

1B01: LENGTH SCALING OF TURBULENT HYDROGEN NON-PREMIXED JET FLAMES WITH COAXIAL AIR.

*Munki Kim, Jeongseog Oh, Youngbin Yoon, Seoul National University, Korea*  
*Seunghan Kim, Korea Aerospace Research Institute, Korea*

**Comment by Godfrey Mungal, Stanford University, USA**  
[mungal@stanford.edu](mailto:mungal@stanford.edu)

In my opinion,  $ksi_L < 2$  from Becker and Yamazaki is too generous a criterion for a momentum driven flame. The physical interpretation of this is that the buoyancy force/jet momentum =  $(ksi_L)^3 < 8$ . As shown in [1,2,3], an improved representation is  $(ksi_L)^3 < 1$  or  $ksi_L < 1$ . How might this affect the interpretation of your results?

References:

- [1] Donghee Han, M.G. Mungal, *Comb. Flame* 124 (2001) 370–386.
- [2] L. Muñiz, M. G. Mungal, *Comb. Flame* 126 (2001) 1402–1420.
- [3] D. Han, M.G. Mungal, *Comb. Flame* 132 (2003) 565–590.

**Reply by Youngbin Yoon**  
[ybyoon@snu.ac.kr](mailto:ybyoon@snu.ac.kr)

The non-dimensional buoyancy parameter,  $ksi$  is the parameter determining whether the flame is momentum-driven or buoyancy-dominated. But, there has been debate on whether the criterion is 5 or a lower value, usually 2 suggested by Becker and Yamazaki [1]. Kim et al. [2] suggested that if the criterion of  $ksi = 2$  is adopted in the case of our study, most of coaxial jet flames would be in momentum-dominated region while only some cases would be influenced by buoyancy. From this fact, we could derive flame length scaling under the assumption that the flame is momentum-dominated. However, if the criterion is changed to be  $ksi = 1$  according to the suggestion of Prof. Mungal, most of coaxial jet flames in our cases would be changed to buoyancy-dominated flames rather than momentum-dominated flames, which is not appropriate because most of the flames are shown to be influenced by the momentum of the jet issuing from the fuel nozzle. Therefore, it is suggested that the criterion of  $ksi = 2$  is an appropriate value to determine momentum-driven flames for our study.

References:

- [1] H.A. Becker, S. Yamazaki, *Combust. Flame* 33 (1978) 123.
- [2] S.-H. Kim, M. Kim, Y. Yoon, I.S. Jeung, *Proc. Combust. Inst.* 29 (2002) 1951–1956.