Referee Report

The review presents substantial improvements compared to the original submission. Before accepting the paper, I would like that the authors seriously address the clathrate case. I strongly disagree with the fact that the clathrate case can be neglected because, according to them, only a small fraction of CO or N2 would be trapped in these ices. There are two papers recently published in Science Advances and in ApJL who show that 67P could be made of clathrate ices in which essentially all CO is trapped:

http://adsabs.harvard.edu/abs/2016SciA....201781L
http://adsabs.harvard.edu/abs/2016ApJ...819L..33M

These recent findings cannot be ruled out, as the authors claim. The implication of these works is that the amorphous ice case may not be relevant to the formation of ices in the protosolar nebula. At least, these issues should be discussed even if the clathrate case is not addressed in the model.

We thank the referee for the comment, and we added a brief discussion of the clathrate case to section 3.1: *"Based on recent observations (Luspay-Kuti et al. 2016) and theoretical models (Lectez et al. 2015, Mousis et al. 2016) for the composition of comet 67P/Churyumov-Gerasimenko, a fraction of the disk CO (and possibly N_2) content may be trapped in clathrates. This would imply CO and N_2 snowline locations corresponding to CO and N_2 in a crystalline H2O ice environment as described above."* We note that the results of Luspay-Kuti et al. (2016) suggest that the CH4 content of 67P is likely to have originated from clathrates, but there is no similar constraint for CO. For the case of N2, both Lectez et al. (2015) and Mousis et al. (2016) find that N2 is much less likely to be trapped in clathrates than CO. Due to these uncertainties, as well as the fact that the binding energy for the clathrate case would fall between the two extremes (amorphous porous and pure ices) that we consider in this study, we don't believe it is necessary to explore the clathrate case in further detail.