

Interactive comment on “Instrument concept of the imaging Fourier transform spectrometer GLORIA” by F. Friedl-Vallon et al.

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We thank the reviewer for her/his positive recommendation and the constructive review. We will address her/his suggestions (marked by blue writing) point by point.

The paper title refers to the instrument concept which is well described in the text, however I would have expected some more information with figures about measurements acquired directly by the instrument itself (L1 products), such as spectra or the off-axis pixel effect on ILS and noise. Instead most figures are about elaborated results, only the last Figure 10 is devoted to plot a quantity directly measured by the instrument. I would add at least some figure with spectra and a short discussion on how off-axis pixel are managed in the analysis.

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We will add figures with spectra and will discuss ILS issues in more depth. ILS has been studied in detailed instrument simulations with a ray-tracing program and subsequent numerical ILS calculations. The applicability of these calculations to the real instrument has been proven by lab measurements. The modeled ILS will be used in future for the L2 retrieval of CM and DM data. The current preliminary L2 data set has been produced without the use of the ILS model for practical implementation problems. We would like to discuss details of the noise performance in a dedicated technical paper since this will go beyond the scope of this overview paper.

The description in Sect. 2 about the choice of instrument requirements based on scientific issues is generally made with reference to other papers. This is complex to follow. I would try to improve clarity giving a short description, in the cases where it is missing, of the scientific question driving a specific requirement. For ex. at page 2305 line 22 the "scientific interest" should be described with some words for improving information and the clarity of the sentence without requiring to read the cited reference.

We have tried to address this request by adding a brief summary of the scientific questions at the beginning of the section and by a partial rewording of the first paragraph of section 2 (please see below). Reviewer 1 also had some comments to this section which we hope to address with this change, too:

A brief summary of the scientific aims at the beginning of the section shall outline the background for the discussion of the instrument requirements. A detailed discussion of the scientific aims and references can be found in Riese (2014). The scientific aims comprise of improved understanding of the in-mixing of moist air into the lowermost stratosphere by quasi-horizontal transport, of convective overshooting and of troposphere-stratosphere exchange e.g. by tropopause faults. Furthermore, long-range transport of pollutants, its influence on the ozone budget of the UTLS, and potential pathways from the troposphere into the middle atmosphere shall be investigated. This involves a complex chemistry of many species with life-times of a few weeks. Finally, we are interested in the dynamical forcing for instance by gravity

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waves and in dynamical structures such as the tropopause inversion layer and its formation. Depending on the focus of an individual science target we are interested in temperatures and a varying number of trace species as well as in cloud properties. In particular for stratosphere-troposphere exchange, pollutants, and for gravity waves it is of advantage to measure as far as possible down into the free troposphere. Filaments in the UTLS, while wide-stretched in one horizontal direction, typically only extend on the order of 100 km in the other horizontal direction and a few hundred meters vertically (citations). To be able to respond to all these scientific questions, GLORIA was designed for two distinct measurement modes: the first one, called chemistry mode (CM), focuses on high spectral resolution and thus maximises the number of retrieved trace species with sufficient spatial sampling for the aforementioned structures. The second one, called dynamics mode (DM), has lower spectral resolution but provides further increased horizontal resolution and the ability for three dimensional sounding for a limited number of species. The geometric and spectral requirements of the two modes are summarised in Tables x and y. In order to improve the long term benefit of GLORIA, instruments requirements include the ability to choose other compromises between spectral and spatial resolution and the ability for nadir viewing.

All technical corrections will be made as suggested.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 2301, 2014.