

## Author's response

We truly appreciate the editor and reviewers for their helpful comments. Below are our responses (red) to their comments.

1) The technical issues identified by Reviewer #3;

- Figures throughout still use XCH<sub>4</sub> throughout instead of  $\Delta$ XCH<sub>4</sub> as written in the text/captions  
XCH<sub>4</sub> has been corrected as  $\Delta$ XCH<sub>4</sub> in all figure titles.
- There is still an instance of XAOD on L201  
XAOD has been corrected as AOD throughout the text.
- L281 and thereafter,  $\Delta$ Xalb is sometimes used in addition to Xalb - it is unclear to me if this is intentional and if so what the definition is  
 $\Delta$ Xalb has been corrected as Xalb throughout the text.

2) The depiction of the Inverse model (LFM) in Figure 4 appears to be misleading, as the term "inverse model" typically refers to a model or process utilized to address minimization (retrieval) issues. In this context, it is my understanding that LFM serves as a forward model used to simulate the radiances necessary for the minimization process.

Thank you for the thoughtful comment. To avoid confusion, we removed LFM from Figure 4.