

# ***Interactive comment on “An aircraft gas chromatograph-mass spectrometer System for Organic Fast Identification Analysis (SOFIA): design, performance and a case study of Asian monsoon pollution outflow” by Efstratios Bourtsoukidis et al.***

## **Anonymous Referee #4**

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The manuscript by Bourtsoukidis et al. describes a new in-situ fast GC/MS system. The instrument adds interesting new engineering developments and is a useful addition to the suite of instruments now available for airborne trace organic gas analysis. I agree with the other reviewers comments and don't want to repeat too much here. The most essential improvements would be 1) focus more detail on the optimization and testing done to determine performance; 2) reduce the discussion of the Asian monsoon outflow (a time series of trace gases would be sufficient to demonstrate the

performance in actual flight research mode); and 3) improve the clarity of the figures (the CAD drawings don't really help understand the functional design of components; the flow diagram needs to be clearer).

Beyond these major revisions and those comments of the other reviewers, I had a few other questions/comments:

P3, L29: The inlet needs a complete description. The reference by Wendisch has no detail on the design, testing, and use of the inlet for trace gas analysis. This is a critical part of the system, and as far as I can tell from the flow diagram, calibration and zero additions are done downstream of the inlet. Thus, the testing that was done (or not) to determine inlet effects under ambient type conditions is important for the performance of the overall instrument.

2.1.1. Cal/Zero control. Would be interested to know if the lines with zero/cal gases are flushed continuously. Intermittent sampling of a calibration tank could cause artifacts.

2.2.3 Liquid nitrogen container description might be better discussed prior to section 2.2.2 on Trap temperature control.

2.2.4. This section on pressure control is not really clear at all.

P7 L25. Were different dwell times tested, or was the effect of total dwell time of multiple ions tested? Basically, it would be important to know exactly how these parameters impacted both signal to noise (from dwell time) and precision/accuracy (from measurements across the chromatographic peak).

Other questions:

Ambient water variations: Often inlets demonstrate artifacts when the aircraft crosses from very dry to very moist conditions. I'd be interested to see examples of instrument performance (esp. for OVOC) under alternating conditions of wet and dry air. Calibration method is unclear. Could this be described in more detail, and also describe an actual sequence of sample/zero/sample/calibration/sample etc. that is used during

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research flights.

P9 L 10. Measured variation of CCl<sub>4</sub> is slightly more than 10%, and the bulk of this variation should be from the instrument, not the ambient CCl<sub>4</sub>. A precision of 10% seems high. Is this typical?

Table 1. Could you explain the value of 5% for uncertainty in sample volume? This seems too high given the quality of pressure and temperature measurements.

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