

## Reply to Anonymous Referee #1

Two initial questions before I can complete my review:

1) I am confused by the model formulation for SOA. The paper initially describes SOA partitioning through equation (1), which is essentially Pankow's relation for the equilibrium between condensing and evaporating organic vapors. On page 26356, we read though:

"Traditionally, SOA is considered to be formed through gas-particle partitioning of semivolatile organic compounds. We call these SOA as ne oSOA hereafter in this paper (see Table 1). "Ne" stands for "non-evaporative", and "oSOA" means "other oxidative SOA" to differentiate from SOA formed from the uptake of glyoxal" ..... etc. The problem here is that it seems as though the "traditional" SOA (e.g. from terpenes) is no longer partitioning, but fixed in the aerosol phase. Both interpretations cannot be correct - either the semi-volatile vapors are both evaporating and condensing according to eqn (1), or condensation is the only process allowed, in which case the K values are not appropriate.

**Response:** Sorry for the confusion. The formation of "ne\_oSOA" here actually includes two processes: the traditional gas-particle partitioning of semi-volatile organic compounds and the following irreversible aerosol-phase reactions (e.g. oligomer formation). The gas-particle partitioning is based on Pankow's model (eqn. 1), which is described by the equilibrium-partitioning coefficient K. Following the gas-particle partitioning, the condensed semi-volatile organic compounds are assumed to react further to form non-evaporative compounds (i.e. oligomer's) assuming a one-day time constant for oligomer formation (the detailed discussion backing up this choice are referred to in the paragraphs between line 13 on page 26360 and line 18 on page 26362). The "ne\_oSOA" stands for "non-evaporative", but it is formed from the condensed semi-volatile organic compounds, which are partitioned into the aerosol phase through gas-particle partitioning. The original explanation of "ne\_oSOA" might not be clear enough; we will clarify it in the revised paper.

2) Page 26363, Line 15. An equation is missing here.

**Response:** Thanks. Here is the equation.

$$\frac{d C_g}{d t} = \frac{1}{4} \cdot \gamma \cdot A \cdot \langle v \rangle \cdot C_g \quad (4)$$