We thank the reviewer for the detailed and helpful comments. We have provided our response below, together with specific comments of the reviewers in italics.

1) In the IS mechanism the reactions of OH with glycoladehyde and hydroxyacetone are updates according to the studies of Butkovskaya et al. These study reported significant yields of organic acids and OH reformation. However, the oxidation mechanism proposed looks unlikely and contrast with other studies finding little or no formic acid (Magneron et al. (2005), Orlando et al. (2012)). Moreover, the proposed
Butkovskaya's mechanism is responsible for the overestimation of HCOOH in the UT/LS, where only production from HCHO + HO_2 *chemistry can easily explain the measurements. The Butkovskaya's mechanism is also implicitly considered in the oxidation of IEPOXOO. Therefore, I would like to see the results of a sensitivity simulation in which the OH-reformation and acid production related to glycolaldehyde and hydroxyacetone chemistry are shut down. I expect significant differences.*

As the reviewer pointed out, the reactions of OH with glycoladehyde and hydroxyacetone in the IS scheme lead to formation of formic acid, acetic acid, and OH reformation (Butkovskaya et al., 2006a, b). Currently, global models generally underpredict these organic acids (Paulot et al., 2011; Stavrakou et al., 2012). Recent work by Orlando et al. (2012) suggests limited acid formation from glycoladehyde and hydroxyacetone oxidation under atmospheric conditions. Therefore, our study likely represents an upper limit for the amount of organic acids originated from isoprene oxidation. This, however, should have only a minor impact on the focus of our study (i.e. uncertainties in isoprene nitrate chemistry). We have analyzed our results and find that the reactions glycoladehyde + OH and hydroxyacetone + OH account for only 3% of all OH reactions. Therefore, OH reformation from these reactions has a small impact on the OH budget.

To ensure that other readers are aware of this issue, we augmented the Supplementary Information and (i) have included a footnote on the relevant reactions and (ii) have included a note on Page 7, Line 7: "[20]: Butkovskaya et al. (2006a, b) (Recent work by Orlando et al. (2012) suggests limited acid formation from glycoladehyde and hydroxyacetone oxidation under atmospheric conditions. Therefore, our study likely represents an upper limit for the amount of formic and acetic acid originated from isoprene oxidation.)"

In future versions of SAPRC in CMAQ we will investigate these updates as suggested by the reviewer.

2) Instead of evaluating the impact of new rate constants for the RO_2 *+* HO_2 *reactions, which are updated anyway, I find more useful to test the impact of the radical-propagating channel of the* RO_2 *+* HO_2 *reactions. Curiously, the authors introduced a 12% OH-yield for the* $ISOPO_2$*+*HO_2 *reaction, which was only attributed by Paulot et al.(2009). However, starting from 2004 direct and indirect measurements have been showing a 44-75% yield for the specific* CH_3CO_3 *+* HO_2 *reaction (Hasson et al.(2004), Jenkin et al.(2007), Dillon and Crowley (2008), Taraborrelli et al.(2012)). β-keto-*RO_2 *show a much lower yield (10-15%). These robust experimental results are not implemented in the IS mechanism. Since this OH-channel has a* *significant effect on* HO_x *and likely indirectly on PNs, the need for at least a sensitivity simulation is compelling. The OH-channel for the reaction of* HO_2 *with* CH_3CO_3*,MACO3,MACROO,MVKOO,HC5OO,*$HOCH_2CO_3$ *could be implemented and tested.*

Laboratory studies have observed OH reformation from RO_2+HO_2 reactions, with differing yields depending on the source of peroxy radicals (Hasson et al.,2004; Jenkin et al., 2007; Dillon and Crowley, 2008; Taraborrelli et al., 2012). In this work we have considered OH reformation from isoprene peroxy radicals (Paulot et al., 2009b, Taraborrelli et al., 2012; Liu et al., 2012), but not from acyl peroxy radicals and β-oxo peroxy radicals. We have now analyzed the likely impact of these pathways on the IS scheme. Assuming OH yields of 0.5, these reactions could be a source of OH that is equal to about 50% of the sum of the HO_x recycled from $ISOPO_2$+HO_2 pathway and the OH formed from the $ISOPO_2$ isomerization pathway.

Recent studies have looked at the impact of including OH recycling from RO_2+HO_2 reactions. Assuming OH yield up to 50%, modeling work in the tropics have shown that these reactions increase OH concentrations by 5–40% (Pugh et al, 2010; Kubistin et al., 2010; Stone et al., 2011). For the Southeast US, smaller impact (~4%) was reported (Stavrakou et al., 2010). Studies also found including these reactions with reported yields are not able to close the gap between observed and measured OH levels, and recycling of 200-400% OH was required (Lelieveld et al., 2008; Butler et al., 2008; Stone et al., 2011). Our calculations above suggest that if these reactions were included in our modeling system, we would expect a larger increase than reported by Stavrakou et al. (2010) but the increase likely would not be sufficient to match the INTEX observations of OH.

We have added the following sentences to Page 27197, Line 7: “Laboratory studies have observed OH reformation from RO_2+HO_2 reactions, with differing yields depending on the source of peroxy radicals (Hasson et al., 2004; Jenkin et al., 2007; Dillon and Crowley, 2008; Taraborrelli et al., 2012). In this work we have considered OH reformation from isoprene peroxy radicals (Paulot et al., 2009b, Taraborrelli et al., 2012; Liu et al., 2012), but not from acyl peroxy radicals and β-oxo peroxy radicals. Assuming OH yield of up to 50%, recent modeling work have shown that these reactions increase OH concentrations by 5–40% (Pugh et al., 2010; Kubistin et al., 2010; Stavrakou et al., 2010; Stone et al., 2011). We would expect an additional increase in OH if this source of OH were included in the IS mechanism.”

3) In my opinion 1) and 2) should be part of the IS mechanism. However, this would imply a major revision of the manuscript. Nonetheless, points 1) and 2) should be considered for the next update of the SAPRC-07 mechanism.

We agree that modifications described in comments (1) and (2) are important and are under consideration for the next update of SAPRC mechanism in CMAQ. Carter and Heo (2012) (http://www.cert.ucr.edu/~carter/SAPRC/saprc11.pdf) have published an updated mechanism called SAPRC-11 that inlucdes changes to the reactions between acyl peroxy radicals and HO_2 similar to suggestions in comment (2). We are in process of merging these and other updates into the chemical mechanism presented in this work.

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