

Interactive comment on “Continuous measurements of methane mixing ratios from ice cores” by C. Stowasser et al.

P. Werle (Editor)

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The authors mention that a few questions of the reviewers remain unanswered. I picked the two important issues below, which I believe need further consideration: 1. Instrument Operation (Zero Check/Calibration Interval and Stability) 2. Missing Manufacturer Information (What is the software doing?)

Atmospheric Monitoring Techniques requires instrumentation and operating procedures to be completely described and open questions, incomplete procedures and unsolved issues at least to be clearly mentioned as well. Therefore, in order to publish the manuscript, the above two issues need to be discussed more in detail (even though the author comments are in general ok.

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1. The missing zero checks and investigation of the calibration interval the first critical issue cannot be cured now after the campaign is over. This is still a weak part of the paper. To cope with that and in order to strengthen the paper, I recommend mentioning in the summary and conclusions that both zero measurements and determination of appropriate calibration intervals are a prerequisite for quality assured measurements. Even if this has not been done in this paper, it is a valuable advice for any reader of AMT planning similar measurements. The importance of "Signal processing and calibration procedures for in-situ diode-laser absorption spectroscopy" is summarized in the review paper P. Werle et al., *Spectrochimica Acta A* 60, 1685-1705 (2004), which you may add with your discussion in the summary and conclusions. In this paper the reader will then find a detailed explanation of the importance of zero and span calibration and errors introduced by signal processing. Even if the discussion is based on direct/modulation spectroscopy the underlying principles are the same for cavity ring down systems. In the above review paper it is also shown how (d) Fluctuations in the laser current translate into frequency jitter leading to "drop outs", but (e) with active jitter suppression an increase in signal stability can be obtained (Fig. 1). Probably similar effects may lead to the drop outs that you observed and it may be worth to discuss this issue with the manufacturer in the context below.

2. The missing manufacturer information could and should still be added. The principles of cavity ring down spectroscopy are well known and it is obvious that in any measurement system noise is encountered in the amplitude and phase of the signals involved in the detection process. While any insider knows about this, it is important for the reader to know where, for what purpose and how signals are 'damped' in order to understand what is going on during data processing. Researchers from Piccaro are involved in the measurements and, therefore, it should be no problem to provide this information. This information in turn might help to understand where the frequency dependence in the transfer function (a significant part of the manuscript deals with that) or the 'drop outs' in the time series data come from. The mentioned 'fitting problem' might be an explanation, but probably no reader can understand this as you write "After

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the field campaign it turned out that the pressure reading of the WS-CRDS had a bias of several mbar. Thus, the custom designed spectral fit did not match the operating pressure. This caused outliers in the CH₄ mixing ratio measurements as shown in Fig.3a (green line).” Therefore, information should be given how the fitting is performed so that a constant pressure bias can cause “drop outs”.

After consideration of the above listed issues, the manuscript can be published in AMT.

My best regards

Peter Werle Associate Editor AMT

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 211, 2012.

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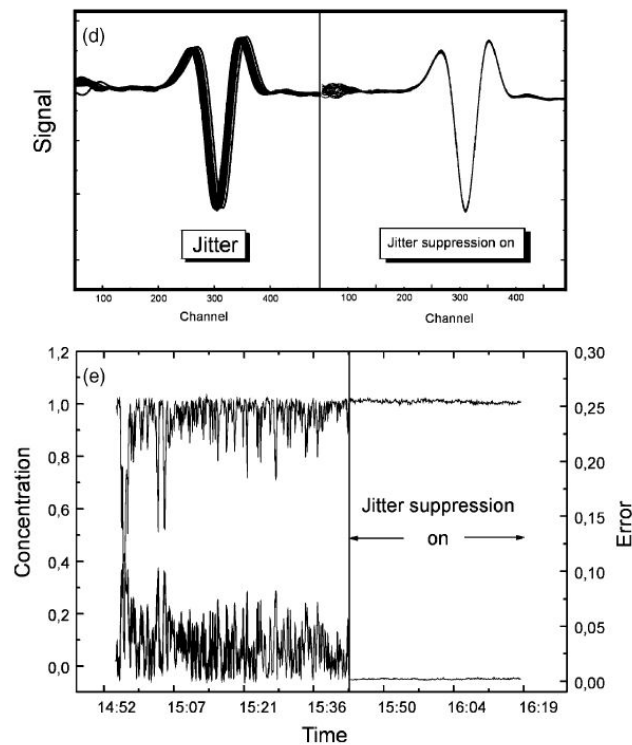


Fig. 1. An example for "drop outs" caused by frequency jitter

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