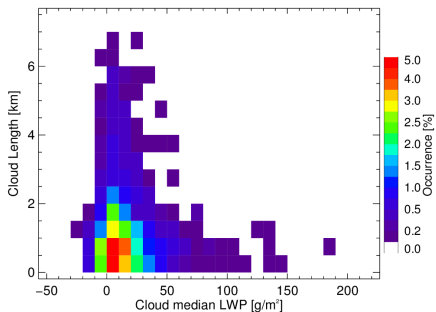Universität
zu Köln

Representing the cloud macroscopic properties observed
during Narval RF02 with DALES: preliminary results

S. Dal Gesso, R. Negger,
S. Schnitt, E. Orlandi, M. Mech, S. Crewell
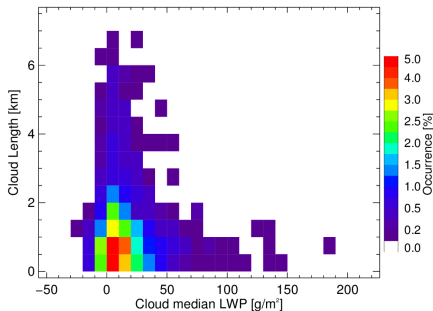
IGMK, University of Cologne

NARVAL II preparation workshop
11 May 2016

Introduction and motivation

Courtesy of S. Schnitt

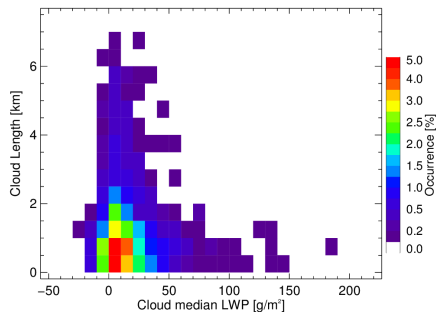# Introduction and motivation

Courtesy of S. Schnitt

Scientific questions

- Can DALES reproduce the mean ABL and cloud structure as measured by the dropsondes?
- Can DALES reproduce the PDF of cloud length and LWP?
- How is the statistics affected by the direction of the flight?
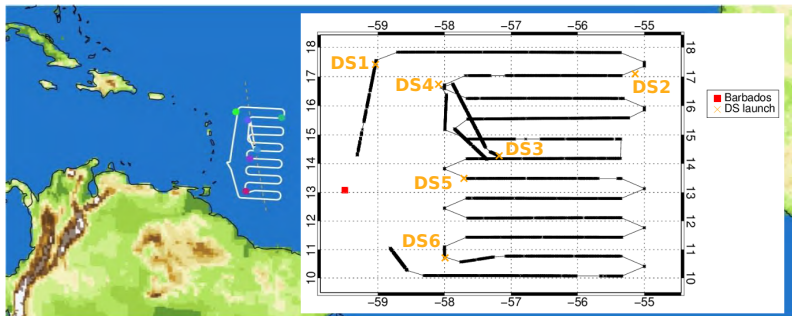
Introduction and motivation

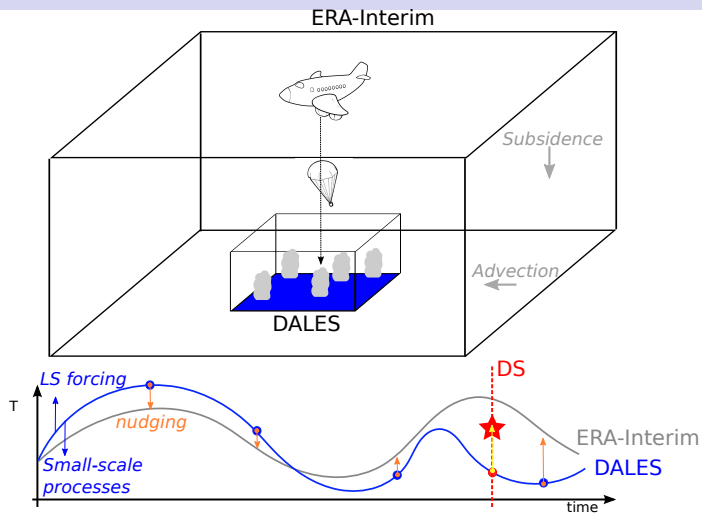
Courtesy of S. Schnitt

Scientific questions

- Can DALES reproduce the mean ABL and cloud structure as measured by the dropsondes?

