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Log-law & power-law: local self-similarity of a flat-plate boundary layer JOSEPH RUAN, GUILLAUME BLANQUART, California Institute of Technology — A large controversy in the previous decade for flat-plate boundary layers was on the scaling of the defect layer with respect to different velocity scales, made prominent by George & Castillo (1997). The lack of enough large Reynolds number experiments and simulations makes the choice of appropriate velocity scale rather difficult. We show mathematically that the differences between the scaling descriptions (using the free-stream velocity or the friction velocity as a scaling parameter) may in fact be negligible for local regions of the boundary layer. We verify from a variety of simulation frameworks that the differences between the two scalings are in fact small for flat-plate boundary layers. Furthermore, we identify scalings of the wall-normal velocity profile as providing contributions of a similar order to the flat-plate boundary layer.

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