Review of the article entitled « Low-order modeling for transition prediction applicable to wind-turbine rotors » by T. Fava et *al.* for Wind Energy Science.

General opinion:

This article presents a simplified method to predict/analyze the onset on laminar to turbulent transition on a fully 3D wind turbine blade. First the boundary layer equations are solved using an approximation for the external (ie at the boundary layer edge) spanwise velocity. Secondly, the stability of the obtained boundary layer mean velocity profiles is analyzed using a Parabolized Stability Equation (PSE) approach including rotation terms. This "tool" appears as very powerful since it only requires pressure distribution on dedicated spanwise sections which can easily be obtained with a code such as Xfoil based on panel method. Stability and transition prediction results are obtained for two blade geometries and compared to RANS computations integrating a database transition prediction tool. The influence of the rotating velocity on stability and transition location is also investigated. These results are very interesting and convincing.

Moreover, it should be noticed that the article is well written and organized so that it is really pleasant to read. For these reasons I strongly support the article for publication.

Below is a list of remarks/suggestions the authors should consider before publication.

Specific remarks:

L38-40: It is written that the PSE model are computational costly so not well suited for design. Nonetheless, the proposed model is based on PSE approach?

L50: It is mentioned that the reference RANS solver (EllipSys3D) integrate a transition prediction tool based on database method. Which one? Are there any references available? In the previous sentence, Sorensen 2009 is given as a reference but this paper deals with gamma-Retheta method which is not a database method. Additionally, since RANS results will be used as comparison for transition prediction, does the database integrates 3D effect and/or rotational effects?

L73: The equations (for the mean flow as well as for the fluctuations) are given in the general case of compressible flow including the equation for the temperature (or the energy). Is there any interest in considering the general compressible case or could it be restricted to simplified incompressible formulation? For an angular velocity of omega=1 rad/s and a radius of r=100m the azimuthal velocity at the tip will be around 100m/s ie a Mach number of 0.3 which is the usual limit to separate incompressible to compressible regimes. Additionally, the RANS code is incompressible (mentioned Section 4, p10).

L82: cp and gamma have already been used before. cp at the end of the abstract to refer to pressure coefficient and gamma in the gamma-Retheta model (ie referring to the intermittency function). It will be used again at the bottom of page 10 to refer to the intermittency factor. Additionally, page 9, equation 29 gamma is used as the angular frequency of the disturbances. A list of symbols at the beginning of the article will be helpful.

L123: It is mentioned that the pressure can be obtained from the velocity and temperature variables. For me one quantity is missing: the density or the total pressure.

L179-180: The PSE is derived from the continuity, ~~Navier-Stokes~~ momentum (better suited), energy and state equations.

L198 (Eq 27): Even though periodicity is assumed in x_2 direction, 'q' and 'qtilde' depends on x_2. Same remark for eq 28.

L205: Already mentioned but the angular frequency is quoted as gamma which has already been used as the intermittency.

L217 (Eq33): the density fluctuation should also tends to 0 (or better be bounded) far away from the wall ($x_3 \rightarrow \infty$)

L221: The definition of the N factor should be given here. How is it related to the amplitude function of the disturbances? Moreover it is often specified that it is an envelope N factor but never said that the envelope is a local maximum on frequency (I guess).

L255: It is mentioned that cp distributions are approximation/differ from RANS ones. It would be interesting to illustrate (quantify) this discrepancy on a figure all the more than in the following this argument is reiterated to justify the differences between BLX and RANS velocity profiles L307 as well as on transition locations L353 and L357.

L284: "Although exhibiting higher values, the BLR and BLX profiles of spanwise velocity present the same shape of those from RANS." I do not understand this sentence since in Fig 6b, RANS provide a u2 profile lower than zero (except close to the wall) while the u2 profile provided by BLR and BLX is positive.

L294: "This is similar to what was observed in Geometry 1 and may indicate the three-dimensional character of the flow at lower radii". Not agree, related to the previous remark.

L337: The threshold value for eN method has been set up to 9 which is a typical value considering flight tests and quiet wind tunnel tests. Is this value appropriated for wind turbine blade application in the 'atmospheric boundary layer'?

L348: The PSE RANS results (not shown). It is unfortunate, since these results are the one to be considered as the reference to validate your approach. Is it possible to perform laminar RANS computations switching off the database transition prediction? Or rising the value of the transition threshold to obtain a laminar extend as long as possible in the RANS computation in order to analyze its stability with PSE? If not at least compare the evolution of the N factor between RANS and BLX for the first per cent of chord.

L384: “However, the modes tend to have a single-peaked structure at r0/R = 0.26, associated with their high propagation angle (in absolute value).” This has to be related to the spanwise mean velocity profile (fig 6a and b) which is inflectional (ie sensitive to CF like disturbances)

L434: “The single-peaked modes observed at r0/R = 0.26 for Geometry 1 and r0/R = 0.40 for Geometry 2 (! = 0.45 rad·s−1) might represent an intermediate stage between a TS and crossflow transition”. Is there a shift/reduction of the frequency of the instability responsible for transition onset (the one reaching the Ncrit).