Review of Macke et al., ACPD, 2016

This paper presents an overview of the HD(CP)^2 experiment and summaries of the associated papers that report on results from the campaign. It provides a useful overview of the available data and model runs that were performed. The paper is suitable for publication provided that a few corrections are made. In places the summaries of the papers do not give enough detail about the work being talked about (see line-by-line comments below). Some suggestions for additions are a table of the model runs performed detailing type of model, resolution, etc. Also, it would be useful to quote the uncertainties of the instruments listed in Table 1. There are a lot of statements along the lines of "xx agrees well with yy", but little quoting of quantitative agreement (e.g. within x %).

Line-by-line comments

Abstract

HOPE-Jülich instrumentation included a radio sounding station, 4 Doppler lidars, 4 Raman lidars (3, 3, and 4 of these provide temperature, water vapor, and particle backscatter data, respectively),

The "3, 3 and 4" part of this sentence doesn't make sense to me since there is only one radio sounding station mentioned.

p.2, L15

The newly developed convection-resolving HD(CP)2 model will be used to develop new convection parameterizations for large-scale eddy simulation models.

The term "large-scale eddy simulation models" could lead to confusion with "large eddy simulation" models, or is this what you mean? Although, in that case might it not also be used to develop parameterizations for coarser resolution models? If you mean lower resolution models then it would be better to describe the types of model that you are talking about in a different way - e.g. mesoscale models, GCMS, or what the resolution range is perhaps. Or maybe this sentence is not even needed here since there is perhaps better explained at the start of p.3.

p.3, L26

(Buehler and Russchenberg, 2016)

Can't find this reference in the references.

p.5, L27

These instruments were complemented by a microwave radiometer which determines temperature and humidity profiles,

Does it also give the cloud liquid water path? This would be worth mentioning if so.

p.5, L29

an X-band rain radar was operated

Since descriptions of what observations the other instruments can give are listed here it would be good to do the same for the X-band radar.

p.7, L7

The follow-up campaign HOPE-Melpitz has become necessary…

Should be "The follow-up campaign HOPE-Melpitz became necessary…"

p.10, L14

for 3 hourly and second-resolution observations, respectively

Please make it clear whether you mean 1-second or 3-second resolution for the latter part of the sentence.

p. 10, L20

"and showed that these increments are more strongly averaged out in space than the transmissivities themselves"

It's not quite clear what you mean by "more strongly averaged out".

p.11, L18

"the integral scales"

It would be useful to refer back to section 3.1 where "integral scales" are explained.

p.11, L3 – "resolution" would be better than "scale" here

p.11, L22 – "A general feature… decreases from the ground towards the top"

This does not seem to be the case for Fig. 5a, only 5b. Can more detail be given about how common this was – e.g. in x % of the periods observed (since only two periods are shown in Fig. 5).

p.12, L3

The inter-comparison shown in Figure 6 presents a sequence and a histogram of the vertical velocities observed with ACTOS (red) and WiLi (blue). Thus, vertical velocities in the stratocumulus are similar at the cloud base (observed with the Doppler lidar) and cloud top (observed with ACTOS).

There is only a histogram (no sequence as mentioned). Also, it would be good to do a statistical test to determine how similar the two distributions are. Also, what are the means values for each distribution?

p.13, L 13-17

Can more detail be given about the type of measurement this is? I.e. is it a profile, or a single surface measurement?

p.14, L3-5 –

How is it known that the large aerosol were emitted in the vicinity of the supersite? Also, how is it known that particle growth was observed rather than large aerosol being advected in? A little more detail of the evidence is required here.

p.15, L4 – "Although the vertical profile of LWC agrees well with the in-situ and the remote-sensing observations, the deviation of the effective radius profile increases towards the cloud top"

It seems that the LWC profile deviates more than the reff at cloud top.

p.15, L5 – **How many profiles go into Fig. 11?**

p.15, L11-12 – **What instruments were used to determine the ice water content and ratios? More detail is needed here, rather than just citing Buhl (2016). Also, what location within the cloud are these values representative of? From the Figure 12 caption it seems they may be vertical averages over thin cloud layers. What criteria is used to determine thin clouds? What is the horizontal averaging period and what is the time period covered by the data?**

p.15, L16-17 – "can be explained with the increasing amount of adiabatically available liquid water with increasing temperature"

This could also be due to the increased concentrations of ice nucleating particles at colder temperatures, which should be mentioned. Can the analytically predicted change in the adiabatic condensation rate explain these large differences?

p.15, L31 – **Fig. 13 only shows data from one day - is it possible to quote statistics from more days, or the whole campaign. Correlation coefficients between the two measurements would be useful.**

p.16, L26-27 – "the model is operating in the so-called "grey zone" where the parameterization of turbulence in the convective ABL may not be necessary"

Will it not be the case that some form of sub-grid turbulence parameterization will always to be necessary even at fairly high resolution? What types of turbulence parameterizations are you talking about here? Also, the term "grey zone" is usually used to refer to the resolutions where convective parameterizations are no longer needed, but that are still too coarse to resolve the important eddies. Maybe this refers to a "grey zone" for the boundary layer parameterizations, or something else? But this needs to be made clear.

p.17, L9 "ratio of cloud fraction by volume and by area"

Not quite sure what is meant here – can you please explain this a bit more?

p.17, L21 "the turbulence characteristics of the ABL were captured satisfactorily"

Can you please give more detail? Captured to within what margin of bias?

p. 17 L24 – **as above – surface fluxes were reproduced to within what range?**

p. 17, L27 – **what was the resolution of the coarser model?**

p. 17, L28-29 – **more detail is needed again – how closely did the turbulence profiles and integrated water vapour match and what timescales do you mean?**

p.18, L12 – **TTRL has not been defined yet.**

p.19, L6 – "ratio of ice to liquid water decreases with decreasing cloud top temperature"

As the temperature got lower (colder) the ratio went up

Figures

Fig. 1

A higher resolution image would be better if possible. Also, the rain radar label is a bit unclear on left panel.

Fig. 2

Dashed lines denote circles of constant distance from supersite JUE

This is repeated in the caption.

Fig. 4

Need to make it clear in the caption what the var(T_D) line is in Fig. 4a. Also explain that the x-axis is the time period (or the inverse of the frequency).

Fig.5

It looks like the line colour labels are the wrong way around for the water vapour and temperature.

Fig. 6

In the caption, please mention LACROS (as in the legend) and WiLi (as in the manuscript text) for clarity.

Also, what are the mean values for the two distributions?

It would also be good to have a statistical test to show how similar the distributions are.

Fig. 11

You should mention that ACTOS is in-situ data in the caption.

Fig. 12

It would be better to plot this with temperature on the y-axis if possible.

Typos

p.4, L19 – "than it was the case for HOPE" - remove "it"
p.9, L5 - "All data will be public available by the end of 2016." – "All data will be publicly available by the end of 2016."
p.11, L28 – move "also" to after "should"
L29 – replace "higher resolved" with "more highly resolved" or "better resolved"
p. 14, L2 – "Figure 9 exemplary" – better as "Figure 9 shows an example of…"
p. 16, L2 – add "are" between "and" and "independent"
p.17, L4 – add comma after "in the past"

p.17, L13 – "general weather patter where"
-> general weather pattern was
p.17, L16 – Schween reference incorrectly all in brackets.
p.17, L19 – "subject of uncertainties" -> subject to uncertainties.
p.18, L13 – "a key information" -> key information
p.18, L21 - "constrain" -> constraint