First of all we would like to thank the reviewers for their comments and suggestions. We considered them as explained below and think that the paper has been improved. See the point-to-point response below:

Reply to Reviewer 1:

This manuscript presents interesting experimental results, measurements performed by Fast CPCs, on detection of elevated ultrafine particle concentrations near the cloud edge regions, mostly right outside the cloud. Based on the data, it is apparent that ultrafine particles are formed near the cloud edge, but the reason seems to be a bit unclear. It is discussed in the manuscript that the reason for NPF may be linked to elevated irradiance, presence of chemical precursor vapors or extent of turbulence or some other thermodynamic phenomena. Here however a conclusion is drawn that elevated irradiance must be causing to the observed new particle formation events (NPF).
To my opinion, it seems that the authors emphasize too much the role of irradiance but understate the role of e.g. turbulence and precursors. If so, the discussion on pages 5-7 should be accompanied with less ambiguous discussion and more straightforward quantitative analysis on irradiance being the main reason, and data to exclude the others. I think in reality the explanation for NPF might be more complicated than the one presented here.

This might be true and we do not think that enhanced irradiance is the only reason for NPF. We think it is a combination of at least turbulent mixing at the cloud edge, reduced condensation sink due to cloud processing, and enhanced irradiance. This combination may provide the precursor gases due to cloud droplet evaporation and following photochemical reactions to start nucleation and growth. More aspects have been considered in the revised manuscript, e.g. it is mentioned that for some cases a relationship between particle number concentration and humidity was found. However, the clear connection between NPF and enhance irradiance has been found for the majority of cases. Thus, the discussion was focused on this relationship.

Detailed questions:
Why is the NPF event observed usually only at one side of the cloud? Is there systematic data available to verify this? Were differences observed between different points of compass when entering/leaving the cloud?

Answer: We never saw NPF at both sides of one cloud. However, NPF was often found between clouds. There was no systematic difference between cases when entering and leaving the cloud, it occurred on both sides. There was also no dependence on orientation or flight direction. We investigated also if there is any dependence on flight direction and following on the direction relative to the wind direction, i.e. if NPF occurs preferentially up- or downwind of the cloud but we did not find any relationship. Other relationships such as the influence of radiation will be discussed below in more detail. In general we concluded that the events were highly variable and thus it is hard to find systematic dependencies.
This is basically written in the manuscript on page 12431, line12-13:
Increased particle concentrations were observed during entering and leaving clouds which rules out the possibility of artificial particle production.

We added in the manuscript: "We did not find any dependence on orientation, flight direction, or upwind versus downwind direction relatively to the cloud."

To my opinion, the data described in the manuscript should be published, but more in the form of an observation, and not as a self-evident consequence of elevated irradiance only. The simplest procedure would be changing slightly the emphasis, and

the title, of the manuscript, not to exclude thermodynamics, turbulence or possible precursors.

We considered also thermodynamic and other parameters during the analysis. Unfortunately, no measurements of precursor gases are available. At first, we looked at the thermodynamic variables and their fluctuations. The relationships between NPF and fluctuations in e.g. temperature and wind speed were highly variable and no clear systematic connection has been found. However, for some cases we found a connection with humidity or water vapor mixing ratio, which is slightly visible in the case shown in Figure 6 (left side). This will be mentioned in the discussion and also conclusions.
One characteristic of trade wind cumuli is that clouds in different stages are present at the same time (Katzwinkel et al, 2014). Some are freshly formed and grow very active, others are 'dying' and dissolving and also rain occurs in parallel. All these cloud have different features in terms of turbulent fluctuations.
In summary, one can say that the relationship between NPF and turbulence was investigated but no clear, general relationship has been found. The connection between NPF and turbulence has been discussed in the conclusions.
We cannot say anything about trace gases but this is probably closely connected to the solar radiation, because photochemical reactions are usually required to initiate new particle formation and growth. In section 4.3 it was also stated that NPF occurs in the entrainment regions which are characterized by increased turbulence, thus, this correlation has been discussed in the manuscript. We added the relation turbulent mixing but leave the title of the manuscript as it is, because enhanced UV irradiance has been found for the majority of cases, thus the title is correct.

After the statement, which was already written in the conclusions 'In our case no measurements of gases are available but the increased UV irradiance at cloud boundaries provides a perfect region for the production of precursors. This could be intensified by turbulent mixing which is typical for the entrainment regions and therefore for cloud edges.' We added:" This was also observed for some cases in this study by high fluctuations of thermodynamic variables in the region where NPF occurs."

For the relationship between NPF and r we added in the description of Figure 6:
"During the NPF, a correlation between N and r is observed."

And for the description of Figure 7:
"Here, the NPF occurs in a region where r is still increased compared to background values."

In the conclusions:
"In this study also a few cases with correlations between NPF and humidity were observed, but for other cases there was no relationship found."

Minor:
The quantity PDF plotted on the y-axis of Fig 9 should be explained.

PDF stands for Probability Density Function which is now written in the figure caption. Furthermore, the figure caption was not correct and has been changed. Now, also the x-axis is also correctly explained there. We hope that the figure is clear now.

Why is the LWC marked in light blue in all the other Figures but in marine blue in Figure 10? Is there an apparent reason for his?

This happened because Figures were created by different programs and there was no special meaning behind. We changed the color in Figure 10 to light blue and hope it is clear now.