The manuscript under review describes a numerical model of a rotary airborne wind energy convertor developed following the approach of Cosserat theory, laboratory tests to determine mechanical properties and its dynamics under forced motions, and a comparison between the two models.

The rotary airborne wind energy convertor seems to consist of a helical rotary system to transmit the torque from the airborne rotor to the ground station, but unfortunately no detailed drawings or information about the design is given. The numerical approach is based on modelling the full helix (with complex internal structure) as a one-dimensional flexible, nonlinear Cosserat rod. The equation of motion is developed using vector analysis and discretized using a Galerkin method. Unfortunately, even after trying to match the material properties with laboratory tests, the results show large discrepancies between the numerical model and the experimental tests. The authors argue that the numerical model can qualitatively reproduce the experimentally observed resonance (leading to destruction of the model in the laboratory), but it remains unclear what features of the actual system the model can actually reproduce and what its limitations are.

The manuscript is mostly well written, but is difficult to read since there is little motivation given for the presented developments. It is also surprising that the authors did not spend more time trying to match the experimental results. See below for more detailed comments on this.

All in all, it seems that this paper is somewhat premature and I recommend that the authors test and investigate the numerical model more.

Detailed comments

1. Cosserat theory is mentioned, among others in the abstract, as the basis for developing the numerical model, but in the section on modelling no reference is made to it. I suggest the authors explain first, to the benefit of readers unfamiliar with this approach, what Cosserat theory actually is, why it is needed here, and where the authors make use of it. In particular, it should be mentioned that the helix is modelled as a 1D Cosserat rod.
2. The rotary wind energy machine for which this model is developed is never really shown or explained. Please include more details about it.
3. What is the motivation for modelling the complex internal structure of the helical transmission system with a 1D elastic rod, instead of a higher fidelity model? Why do the authors think that such a simple model is good enough to reproduce the important features (what are they?) of the system?
4. Why did the authors not use a standard flexible multi-body approach where individual elements of the helical structure are modelled directly, and in much more detail than with their approach? Or, why not use Cosserat rods for each member in the helix, instead of the full helix?
5. It should be mentioned where the slenderness assumption is used (e.g. Eq. 16?)
6. line 124: Why is it natural to make this assumption?
7. For the benefit of the reader, when citing books, such as Villaggio and Press et al, please indicate which chapter of the book is relevant here.
8. Eq. 49: Is it correct that alpha_2, ..., alpha_N-2 (mapped by the C_alpha matrix) are all supposed to be zero?
9. Figure 2: What is N for the experimental system shown in Panel d?
10. line 313: If eigenvalues are pure imaginary, the system is not asymptotically stable and can exhibit bounded oscillations. Is this physically realistic?
11. What assumptions where made about the damping in the numerical model?
12. line 344: Why is the coupling with the rotor avoided? Why not couple the numerical model with a simple blade element momentum model for the rotor? The work of Wacker et al (https://doi.org/10.1088/1742-6596/2626/1/012011) suggests that this is feasible. In fact, this work also shows an analysis of a helical system by someAWE that the authors might want to consider and comment on.
13. Figure 7: Please include a similar time domain plot for the numerical model, to allow comparison.

14. line 380: Why is Fig. 8 showing a bifurcation (and not simply a resonance)? This is mathematical concept with a very precise meaning, are you sure that this is what is happening here? Why?
15. Please discuss the possibilities to better match the numerical model with the experimental tests. Which parameters are still available, or is the numerical model fully specified?
16. Figure 8: Please also show the standard deviations and the phases of the simulations for the different forcing frequencies.
17. The manuscript needs a proper conclusion that sums up not only what has been done, but also what readers can learn from this work.
18. Reference Beaupoil (2017) is only an abstract. This is discouraged and should not be done according to the uniform requirements for scientific manuscripts. Please reconsider.