1. The authors have published several articles addressing very similiar questions. The differences between this article and their previous or current work should be made mor clear.

There are several aspects of the paper which have not been addressed in previous publications. We will make them clear in the introduction and/or the conclusion of the revised manuscript:

(1) The application of lower resolution spectra documents the general validity of our developments in the field of ground-based infrared H2O profile remote sensing:
Ground-based water vapour retrievals are very challenging and there has been a lot of progress during the last years: log-scale retrieval, simultaneous temperature retrieval, speed-dependent Voigt line shape. These developments have been based on analyzing the high resolution spectra measured within NDACC. It is very satisfactory that these developments lead also to good "profiles" when applying the lower resolution spectra of TCCON. It is a nice confirmation of the general validity of these developments.

(2) Extension of ground-based FTIR H2O remote sensing data set:
There are about 25 NDACC FTIR systems and 15 TCCON FTIR systems. The number of TCCON experiments is still growing and producing H2O from TCCON spectra significantly increases the ground-based FTIR H2O remote sensing data set. Both NDACC and TCCON follow a long-term strategy and are a valuable complement to the humidity radiosonde data set in particular concerning climate research.

(3) Free tropospheric H2O data with a unique high measurement frequency:
To our knowledge only TCCON can produce a value of middle/upper tropospheric humidity every 2-3 minutes. This might help to improve the parameterization of atmospheric small scale processes and allow an estimation of temporal coincidence criteria required for inter-comparison studies.

(4) Retrieving H2O "profiles" from TCCON spectra decreases the risk of interferences of H2O with the prime TCCON target gases CO2, CH4, N2O, etc:
TCCON aims primarily on very high precision measurements of CO2, CH4, and N2O column abundances. The spectroscopic signatures of these absorbers often interfere with water vapour signatures. The high variability of water vapour might thus be a significant error source for the retrieved columns abundances of CO2, CH4, and N2O. Using the H2O "profiles" retrieved from the TCCON spectra when evaluating the CO2, CH4, and N2O TCCON signatures will significantly reduce this "interference error".

(5) Demonstration of the possibility to derive "profiles" from TCCON spectra:
We demonstrate that the TCCON spectra contain information about the vertical distribution of tropospheric trace gases. The tropospheric profiles of CH4, N2O, or CO vary significantly. In order to achieve CH4, N2O, or CO column abundances of very high quality it is important to apply profile retrievals. So far the applied standard TCCON retrieval algorithm only scales a prescribed climatologic profile, which introduces an error that can be avoided by profile retrievals. In this context our paper is a first demonstration of the feasibility of a TCCON profile retrieval algorithm. It is good to demonstrate this feasibility taking H2O as an example since only H2O profiles can be extensively validated taking radiosonde humidity data as a reference. TCCON trace gas profiles of CH4, N2O, or CO can not be validated at such extent since there are no respective reference profiles available on a regular basis.

2. The method provides 2-3 more or less independent data points for the whole troposphere. I have a hard time calling this a "profile".

Yes, compared to in-situ measurements 2 independent data points is very modest. With TCCON measurements we can distinguish lower from middle/upper tropospheric water vapour. Retrieving more details is not possible.

3. All FTS measurements have a strong sunny-weather bias. This is not discussed at all even so it is obvious that this might have a huge influence on the interpretation of all tropospheric humidity measurements.

Yes, this is absolutely correct. We examined the clear sky dry bias of ground-based FTIR H2O data in our Schneider et al. 2010a paper. It is about 10-20%.

4. The usefulness of this method and the application at other TCCON sites may strongly depend on station altitude, typical tropospheric humidity and tropopause height. I miss a discussion on how site-dependent the whole approach is.

In Schneider and Hase 2009 in Fig. 1 we show averaging kernels for two very distinct sites: a sub-polar low altitude site and a sub-tropical high altitude site. For both sites we find a good sensitivity up to an altitude of about 7-9 km above the altitude of the FTIR instrument.

5. The retrieval method employed by the authors requires certain statistical parameters for the setup of a priori profiles and covariance matrices. Unfortunately, the authors do not explain how these important constituents of their retrieval were derived.

We calculate the climatologic mean profile and the climatologic covariance from Vaisala RS92 radiosonde measurements performed on Tenerife between 2005 and 2009 (the radiosondes are launched twice daily).

6. It is certainly interesting and encouraging that such retreivals could also be done within TCCON. However, especially in the conclusions the authors greatly overstate the potential applications of their method.

Admittedly the conclusion section was written with some haste and the term “unprecedented” in the last of the listed items might be exaggerating. We will critically reflect about eventual further overstatements. However, we also think that there are some misunderstandings, which we would like to clear by responding to the referee’s comments (a)-(c).

(a) Assimilation:
It was not meant that the TCCON data should be assimilated! The idea was to use the TCCON data for a characterization of the small scale variability and thus of the uncertainty that has to be considered when assimilating data that represent larger scales (for instance upper tropospheric humidity from geostationary sensors).

(b) Variability of tropospheric water vapour and inter-comparison studies:
Tropospheric water vapour variability is very high and the frequency of radiosonde measurements of typically 12h is not suited to estimate a temporal coincidence criterion for satellite validation purposes. For such estimation we need to perform measurements during several hours and with a frequency of a few minutes. To our knowledge only the TCCON measurements can provide a free tropospheric H2O value every few minutes.

(c) Free tropospheric humidity and climate:
Feedback uncertainties in climate models are large whereby free tropospheric humidity is a key parameter. Predicting the correct regional changes of relative humidity is crucial for a correct prediction of the water vapour radiative feedback and of cloud feedbacks (relative humidity strongly impacts on the formation of clouds; Sherwood et al., 2010). Cloud feedbacks are currently the largest uncertainty in climate models (IPCC, 2007). Therefore the credibility of simulated climate change depends on the ability of atmospheric models to correctly simulate the processes that control free tropospheric humidity. The high TCCON measurement frequency could improve the parameterization of small scale processes and its representation in the models.
Reference: Sherwood et al. (2010), J. Geophys. Res.: doi:10.1029/2009JD012,585.

In the revised manuscript the five items listed as response to comment #1 of the referee will also be considered for the conclusion.