We thank referee #1 for the comments (in blue).

- The presented time series is pretty short even if a detailed analysis of the data is not part of this paper. The authors should consider extending the time series in Fig. 6 to up-to-date data (if the instrument is still running). No information is given on the length of the available data set. Aren't 6 months too short to determine a seasonal cycle?
Reply: We extended the data set to include more recent data. Because Russian authorities have to approve each new data set first, it is available for us with delays of up to 5 months. Now the length of the data set covers nearly a whole year. Figure 6 (now Figure 8) is updated and all numerical results that are affected are updated in the manuscript (annual amplitude changed to 30.4 ppm CO_2).
We also added a more recent water test in Figure 3 c and d, which confirms previous findings (section 3.4).

- The manuscript is too detailed in some respects. The description of the meteorological measurements is not at all required here. Section 2.8 could be remarkably shortened; the corresponding Table 3 and Figure 5 are not necessarily needed. The description could be part of an overview paper of the tall tower special issue (if there is any) or a separate publication on the ZOTTO tower in general. Table 1 is also very detailed and provides plenty of information that is of minor interest when only considering the CRDS measurements (but could be kept anyway). There are already some papers published dealing with measurements at the ZOTTO tower. Is all this information so far unpublished? If the authors decide to keep all this additional information I suggest to change the title of the paper to something like 'Zotino Tall Tower Observatory (ZOTTO) in Central Siberia: site description and first continuous low-maintenance CO2/CH4/H2O measurements'. If so, a photo of the tower and the surroundings could be maybe added.
Reply: We can follow the concern about too many details in Section 2.8 (Meteorological measurement). As this albeit technical but relevant information is not published elsewhere, we would like to keep it in the paper. We suggest shifting the detailed description (including former Table 3 and Figure 5) to a supplement to which we refer to in a substantially shortened version of section 2.8 that now reads as follows:
"*Various meteorological instruments have been installed at ZOTTO in the year 2007. They record meteorological variables (3 dimensional wind, temperature, humidity, radiation) in a vertical profile on the tower as well as a number of soil parameters in vertical and horizontal profiles at two ground locations. A detailed description is given in Supplement 1 of this paper.*"

We would like however to keep Table 1 and according details to allow a full comprehension of the system, which has not been described in previous publications as the former system was replaced by this new integration.

- It would be nice to add an additional plot illustrating the performance of the instrument besides the ambient air time series. This could be a time series of the target gas measurements and/or the calibrations to get a feeling of the variability of the instrument performance. The comparison of the continuous measurements and the flask samples could be also shown.
Reply: We added the target tank time series to illustrate underlying homogeneous performance that lead to the mentioned mean and standard variation of the time series. New data for flask comparisons are available now and are shown in the revised version. We added a further paragraph in the paper to describe the comparison procedure (see later comment).

Specific comments:

Page 1400, lines 1-2: skip first sentence: I do not see that this statement is a main outcome of the paper. The authors refer to a couple of previous publications in Section 1.1 to underline this statement. Merge the necessary information (station name, coordinates) into the second sentence.

Reply: We change to a new sentence structure:

"*To monitor the continental carbon cycle, a fully automated low maintenance measurement system is installed at the Zotino Tall Tower Observatory in Central Siberia (ZOTTO, 60°48' N, 89°21' E) since April 2009. A cavity ring-down spectroscopy (CRDS) analyzer measures continuously carbon dioxide (CO_2) and methane (CH_4)* from six heights up to 301m a.g.l."

Abstract: information on the length of the data set is missing.

Reply: The length of the data set is mentioned now in the abstract (last sentence) and in section 4.1 (2nd sentence).

Abstract, lines 16-18: I don't like the idea to speak about seasonal cycle amplitudes when there are only 6 months of data available even if the data cover a complete vegetation period. The authors should clearly mention that the data set isn't covering a whole year. The information is missing that the 26.4ppm refer to CO2.

Reply: Point taken. Now, the data that are used for this analysis cover nearly one year. See also our reply to the first comment. The "CO_2" label is added to the numerical value.

Page 1401, lines 27-28: I do not agree with this statement. There are many atmospheric measurements sites in polluted environments, e.g. for monitoring air quality limit violations. Add maybe 'for background composition observations' after 'atmospheric measurement sites'.

Reply: We changed "In the past, atmospheric measurement sites were mainly situated on remote coastal or mountain stations to suppress local disturbances for inverse model estimates of carbon sources and sinks."

to: "S*ites for measuring atmospheric background signals* are mainly situated on remote coastal or mountain stations to suppress local disturbances for inverse model estimates of carbon sources and sinks."

Page 1403, lines 12-16: sentence sounds awkward. Rewrite it. 'reduced' has to be read 'enhanced'? Split sentence into 2.

