We thank the reviewers for their in-depth review, comments and suggestions to improve the manuscript. We hope that in the following we alleviate all their critical questions;

The following codes are use through our reply:
Blue : authors' response
Blue-Italic: text added to the MS

B. Alexander (Referee)
The manuscript is very well written. My only major thought when reading this manuscript is that a discrepancy between observed and calculated O-17xs also exists at the global scale (see Figure 2d in Alexander et al., 2009). In other words, this discrepancy is not just limited to Dome C, and I think this should be mentioned in the text. The only way to alleviate this discrepancy in Alexander et al. [2009] was to assume a bulk O-17xs value for O3 of 35 permil. Since then the Savarino group has published observations that the O-17xs of O3 is closer to 25 permil, but there has since been no suggestion of how to account for this calculated versus observed discrepancy in nitrate O-17xs that would be of relatively similar magnitude on the global scale.

As suggested by the reviewer, the revised version of the MS now mentions explicitly the discrepancy observed also during global modeling of Δ^{17}O of nitrate. This is stated:

- Line 1 P24057 by rewording the sentence as:
The source of discrepancy between observed and modeled $\Delta^{17}O(NO_3^-)$ is presently unknown but we note that such underestimation of the modeled $\Delta^{17}O(NO_3^-)$ versus the observed $\Delta^{17}O(NO_3^-)$ was also pointed out in 3D modeling of the nitrate 17Oexcess (Alexander et al., 2009).

-Line 21 P24061 we added the following paragraph
Alternatively, we can question the accuracy of the $\Delta^{17}O$ of ozone measured in the atmosphere and specifically the ones observed at Dome C (Figure 3). In a 3D global modeling exercise of $\Delta^{17}O(NO_3^-)$, (Alexander et al., 2009) could reconcile modeling and observation only by assuming a bulk composition of ozone at $\Delta^{17}O$ = 35 ‰ instead of the 25 ‰ generally assumed for the tropospheric ozone. While application of such high values will also solve our discrepancy, all observations and measurements published so far by different technique and groups are consistently closer to 25 ‰ than 35 ‰ (Vicars and Savarino, 2014; Johnston and Thiemens, 1997; Krankowsky et al., 1995). Giving the stability of the measurements observed at Dome C (Figure 3) and at other places (Vicars and Savarino, 2014), if atmospheric measurements are underestimated, it should be by a systematic error common to technique as different as liquid helium condensation or coated filters. In absence of such demonstration, we think that either a missing chemistry or wrong $^{17}O_{excess}$ transfer balance is the cause of the discrepancy and not the ozone $\Delta^{17}O$ observed in the troposphere.

At the beginning of page 24062, it would be helpful if the authors would elaborate why the spring sees a maximum in snow photochemistry when one would expect this to occur closer to the middle of the summer when the solar zenith angle is highest.

We are not sure to understand clearly this question. If the maximum concerns the $\Delta^{17}O$, then the answer is $\Delta^{17}O$ is maximum in spring because OH concentration has not reached yet its optimal value, thus limiting its dilution effect. Now if the question refers to why the most depleted nitrate in 15N is seen in spring and not in summer when snow NOx emission and recycle are at maximum for the latter, the reason has to do with the relative size of snow and atmospheric reservoir. Note that this specific delay between isotope and chemistry has already been presented in Erbland et al. 2013 and modeled in Erbland et al. 2015. To summarize, in spring when the photochemistry restarts, the nitrate burden of the atmospheric reservoir is very low. Any emission of NOx from snow nitrate will quickly show up and imprint a very depleted 15N reservoir in the atmosphere. As the photolysis continues, snow pack nitrate starts to be photo-denitrified but get enriched in 15N at the same time to a point where the new emitted NOx are still 15N depleted relatively to snow nitrate but enriched with respect to spring NOx emissions. This effect can be seen as a Rayleigh isotope distillation delayed in time by the relative size reservoir between snow and atmosphere.

Erbland, J., Vicars, W. C., Savarino, J., Morin, S., Frey, M. M., Frosini, D., Vince, E., and Martins, J. M. F.: Air-snow transfer of nitrate on the East Antarctic Plateau - Part 1: Isotopic evidence for a photolytically driven dynamic equilibrium in summer, Atmos. Chem. Phys., 13, 6403-6419, 10.5194/acp-13-6403-2013, 2013.
Erbland, J., Savarino, J., Morin, S., France, J. L., Frey, M. M., and King, M. D.: Air–snow transfer of nitrate on the East Antarctic Plateau – Part 2: An isotopic model for the interpretation of deep ice-core records, Atmos. Chem. Phys., 15, 12079-12113, 10.5194/acp-15-12079-2015, 2015.