



HALO-(AC)³ dry run weather conditions – what did we learn?

(March, 08th – April, 18th 2021)

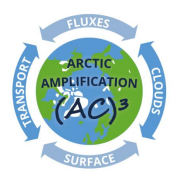
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HALO-SPP Status Colloquium 2021 – 15th September

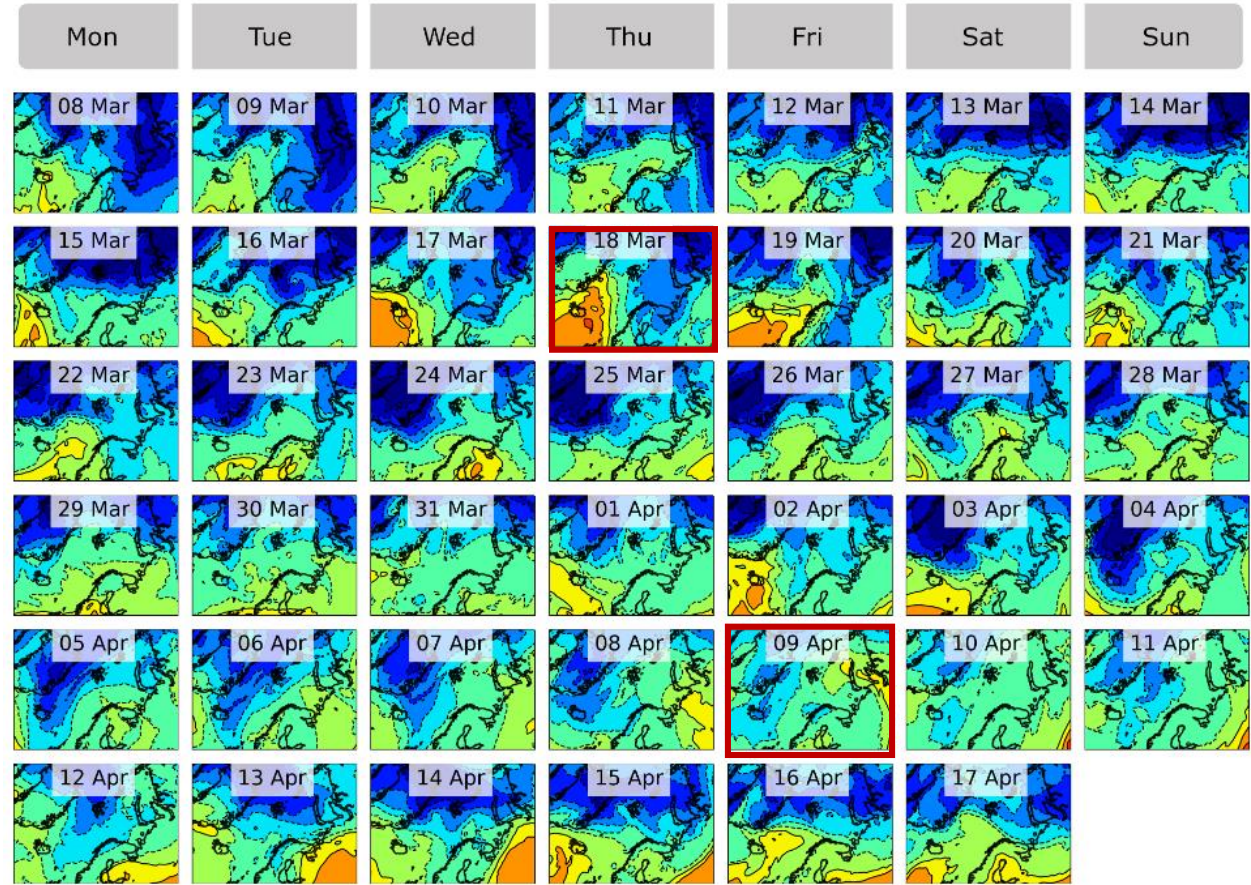


Detection of CAOs and **WAI** during Dry Run

CAO index: $M = \theta_{\text{SKT}} - \theta_{800\text{hPa}}$



CAO index



T850 (°C)



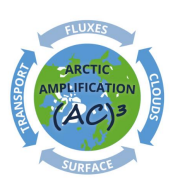
Flight budget sufficient for interesting synoptic situations

- Financial perspective: funding covers 13 to 14 flights of HALO & 12 to 13 flights of Polar 5 and 6 (incl. ferry flights)

	Week 1							Week 2							Week 3						
	08. 03.	09. 03.	10. 03.	11. 03.	12. 03.	13. 03.	14. 03.	15. 03.	16. 03.	17. 03.	18. 03.	19. 03.	20. 03.	21. 03.	22. 03.	23. 03.	24. 03.	25. 03.	26. 03.	27. 03.	28. 03.
CAO																					
WAI																					
Polar 5/6																					

