

## ***Interactive comment on “Pollution plumes observed during CARIBIC flights in the upper troposphere between South China and the Philippines” by S. C. Lai et al.***

**Anonymous Referee #2**

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The paper reports the concurrent measurement of a range of trace gases and some limited aerosol properties from an in-service aircraft, part of the CARABIC programme. The measurements made by this experiment are highly unusual and they throw up many interesting aspects of atmospheric chemistry that are missed by very limited experiments using research aircraft. The paper is of general interest in that it adds to the inventory of chemical speciation in the upper troposphere in this region. This is in itself very valuable since the sources of pollution in the continent are changing rapidly, and what was observed as a prevalent source or chemical distribution a decade ago may not be so today.

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Overall the paper should be published but there are a number of areas which need clarification before this can happen.

1. The weakness of the analysis presented here is that it is based on a very small number of whole air samples, and their point measurement nature leads to a degree of simplification in the treatment of sources. It is a somewhat semantic point, but I struggled throughout the paper with the author's definition of each of the elevated pollution regions as being in a 'plume'. A plume has very specific meaning (to me at least) indicating a point or highly concentrated source region, being then transported, mixed and diluted. Some of the elevated regions of data shown in the paper assigned as plumes cover very large distances (eg CO is elevated for 30 minutes of flight time in plume 1); one might better refer to these as polluted airmasses 1,2,3 etc rather than plumes. If there could be some sort of clarification on this, even if it is just in definition, it would be helpful.

2. The combination of trajectory data with cloud cover is used to illustrate that convective processes could be responsible for the elevations seen from the aircraft. The approach is excellent and appropriate, but I found it very difficult to see how convincing the data was from the figures.

Figures 3 and 4 show trajectories / clouds for all the flights, but what is really of interest to the reader are the trajectories and associated clouds only for those periods assigned as plumes and where there were whole air samples. I would really like to see these figures reworked so that the reader can trace backwards from the flight track and the whole air sample via trajectory to the cloud. I had to draw on the sample points from Fig 1 on to Figure 3 and 4, and then try to follow the trajectories by hand. This could be a new figure?

3. A summary table which highlighted the basic statistics for all species concentrations in and out of polluted regions would be a valuable addition to the more detailed information given in Table 1.

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4. Page 21898 lines 2-8 were highly confusing and need re-writing.

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