Review of Eric J. Limacher and David H. Wood

An impulse-based derivation of the Kutta-Joukowsky equation for wind turbine thrust, Revised version

General remarks:

The authors aim to develop a "Kutta-Joukowsky-equation", Eq. (28), by avoiding use of pressure. As the reviewer's first-round remarks, there are already derivations (or discussions) from Glauert (1935) Soerensen (2016) and van Kuik (2018). Nevertheless, this does not mean that a new derivation is meaningless, but it then should be "easier" to understand or lead to further progress.

Unfortunately, I do not see if this goal has been achieved.

Specific remarks:

A complete list of used symbols before the actual text would be desirable.

Figure 1: Please add a coordinate-system

Eqs. (2) and (3): Please add statements about the regularity of the velocity and vorticity fields you imply, i. e. to which class $C^1, C^2 \ldots C^\infty$ they should belong, to make all integrals well-behaved. To put it more in terms of physics: What assumptions of vortex lines, sheets or so on are made implicitly?

Eq. (12) Is this simply a definition of p or a non-trivial statement?

(An additional sketch would be helpful)

Line 141: "the other dynamic conservation equation" Do you mean: "The other dynamical equation based on conservation of angular momentum"?

Section 3 (lines 141 to 165): think about skipping it because you state " . . . has not enriched the analysis"

Eq. (24) Line 171: I'm afraid that from this INTEGRAL almost nothing can be concluded for local behaviour unless you make severe assumptions on v(x) and a(x).

Line 174: ". . . likely consequence $v \approx a$ at the edge of the wake". As in Fig. 15/16 of Madsen et al. (2010) only results from numerical investigations are discussed, an analytical approach should give saver estimates about the flow esp. at the edge (x=1) of the actuator disk.

Line 220: How are Eq. (30) and Eq. (12) connected ?

Line 233: " . . . a constant-p wake defines an optimal rotor, (originally from Betz (1919) . . .).

Unfortunately, Betz, in his paper only investigated lightly-loaded propellers and not heavily-loaded wind turbines, as also remarked in Soerensen (2016).

Line 268/269: "We are completing .." think about skipping this sentence

Line 217: How can x be large if $0 < x < 1$?

Line 301 ff: " . . . approximately correct at high tip speed ration . . . "

Can this be made more explicit? Like $O(\lambda^{-n})$?

Line 302: " . . . cannot describe the runaway (raw) state …" As far as I know , this stat ($cP = 0$, $TSR\_raw < \approx$) is excluded from this model at all, because cP increases (strongly) monotonously.

Line 303: “Thus the trailing . . . assumed in lifting line theory for wings.” Isn’t this statement trivial and superfluous, as pure translational rotational motion have nothing in common ?