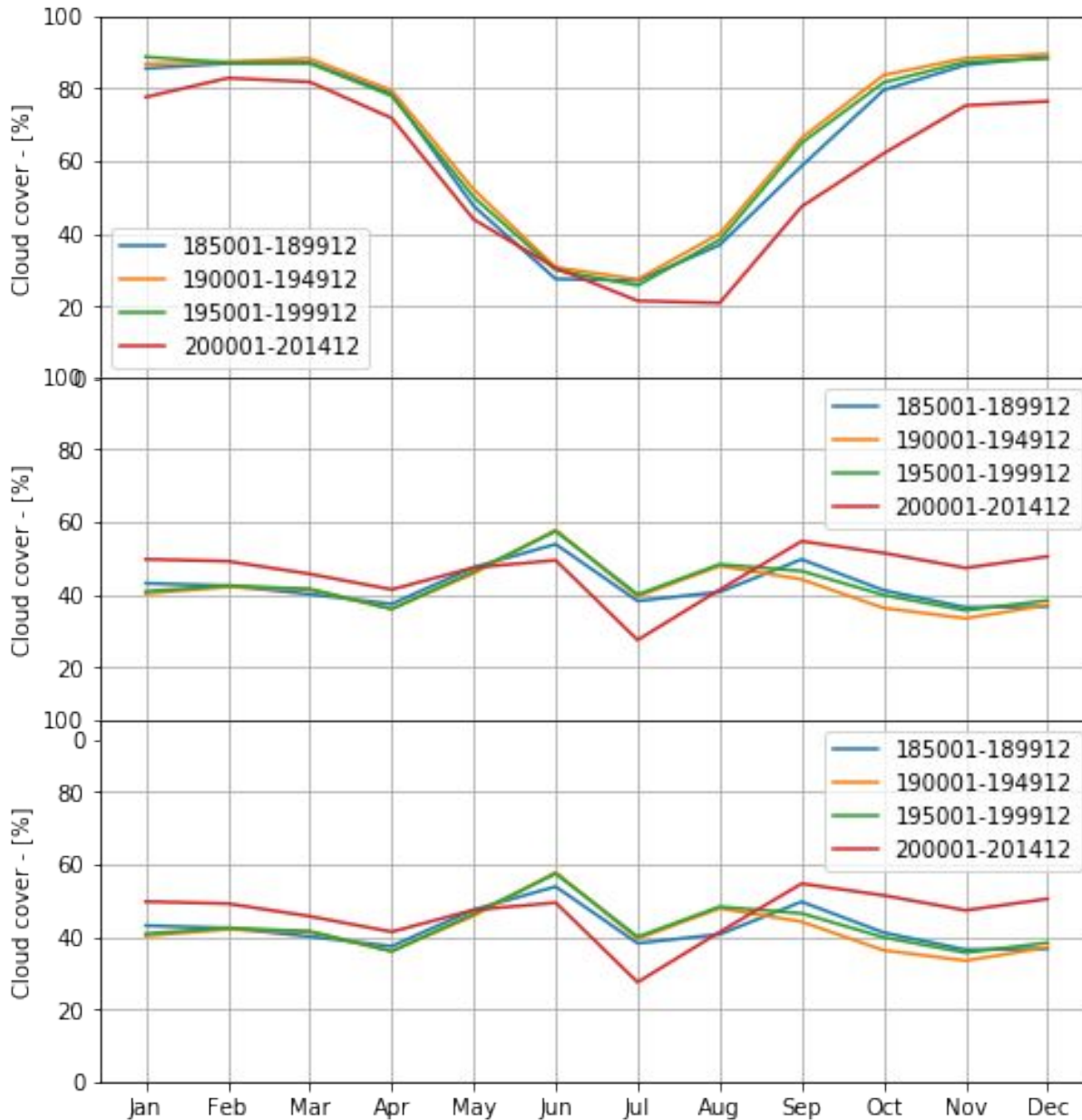
Results: Cloud variation from observations



Results: Summit Observations(!) split in hist and future



Results: Cloud variation from Models



Level 0 (169.5 m a.s.l.)

- Why is there a seasonality?
- Why do we have ~90% cloud-cover in winter

Level 0 - Level 10 mean (169.5 to 1087.5 m a.s.l.)

