

**Interactive comment on “Atmospheric composition and thermodynamic retrievals from the ARIES airborne FTS system – Part 1: Technical aspects and simulated capability” By S. M. Illingworth et al.**

The paper presented an assessment of the retrieval capability of the ARIES (Airborne Research Interferometer Evaluation System) airborne Fourier transform Spectrometer that is operated on board of UK FAAM aircraft (Facility for Airborne Atmospheric Measurement) using the simulated data and the retrieved components include Temperature, Water Vapour, Ozone, Carbon Monoxide and Methane. The application to this retrieval scheme in real observations is planned to present in a parallel paper. I would recommend publication after some revision.

Structure: Some change in the structure needs to be made. It would be easier to read if putting all the description of Sa, Sy, Xa etc in the section of retrieval method.

The references in the introduction Section is incomplete and up to current. CO<sub>2</sub>, CH<sub>4</sub>, CO and O<sub>3</sub> are standard products in Atmospheric Infrared Sounder, and similar products from IASI are generated in Eumetsat and NOAA. These works should be discussed and cited.

P10843, L7-8: something is wrong and need to rewrite this sentence.

P10844, L8-10: The retrieval method is a straightforward application of Rodgers' Optimal. How to choose the damping Lambda is a very important part, so it would be helpful to give more detail.

P10846, L1-8: It is not quite clear to me the steps for different gases retrievals, including the sequence of the retrieval, and how the variable of temperature, H<sub>2</sub>O, T<sub>s</sub> are retrieved together with different gases (which are in different steps). This paragraph needs to revise.

P10851, L12: To test a retrieval system, the simulations should be made in assemble of profiles, then we can evaluate whether the algorithm works in different atmospheric conditions. Here two profiles were chosen. Maybe I missed something, and I do not quite clear whether this algorithm was tested in enough simulated cases.

P10852, L14-22: it is better to move it to Section 4.