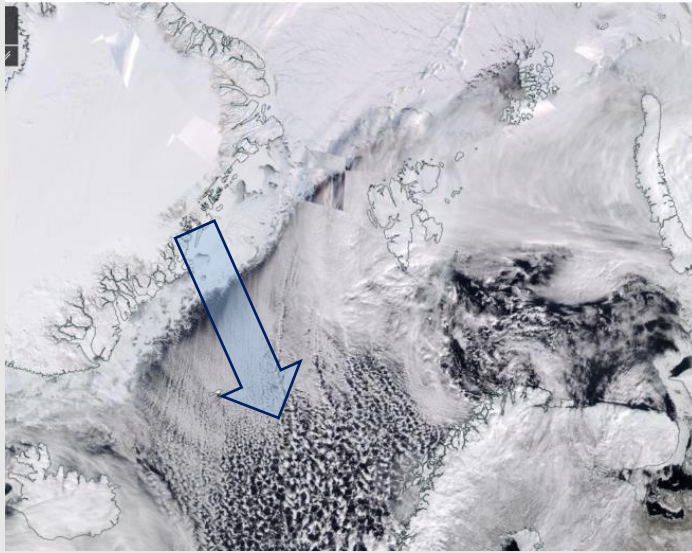
	Week 4							Week 5							Week 6						
	29. 03.	30. 03.	31. 03.	01. 04.	02. 04.	03. 04.	04. 04.	05. 04.	06. 04.	07. 04.	08. 04.	09. 04.	10. 04.	11. 04.	12. 04.	13. 04.	14. 04.	15. 04.	16. 04.	17. 04.	18. 04.
CAO																					
WAI																					
Polar 5/6																					

15 possible days exceed number of possible and funded flights for the aircrafts slightly.



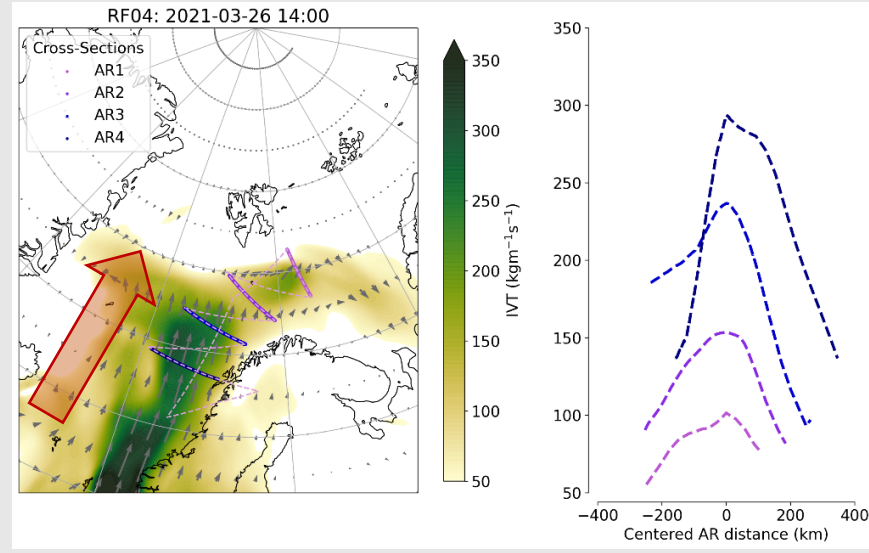
Synoptic phenomena covered

CAO



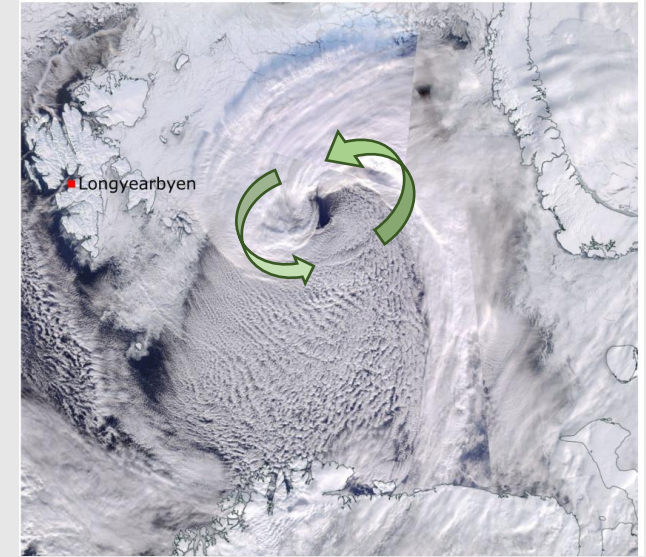
- Frequent CAOs from northerly flow perpendicular to sea ice edge forming typical cloud streets over open sea
- Most intense events close to Svalbard occurred in first two weeks.
- Second pronounced CAO activity starts around the 3rd of April lasting about 2 weeks.

