**Atmospheric
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Discussions
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Interactive comment on "A two-dimensional volatility basis set – Part 3: Prognostic modeling and NO$_x$ dependence" *by* W. K. Chuang and N. M. Donahue

Anonymous Referee #1

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Chuang and Donahue (2015) present the expansion of the 2-D Volatility Basis Set (VBS) to include NOx-dependence. The authors provide the mathematical overview of the 2-D VBS and detail how NOx-dependence fits into the parameterization. They proceed to test the implementation under varying conditions, i.e. varying NOx (using β) and mass loadings (which is also used to represent variations in yields), in a box model. I would have like to have seen comparisons with experimental data but recognize that limited experiment data likely exist for such a comparison. The paper is generally well written and is recommended for publication after minor revisions as outlined below.

C6018

General Comments:
Terms IVOC, LVOC, SVOC, etc. are used multiple times (e.g. p. 17299, Fig. 1) but are not defined here (definitions are provided in Donahue et al., 2012). I suggest providing a brief definition/description of these terms.
Figure captions, especially figures 2-6, tend more towards discussion than description. I would suggest adding a sentence at the beginning of each to describe what is being plotted.

Specific Comments:
p. 17292 Eq. 2: Do n$_c$ and n$_o$ correspond to the number of carbons and oxygens, respectively?
p. 17298 lines 6-7: Is there atmospheric relevance to β values of 1 and 0.15, e.g. typical rural and urban values?
Fig 2: I assume the blue lines for OM are for high-NOx conditions and would suggest indicating this on the legend.
Fig 3: Suggest noting in the caption the order of magnitude difference in the C$_{OM}$ scales between plots (a) and (b).

Technical Corrections:
p. 17285 line 4: "etc. Organics"
p. 17285 line 25: "organic compounds"
p. 17286 line 11: NO$_3$ has not defined
p. 17286 lines 17-18: "most commonly"
p. 17287 line 27: "30:46 can"
p. 17291 line 4: "MATLAB" (throughout)
p. 17296 line 9: "phase (Trump and Donahue, 2014),"
p. 17296 line 15: "left to a later"
p. 17297 line 22: "A concentration of 100 μg m^{-3}"