2D numerical study on the flow mechanisms of boundary layer ingestion through power based analysis

The authors are using a power base analysis to simulate laminar and turbulent flat plates, actuator disc, and the combination of flat plate and actuator disc. The simulations are incompressible and 2D to simplify the analysis. They provide a nice description of the power base analysis. However, I still need to have some clarification on some aspects of the paper.

1) Why do you have the w component of velocity in your equations (see Eqs. (5), (8), (10), and (20))? Your simulations are 2-D and thus there should be no trace of the third component of velocity in your calculations.

2) In Table 2, the last row calculates $(\dot{E}_{w,i} + \Phi_i - \dot{E}_{w,inlet})/\dot{E}_{w,inlet}$. The results should be negative numbers; however, you have all positive values.

3) In Figure 5, I cannot see the increase in the jet diameter along the x-axis. Could you explain why?

4) On page 12, in the bottom paragraph, I think you are referring to Figure 8 and not Figure 10.

5) In the top figure in Figure 8, what is the yellowish vertical line at about $X/L = 2.8$ below $Y/L = 0$?

6) On page 15, in the top paragraph, the last sentence introduces the N with no definition. Please refer to Equation (17) in the sentence.

7) In Figure 11, there is a center region downstream of the actuator disc with lower total pressure. However, in your discussion, you are talking about constant total pressure after the disc. Please clarify why you assume constant total pressure.

8) On lines 396-398 on page 15, the combination of flat plate and actuator disc results show higher drag in comparison to the isolated flat plate and lower thrust in comparison to the isolated actuator disc. The question is how smaller thrust and higher drag can give you a better result? Although the P_k value is decreased, you still need to have enough thrust to overcome the drag. To me, it is not an efficient way since it increases drag and reduces thrust. Please clarify.

9) On page 17 line 438, you reported a ratio of 3.6%. This number needs justification for being significant. What is the uncertainty in the numerical results besides the grid effect? What is the significant digit in the results? Does this number is meaningful? What is the accuracy of input power in the reality and what is the uncertainty in measurement in the real world?

10) On page 18 line 447, you introduced the propulsive coefficient. Since your reported numbers are positive, to have a better idea, you need to provide the propulsive coefficient for some of the other propulsive systems such as turbofan. I think without having the propulsive coefficients for comparison, the reported numbers have no meaning since they are greater than 1.

11) On page 18 line 455, your statement isn't correct. You do not have an increase in thrust generated. On page 11 line 267, you reported the thrust of 0.12 N for an isolated actuator disc. On page 15 line 397, you reported a thrust of 0.0130 N for the combination of the actuator disc and the flat plate. It is obviously not an increase in thrust.

12) On page 19, line 514, you probably referring to Figure 13.

13) On page 19, it would be relevant to the last paragraph to explain why there is no low-intensity region of Φ (yellow color) over the flat plate in the turbulent while it exists in the laminar case.

14) On page 22, lines 576 and 580, I think you are referring to Figure 14.

15) You are talking about an actuator disc with a variable change in pressure. Do you have any idea about how this can be done in the real world?

16) On page 23 lines 602, 603, 615, and 616, again similar to my comment number 9, how you can justify that these are real numbers with significant meaning. Considering that you reported 1.3% for power NV_∞ and you have a 3.1% error. The reported number for the increase in Φ_{BL} is even 0.03% which is too small in comparison to your error. Similar is true for your reported 1.2% increase in drag coefficients. None of the reported numbers are significant since they are less than the error and thus should not be reported and be discussed.

17) There are some minor grammar issues in the paper.