WAI



- Advection along common North Atlantic pathway, but one WAI taking the Siberian pathway was observed in April
- Intensity and Frequency of WAIs were very slight.
→ Only one strong WAI during six weeks

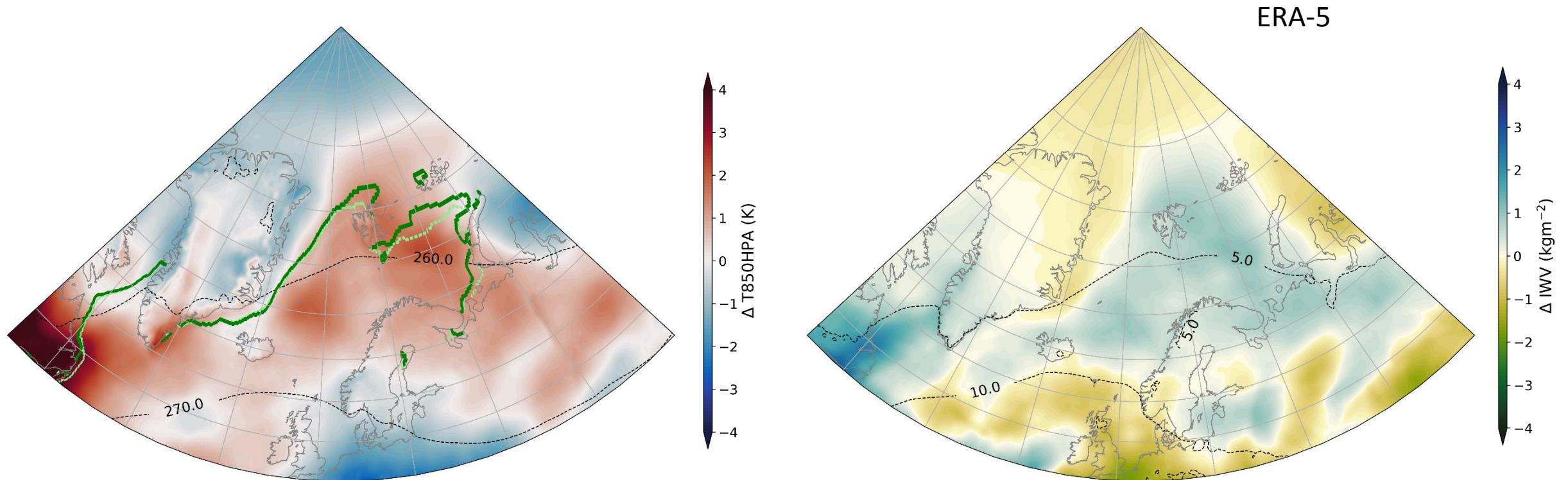
Polar Low



- Cyclogenesis north of polar front
- CAOs destabilize marine boundary layer and cause baroclinic instability.
- Polar lows have scales below 1000 km
- Cirrus shield that formed from the deep convection to the north and east of the center and the relatively cloud-free eye



Dry Run in Climatological Context: Deviation to Long-Term-Mean (ERA5 from 1991-2020)



- Although various CAOs occurred in the region of interest, they were situated in the vicinity of relatively warm and moist air.
- Northward shift of sea-ice edge especially around Svalbard
- Negative anomalies of moisture transport into higher Arctic ($>75^\circ\text{N}$) due to blocking situations and stationary low pressure system above Svalbard.

Conclusions:



Material:

Daily Weather Briefing Slides: https://home.uni-leipzig.de/~ehrlich/HALO_AC3_wiki_doku/doku.php?id=briefings_dryrun

Dry Run Weather Report Manuscript: <https://speicherwolke.uni-leipzig.de/index.php/s/WHH4QXNWjcwHmQZ>

Synoptic Observations during Dry Run Period:

- Synoptic constellation was dominated by persistent high pressure over Greenland favoured frequent CAO events.
- Less pronounced WAIs held back mainly south of Svalbard.

→ 12 days (13 days) stronger (weaker) CAO situations, 1 day (7 days) of stronger (weaker) WAIs

Slight exceedance of interesting days against availability of aircrafts: Flights should be concentrated on strong CAO events and strong WAIs in particular when conditions are not feasible for Polar aircrafts.

- Despite large number of CAOs, region south of the sea ice edge has been warmer and more humid than long-term average.
- As no intense WAI passed through the Fram Strait, negative temperature anomalies are found north of Greenland.

Our detailed dry run flight patterns (24.03-26.03.2021) deliver lots of phenomena to be investigated as proxy for HALO-(AC)³