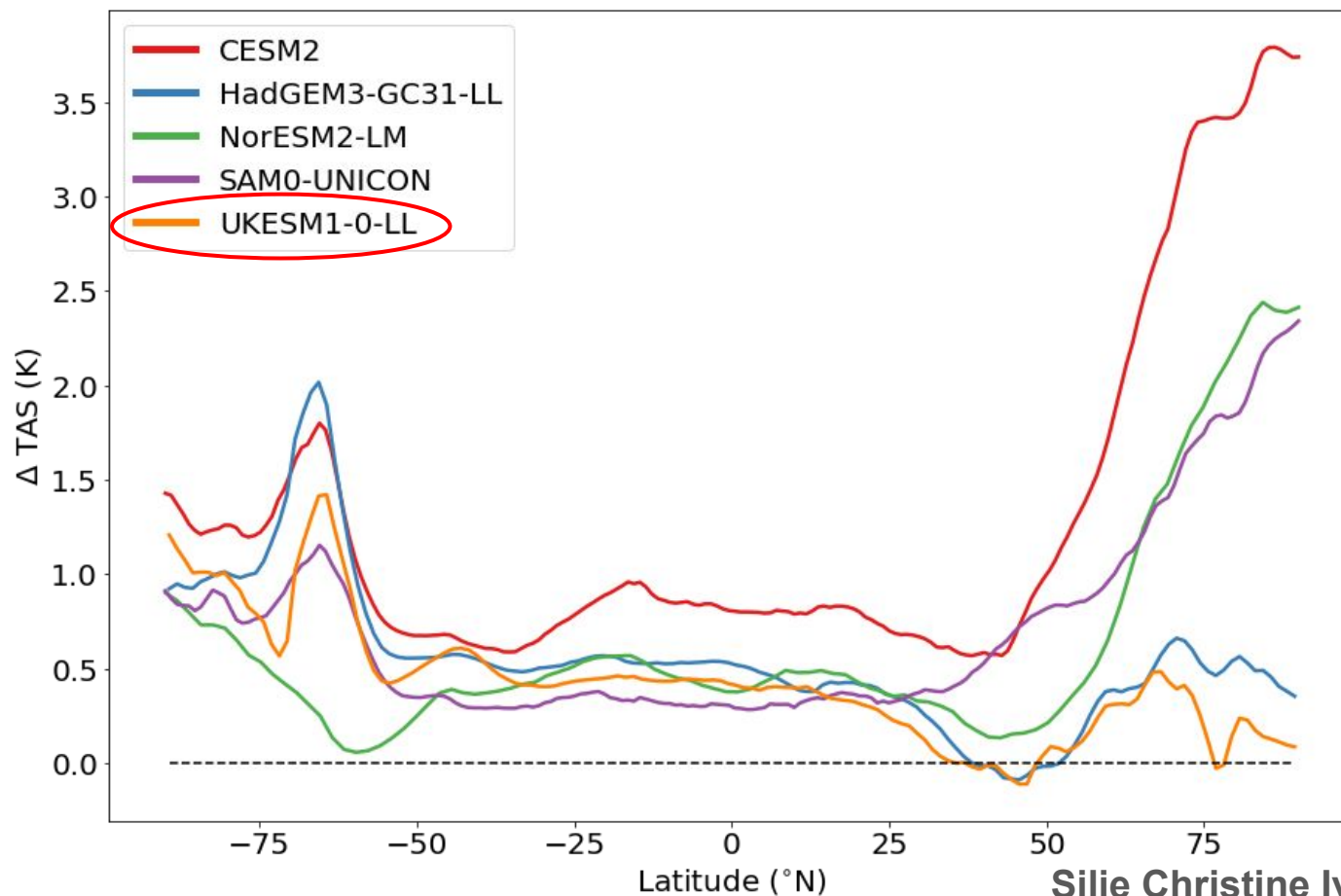
Level 10 (1087.5 m a.s.l.)

- Shape close to 0-10 mean

Results: (To be produced)

- I want to compare the cloud cover and phases for fixed heights (0-1000m, 1000-2000m, etc.)
- Plot and compare seasonality of clouds in models compared to the observations
- Maybe scatter-plot between modelled cloud-cover and observed cloud-cover.

Outlook: Why not the others?



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