Over RF02

Over RF02

Courtesy of S. Schnitt

Method

ERA-Interim

Subsidence

Advection

DALES

LS forcing

DS

nudging

Small-scale processes
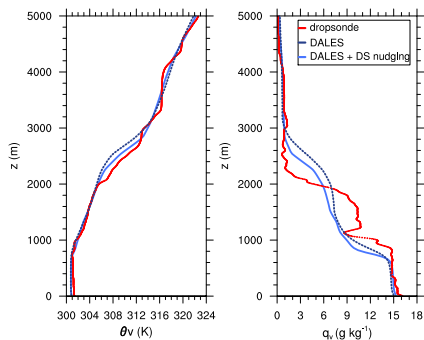
ERA-Interim

DALES

time

T

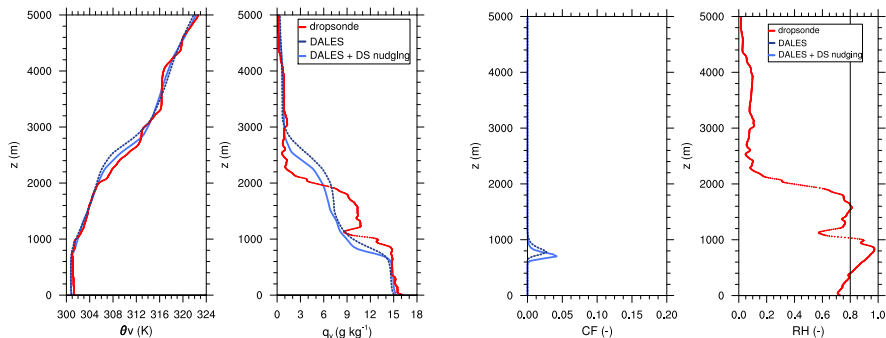Adapted from Neggers et al., 2012

DALES4

5 simulations at the location of the dropsondes, run for 24 hours.

- Horizontal domain size: 12.8 km
- Horizontal resolution: 50 m
- Domain height: 5 km
- Vertical resolution: 40 m
- Nudging towards dropsondes observations: T, q_t, U, V.
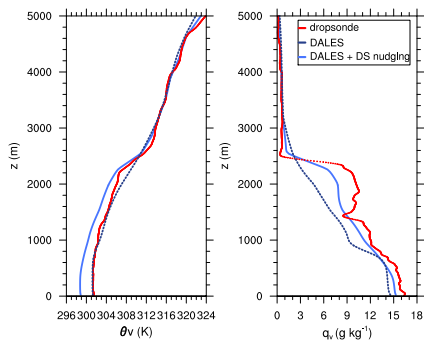
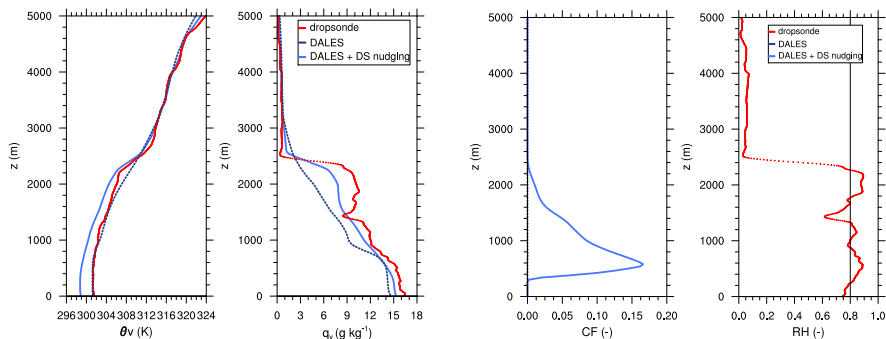# DS1: some improvements in the ABL state

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DS5: systematic cooling of the ABL

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Possible contributors to the temperature bias

1. Evaporative cooling: more humidity $\longrightarrow$ more clouds $\longrightarrow$ more precipitation $\longrightarrow$ cooling due to evaporation of rain.

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1. Evaporative cooling: more humidity $\longrightarrow$ more clouds $\longrightarrow$ more precipitation $\longrightarrow$ cooling due to evaporation of rain.
2. Bias in SST in ERA-Interim: too low SST $\longrightarrow$ too weak SHF and LHF $\longrightarrow$ too cool and dry ABL.
3. Overestimated radiative cooling: presence of high-level clouds $\longrightarrow$ overestimation of the LW radiative cooling at cloud top $\longrightarrow$ extra cooling in the ABL.

Concluding remarks and outlook

Summary

- DALES has been run at the location of the dropsonde launch for RF02 of Narval I;
- Nudging the model towards the observed state improve the representation of the ABL height and the q_v profile, but leads to a temperature bias in the ABL (too cool).

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- DALES has been run at the location of the dropsonde launch for RF02 of Narval I;
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Useful observations

- local SST;
- radiative fluxes above clouds.

Concluding remarks and outlook

Outlook

- implementation of on-line sampling along a random path mimicking the airplane measurements;
- sensitivity studies on the results dependency on the airplane direction;
- sensitivity study on the dependency on the microphysical assumptions.

Thank you!