Reply: We rephrased the sentence to: "*It shows the near field of the tower having the main influence on measured mixing ratios (up to 10 ppm/(µmol/(m²s))). The area with a surface influence above 0.1 ppm/(µmol/(m²s)) covers about 1 000 000 km² of Central Siberia, …*"

Page 1404, line 12: 'mushroom-shaped inlet'. Is that a standard term? I have never heard of it. However, I can imagine how it might look like.

Reply: Indeed, mushroom-shaped inlet is not a standard term, but we are not aware of a better description of the form. For better imagination we additionally provided a small illustrational scheme of the inlets in Fig. 2.

Page 1406, lines 5-7: how do you know that the maintenance on an annual basis is sufficient when the instrument ran so far only for 6 month?

Reply: We changed the sentence to "We *expect the remaining maintenance efforts* to concentrate on regular annual pump maintenance, …"

We did not want to state our system to be fail-proof, but the sentence should contrast ZOTTO to other systems, where many more scheduled efforts are needed for undisturbed operation.

Page 1406, lines 26-27: drifts: what does that mean? Is that a drift in the standards or a drift in the sensitivity of the Picarro? Please clarify.
Reply: For clarity we changed to: “Raw data from repeated measurements of calibration gas tanks reveal *a long term drift of the analyzer* of less than 0.25 ppm, and 3.2 ppb per year for CO_2 and CH_4, respectively *(similar to [Crosson, 2008])*.”
Strictly speaking, we cannot differentiate between raw data drift of the analyzer and the drift in a calibration tank. Nevertheless experience makes us expecting the meaningful contribution from the analyzer [Crosson, 2008]. Because the observed drift almost linearly depends on the concentration of the standard gas tanks, the random drifts from the standards can be almost excluded. Typical drifts of standard are supposed to be less than 0.045 ppm/year [Kitzis et al., 1999].

Page 1407, lines 25-27: please specify the duration of a calibration. A back-of-the-envelope calculation told me that you roughly need 2l per calibration, right?
Reply: The duration of one calibration is described in section 2.6. One calibration takes 8 min for each tank, thus 150 sccm x 8 min = 1.2 l gas per calibration.

Page 1409, equation 2: equation is not needed, skip it.
Reply: We think equation 2 is useful for the reader, because the following results of the second order fit can be related to this linear approach.

Page 24-27: If I understand correctly, the water trap can equilibrate to ambient pressure through the outlet at the top. That means that changing the downstream pressure of your flushing gas changes the flow (and not the pressure) of your gas through the trap and the gas has simply less time to take up water at higher flow rates, right?
Reply: No, only the vapor pressure of the water stays constant (the partial pressure of the water vapor) with constant temperature. The absolute pressure inside the trap is regulated by the incoming gas, thus it is not stable. With the changing absolute pressure and constant partial pressure of the water vapor, the relative amount of water vapor finally changes.

For better understanding, we modified line 21-27 on page 1409 in the discussion paper: “The humidified air leaves the trap through an outlet at its top *towards the analyzer with the same pressure as it left the pressure regulator at the high pressure tank*. Because temperature changes of the trap to achieve different dew points resulted in unstable conditions, the trap was held at constant temperature within an ice bath, whereas the pressure of the flushing gas was changed: with decreasing absolute pressure, the relative amount of water vapor increases, even though the *partial* water vapor *pressure* stays the same at constant temperature.”

Regarding the second point, the reviewer is right. The flow rate inside the water trap changes with pressure. Hence, it affects the humidification efficiency. The effect is further amplified.

Page 1411, lines 12-17: this was done in the laboratory in Jena?
Reply: The experiment was done at LSCE in Gif-sur-Yvette, France. We add this to the text.

Page 1412, lines 22-23: ‘For each tower level six data points are recorded within 3 min.’ Why not simply: ‘Each tower level is sampled for 3 min.’ The 30sec averaging is already mentioned above.
Reply: Point taken. The text was changed accordingly.

Page 1413, lines 2-7: move to Section 2.3
Reply: Even though it generally fits to Section 2.3, we would like to leave it in the “Data acquisition” Section 2.6. There it is more important to follow the steps of the R programming.

Page 1413, line 6-7: Are the results of the individual neighbouring calibrations significantly different that a linear interpolation is required to be applied? How much does the instrument drift? It would be interesting to see some of the calibration results (see main comments above).
Reply: The linear interpolation is not necessary, because the drift between two calibrations is below 0.04 ppm / 0.5 ppb. But the algorithm is useful for further experiments, e.g. allows for extension of calibration cycles. It does not harm the data processing here.

Section 2.8, Table 3, Figure 5: This section could be strongly shortened. To my mind, Table 3 and Table 5 are not needed. See main comments above.
Reply: See above. This part moved to the Supplement material.

Page 1415, lines 4-5: that's the only place in the manuscript where some dates are mentioned. However, it is still not clear for the reader if the data set ends on November 24.
Reply: We change the sentence: "The station was equipped with the new analyzing system in April 2009. The measurement is authorized by Russian FSTEC agency *and the system is operational since May 20, 2009. Up to the most recent data (April 30, 2010)*, the total time of missing data due to humidification experiments (section 3.4), maintenance or malfunctions is limited to *91 h (1.1 %)*"
The reason for the confusing formulations is the administrational procedure, through which the measurement system had to pass before the measurements could start.

