Response to detailed comments of reviewer #3

Line 21-22: missing citation.

#Response: Correct citations are added

Line 103: a dynamic system -> a dynamical system

#Response: Rewritten to the suggested words.

Line 104: I don't know much about L0 and L1 controller. Based on what's written, L1 is the distance between the kite and the target (i.e., the error). If so, how could L1 be an adjustable parameter?

#Response: The L1 is not calculated as an error, it is the distance to the path where the target should be defined. Basically, it defines how far the controller looks ahead to determine the target. We added a sentence to the controller section to clarify this: "This distance is often used as a control parameter to ensure that the system moves toward the desired trajectory by looking either closer or further ahead to determine an optimal target position to track."

End of line 140: the -> to

#Response: Rewritten to the suggested word.

Equation 3: are the phi_tau terms the roll angles (desired/actual) on the Earth axis or the tangent axis? I assume it's the latter. Please specify.

#Response: We believe the last sentence before equation 3, together with the tau subscript should clarify it refers to the tangential plane: "Finally, by considering all forces acting on the kite, the desired roll angle $\phi_{\tau,\mathrm{des}}$, relative to the tangent plane, is determined by Equation (3)."

Line 157: is lift F_L taken directly from the aerodynamic model, or is there a way to measure it in-flight in real life?

#Response: Lift is generally impossible to measure in real life. In this simulation framework, there is no mismatch between the aerodynamic model and kite force. In real life, one would need to be able to deal with this model mismatch, as the controller would only know a predicted lift instead of the real lift. Several methods could be employed to reduce the risk of that becoming an issue. Either by improving the aerodynamic model to better predict real forces or by changing to a controller which can better handle the mismatch. This work aimed for a simple tunable controller for numerical studies only. For a real kite controller, this might come with several problems that need to be addressed.

Line 193: 'this thesis' – please update.

#Response: Rewritten the sentence.

Line 217: please specify whether this is the tether force on the winch or the aircraft body, or are they the same?

#Response: We rephrased the text to clarify this. It is the ground tether force, as this, in the end, is what is converted into electricity, so this is what the controller tries to track. The tether force at the kite, is quite similar to the ground during the traction phase when there is little to no tether sag, during reel-in when the tether sag is much larger the two differ significantly. The tether model we are using captures this difference.

Line 256: I guess the word 'using' shouldn't be there.
#Response: We rephrased the sentence.

Lien 286: become -> be
#Response: We rephrased the word.

Line 288: the maximum -> the maximum velocity
#Response: The word 'velocity' is added.

Line 307 and others: the authors use the term 'most optimal'. I don't think that's appropriate because an optimal point is the best one, unless we are referring to local and global optima.
#Response: That is indeed what we refer to. We can never be sure we have a global optimum for such a large non-linear framework, even under specific conditions.

Line 315-316: "the winch needs to retract a bit to insert energy into the system to get it to the top of the circle." Is this common in airborne wind? I would have thought that if one needs to add more energy to the kite via the winch, it means the target trajectory is too challenging and the kite should fly at a lower height.
#Response: It is a common thing we see in simulations for heavy kites. However it is an undesirable phenomenon. As is also concluded in this paper, it is bad for the power quality. This is not generally solved by flying lower, however, flying lower could mean a lower elevation angle, and this decreases the cosine losses having a positive effect on the achievable aerodynamic force. If with lower, a shorter tether length is meant, this could reduce the tether drag and increase system performance. But, flying lower can also come with other problems like minimum required altitude or other flight domain size requirements. In this case the elevation angle is already quite low, so we do not expect a large difference with a lower altitude. It must also be noted, that this kite is designed using a single element airfoil with underperforming aerodynamic characteristics due to the limited access to advanced aerodynamic solvers at the time. Therefore, the kite does not perform too well compared to its mass, causing these gravity-induced problems. As we keep the kite constant throughout the analysis, this effect is for all patterns the same, so it would still make up for a fair comparison. We as authors have also worked with a different controller on this kite, which showed that this phenomenon could be minimised using alternative (more complex) pitch controller strategies, but was only tested for the traction phase of an up-loop figure-of-eight pattern (DOI: 10.1088/1742-6596/2767/7/072019, also in the list of references and referred to in Section 2.1.3).

Line 330-331: "Compared to the down-loop, this indicates a higher likelihood of fatigue damage over time as the kite will go through more load cycles more quickly." This is unclear. Does the figure-of-eight frequency cover 1 orbit on 1 side or 2 orbits (1 on each side)? If it is 2 orbits (1 on each side), then the figure of eight is expected to have a lower frequency than circular flight, but each figure of eight cycle stresses the aircraft (roughly) twice as much a circle cycle because we are doing 2 circles (1 on each side). The comments on aircraft stressing might need some further thinking.

#Response: This is only true if the pattern is flown in the same time. We do not look at a load cycle as the flown pattern, even though this is generally the case for a circle, and half that of a figure of eight. We look at the cyclic lift force compared to time independent of the flown pattern. The given frequency, therefore gives a simplified early indication of the amount of cycles in a life time. We did rephrase the discussion to better explain what is meant, and we added a sentence about the force amplitude, which supports the given argument even more. However, it is also stated as an additional result, and must be interpreted with caution, especially the frequency. The relative amplitude can be expected to be more consistent with the pattern choice.