

Huang et al. Present a detailed computational fluid dynamics (CFD) model of their laminar flow tube. They highlight the importance of flow-shaping and mixing at the inlet of the reactor and how non-isothermal conditions can substantially impact on e.g. the distribution of residence times (RTD). Computed RTDs were compared with measured residence times of trace gases, especially O₃ following pulsed admission to the flow tube. Introduction of eddy-like diffusivity was required to align calculation and observation.

Without presenting anything particularly new or unexpected, Huang et al. compile some useful information concerning the design and construction of high pressure, laminar flow-tubes with long residence times and draw comparison with some previous designs. This paper is a good starting point for anyone looking to construct such an experiment for investigation of atmospheric processes and is thus appropriate for AMT. The manuscript is clearly written and organized, the figures are appropriate and of good quality. The authors may consider the following comments / questions.

There is almost no indication in this manuscript (P1L15, P2L4) about what atmospheric, chemical / physical systems the flow-flow is intended to be used for. Likewise, at the end of the manuscript, apart from mention that some gas-phase organics may be lost at higher rates to the walls, there is little indication of what type of chemical systems may be problematic. This manuscript would benefit from such considerations even if only qualitative.

P2L4 There are many examples of problems associated with increasing radical concentrations to reduce the time scales on which atmospheric processes take place (>days) to make them observable on typical (hours) laboratory time scales. Not all processes are linear in time x concentration. Obvious examples involve reaction terms (e.g. reactions between peroxy radicals) that are quadratic in concentration. This deserves mention.

P3L4 The max. Reynolds number in the conical section is listed here. It would also be useful at this point to list the Reynolds number in the long cylindrical section of the flow tube.

P3L9 The lamps emit mainly at 254 nm. Please indicate the relative intensity (penetrating the jackets and water coolant) of the other lines are. Perhaps a Figure of the lamp emission spectra would be useful.

P5L20 Ezell were not the first to use the shower-head design ?. I'm aware of others (constructed for a similar purpose) that precede this by several years (e.g. Bonn et al., J. Phys. Chem. 106, 2869, 2002).

P11L21 The diffusivity for ozone can be accurately calculated or simply taken from previous experimental determinations found in the literature. Why assume a value of 1e-5 m²/s?

P17L29 the authors write: The current study indicates that secondary flows can exist in laminar flow tube reactors and affect the fluid dynamics and RTD. This is true but this is not the first time that this fact has been established. Previous users of high-pressure, laminar flow tubes have recognized this fact and done detailed characterization of the effects of mixing and non-laminar conditions by conducting kinetic experiments with well-known reaction systems (see e.g. Donahue et al. J. Phys. Chem. 100, 5821, 1996). While the pulsed addition of a trace gas will provide an estimate of the RTD, the study of a reaction would provide even more insight as the effects of mixing of trace gases of different diffusivity and wall losses can be assessed.