Page 1415, lines 21-27: please clarify? How many 30sec data are used for the comparison with the flask data. The flask sampling takes 15min. Did you consider 30 data points for comparison? Or only a reduced set as the buffer volume provides an integration over 37min. Which 30sec data did you choose then?
Reply: In the discussion version of the paper all available, but only a very few number of flasks were taken into account. They matched coincidently quite well. To merge the newly available most recent flask data and to explain in detail how the comparison was done, the whole paragraph about flask comparison was extended:

"*We used laboratory analysis of the flask samples for comparison with the CRDS data. Flask analysis has a measurement precision of 0.08 ppm CO_2 and 1.3 ppb CH_4. Influences on CO_2 and CH_4 concentrations through the long storage at ZOTTO (max. 363 days) can be excluded, as the storage in glass flasks using PCTFE seals was intensively investigated for periods up to 420 days [GAW Report No.161, 2003]. For the flask comparison the integrating effect of the different air volumes has to be taken into account: tau = 37 min for the 8 l buffer and tau0 = 0.5 min for 1 l flasks (at 2 slm flow, Eq. 4). Generally, the measured concentration c(t) through a well mixed volume can be calculated by convolving the in-situ concentration s(t) with the response function g(t) of the volume:*

$$c(t) = g(t) * s(t) = \int_0^t g(t-t')s(t')dt' \text{ with } g(t) = \frac{1}{\tau} e^{-t/\tau} \qquad (5).$$

The CRDS analyzer measures the integrated concentration c(t). By taking the derivative of Equation 5 we get a solution as an approximation for the highly variable in-situ data:

$$s(t) = c(t) + \tau \frac{dc(t)}{dt} \qquad (6)$$

Figure 6 illustrates this deconvolution exemplarily for one flask measured in August 04, 2009. Three consecutive data points of the CRDS analyzer are combined to one (representing 1.5 min, grey dots) and give the basis for a smoothed spline (grey line, degrees of freedom is 2/3 of the length of the data series), representing c(t). Equation (6) gives the approximate in-situ data (red line). For our attempt to estimate the errors (red dashed line) we used the

standard deviation of the three combined CRDS data points (light grey bars) scaled with the factor $\sqrt{\tau}/\sqrt{\tau_0}$ *that accounts for the deconvolution uncertainty.*

For overall comparison we used 77 flasks from 29 different points in time. The mean difference ± standard deviation between currently all available flask data and the in-situ approximation is -0.2 ± 0.4 ppm for CO2 and 0.7 ± 3.7 ppb for CH4 (Figure 7). The results are in line with other comparisons (e.g. [Popa et al., 2010]) despite having only the buffered signal c(t) available and no high-frequency in-situ signal s(t). Hence, larger deviations in Figure 7 are a sign of atmospheric variability (s(t)) that was smoothed out by the 8 l buffer volumes in the CRDS data (c(t))."

New Reference:
GAW Report No.161: 12th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases and Related Tracers Measurement Techniques, Toronto, Canada WMO TD No. 1275, 273 pp., 2003.

Additionally we change in "4 Summary and conclusions" (p. 1418 lines 11-14):
"*The difference between the continuous data and flask data is (0.2 ± 0.2) ppm CO2, and (0.7 ± 1.5) ppb CH4. This corroborates, in an independent way, the good quality of wet air measurements.*"

Page 1416, line 5: add 'CO2' after 'All'.
Reply: Will be done.

Page 1417, lines 14-26: Nighttime inversion layers mainly develop during clear sky conditions and low speed. I suppose that the night from July 22 to 23 is one of the most remarkable ones. Do you also observe episodes with inverted profiles, i.e. higher concentrations at the higher levels cause e.g. by long-range transport of polluted air etc. Please elaborate a little bit. What's the height of the vegetation? Please add in Section 1.1.
Reply: We add to Section 1.1: "The ecosystem in the light taiga around the station comprises Pinus sylvestris forest stands *(about 20 m height)* on lichen covered sandy soils [Schulze et al., 2002]."
We add at page 1417, line 26: "*The concentration profiles generally behave similar throughout the summer season, but the point in time varies, when the concentrations of different heights split up. Occasionally, local convective transport merges the concentration time series of different levels and large-scale transport may alter the concentration on all levels. In winter, inversions occur for several days and decouple the six time series.*"

Fig. 1: Is it possible to add the Ob swamplands and the Yenisei river in the map?
Reply: Done.

Fig. 6: Does panel c contain H2O data from the Picarro and the meteo logger? If so, please update the legend.
Reply: Done.

Fig. 6, caption: I suggest adding the start and end date of the presented period.
Reply: Done.