

## ***Interactive comment on* “Strong impacts on aerosol indirect effects from historical oxidant changes” by Inger Helene Hafsahl Karset et al.**

### **Anonymous Referee #4**

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This study examines how estimates of the aerosol indirect effect are affected by assumptions regarding preindustrial oxidant levels. The paper is interesting and well executed. For example, in addition to examining the overall effect of preindustrial oxidants, simulations were performed in which present day OH, nitrate, and ozone were replaced with preindustrial levels one at a time. I have just one major comment.

The authors note that the major driver leading to brighter clouds in the preindustrial period compared to default oxidant assumptions is the nitrate radical level. Since the nitrate radical is most abundant at night while daytime oxidation is dominated by OH and ozone, have the authors thought about their results in the context of this diurnal shift towards daytime oxidation? Is the change in AIE mostly due to changes in daytime aerosols? What does that mean if the major oxidant driving changes is primarily

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nocturnal? Is nitrate radical oxidation most confined to the lowest model layers as a result of nocturnally stable boundary layers? Thus do the changes in vertical profiles of monoterpenes and DMS in figure 5 mostly reflect an increase in near-surface nocturnal concentrations with PI oxidants? Do any results (Table 3 compound lifetimes?) need to be presented as a daytime average instead of 24-hour average?

Minor comment: Page 8, line 20: "SO<sub>2</sub> nucleates easier than SOA" Is SO<sub>2</sub> the model species that nucleates due to logistical reasons or is it sulfuric acid?

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