We greatly appreciate the comments of the referee, which have helped us considerably improve our paper. Detailed responses to the referee's comments are given below.

1. **Referee A**: It seems like one of the key differences between Jensen et al. (2011) and this work is the treatment of shear: it is smaller in this study (and generated entirely by the Kelvin wave) than in Jensen et al. (2011), and this may explain the different conclusions. What observations are there to support one value of shear over another? Since the shear in this study is set by the amplitude of the Kelvin wave, how was the amplitude of the Kelvin wave chosen? I think the paper should include some discussion of this.

1. **Authors**: The values of shear in the two studies are only slightly different from one another. The constant shear in Jensen et al. (2011) is $5\,\mathrm{m\,s^{-1}}$, while the maximum shear in this study is $4.5\,\mathrm{m\,s^{-1}}$.

   An essential difference is that the shear in Jensen et al. (2011) is steady and uniform, whereas ours varies in space and time consistently with the structure and propagation of the Kelvin wave. The structure and propagation of the Kelvin wave are determined by the sounding, which has been taken from balloon measurements. Corresponding to a sharp increase in the Brunt-Väisälä frequency at the cold point tropopause (CPT) in the sounding is a maximum of the Kelvin wave amplitude just above the CPT. The cloud in this study, as well as most observed TTL cirrus, are located below the CPT. Hence, the cloud in this study is not subject to the maximum shear of the Kelvin wave.

   The amplitude of the Kelvin wave generated in the model is determined by the amplitude of the forced vertical velocity (see Eq. 8). In Eq. (8), we chose w_0 such that the amplitude of the wave temperature perturbations are 2.0 to 2.5 K. These values are consistent with the observations of Kelvin waves by Immler et al. (2008). The consistency between the simulated wave amplitude and Immler et al. (2008)'s observations is noted in the last paragraph of Sect. 3.1.3 in the manuscript.

   As noted by the referee, the shear in this study is generated entirely by the Kelvin wave. We have not taken into account any shear associated with the mean wind. The shear of the mean wind in the TTL varies with longitude. In the region of maximum TTL cirrus occurrence between 170° E and 160° W (Mace et al., 2009, their Fig. 13c), the shear of the mean wind is less than $1\,\mathrm{m\,s^{-1}\,km^{-1}}$ (Fueglistaler et al., 2009, their Fig. 6b). We revised Sect. 3 (see page 8 of the revised manuscript) to discuss the shear of the mean wind.

2. **Referee A**: Although the point of this paper is to establish a proof of concept (i.e. that radiatively drive ascent can out-compete free fall), I think it would be helpful to include some discussion as to the generality of these conclusions. If the simulation is run for longer than 12 d (two wave periods), does the water continue to rise? What real-world scenario would have created the initial supersaturated patch of vapor?

And, along the lines of my other comment, how sensitive is this to the magnitude and period of the Kelvin wave?

2. **Authors**: The cloud disappears after 12 d, so there is no further upward transport due to the mesoscale circulation. There are however further periodic changes in the water vapor profile due to advection by the large-scale wave.

   Observations indicate that TTL cirrus appear as separated clouds, rather than an unbroken sheet covering the entire TTL. Spatially separated clouds can be formed if there are spatial variations in either temperature perturbations, or water vapor perturbations. In this study we have experimented with the second scenario in which an isolated, initially moist patch is specified.

   An isolated moist patch in the TTL may be formed by the transport of water, either as vapor or ice, from the upper troposphere by deep convection. The size of the moist patch depends on the size of the convective system, and on the wind shear that may have been present after convection stops and before a TTL cirrus is formed in the moist patch.

   To solve for a realistic moist patch in the domain involves conducting a complex radiative-convective equilibrium over a large part of the tropics, which is beyond the scope of this study. To keep the setup tractable here, we solve an initial value problem by following the evolution of a pre-existing moist patch under the influence of a Kelvin wave. This is a conceptually simple way to frame the initial value problem.

   It is indeed important to test the generality of these results. We are currently preparing a paper describing the influence of variations in the wave amplitude and period, the size and location of the moist patch, the relative humidity inside and outside the moist patch, and the deposition coefficient of water vapor on ice.

3. **Referee A**: Page 10735, lines 6–7: Is the background aerosol concentration and radius kept fixed throughout the simulation, or is this just the initial condition and the aerosol distribution is prognostic?

3. **Authors**: The background aerosol concentration and radius are fixed. We have added the word “fixed” to the revised manuscript to clarify this.

   The background aerosol is relevant to the problem only during the brief ice nucleation event that happened just before $t = 2\,\mathrm{d}$. Hence it is not necessary to solve the background aerosol prognostically.

4. **Referee A**: Page 10738, line 9: k should be $1.047 \times 10^{-6}\,\mathrm{m}^{-1}$ here.

4. **Authors**: Thank you for carefully checking this calculation. We have fixed this error in the revised manuscript.

5. **Referee A**: Page 10749, line 20: Swap RAI and RAV.

5. **Authors**: As suggested by the referee, we swapped RAI and RAV in the revised manuscript.

6. **Referee A**: Page 10749, lines 26–28: Please explain what terms in the equations are being removed in each of these experiments.

6. **Authors**: In the no-RAV case, we neglected the term $\mathbf{u}_\mathrm{c} \cdot \bigtriangledown(\tilde{q}_\mathrm{v} + q'_\mathrm{v,c} + q'_\mathrm{v,ls})$ in Eq. (22). In the no-RAV-no-RAI case, we neglected both terms $\mathbf{u}_\mathrm{c} \cdot \bigtriangledown(\tilde{q}_\mathrm{v} + q'_\mathrm{v,c} + q'_\mathrm{v,ls})$ in Eq. (22) and $\mathbf{u}_\mathrm{c} \cdot \bigtriangledown q'_\mathrm{i,c}$ in Eq. (18). In the no-radiation case, we neglected the radiative heating Q_rad. Since the latent heat release is negligible in this problem, $Q_\mathrm{rad} = 0$ means that $\dot{Q} = 0$ in Eq. (21), consequently $\mathbf{u}_\mathrm{c} = 0$, $\theta'_\mathrm{c} = 0$, and $p'_\mathrm{c} = 0$.

   We agree that adding this information to the manuscript helps clarifying the experiments. Please see Sect. 5 in the revised manuscript for the changes.

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