General comments: Vertical velocity has a tiny magnitude near surface and is difficult to measure because its magnitude is usually smaller than errors. However, vertical velocity plays a substantial role in mass and energy exchanges between land and atmosphere. For simplicity, they usually assume it is zero at surface. The author argues that it is non-zero by a "thought experiment". The author is a theoretical thinker. This paper shines light on this knowledge gap. I recommend it to be published with minor revision.

Specific comments:

(1) 2.1.2 The 0^{th} Law of Thermodynamics – I do believe that this is a case from second law of thermodynamics (Postulate of Clausius, see Thermodynamics by Enrico Fermi, 1936). I don't think that "The 0^{th} Law of Thermodynamics" is independent from second law of thermodynamics. So I suggest using the second law of thermodynamics instead of the 0^{th} Law so that your statements no matter heat transfer and mass diffusion are govern by the same second law of thermodynamics. Fourier's law and Fick's law are empirical relationships between fluxes and gradients. Gradients are drivers for fluxes and consequences of fluxes reduce gradients, following a single irreversible direction (entropy increasing) – equilibrium (entropy maximum) –second law of thermodynamics.

(2) Vertical velocity at surface is always positive (upward) predicted by the equation (4). Based on your thought experiment, this looks true everywhere (leaves, ground, water surface) including large scale (e.g. synoptic scale). To my knowledge, it is sure that vertical velocity is negative in high pressure system areas and positive in low pressure system areas. Therefore, it is difficult for me to understand the positive vertical velocity predicted by your theory in high pressure system areas or divergent air-flow near surface at any scale. Please clarify the conflict in your revision.

(3) Page 6 second paragraph,

> negative of the inner product $\mathbf{v}\cdot\nabla\xi$, where $\mathbf{v}$ is the fluid velocity and ∇ is the gradient operator. To be clear, it can make sense to speak of "upward diffusion", but certainly not "upward advection". The tendency, in the science of surface-atmosphere exchange, to speak of "vertical advection" (e.g., Rannik et al., (2009)) is intimately related to an assumption of horizontal homogeneity, precluding horizontal scalar gradients particularly in the direction of the mean wind.

It is fine to me with "vertical advection" because it is clearly defined by vertical component

$$\mathbf{v}\cdot\nabla\xi = u\frac{\partial\xi}{\partial x} + v\frac{\partial\xi}{\partial y} + w\frac{\partial\xi}{\partial z}$$

vertical advection $w\dfrac{\partial\xi}{\partial z}$

horizontal advection $u\dfrac{\partial\xi}{\partial x} + v\dfrac{\partial\xi}{\partial y}$

It does not need to assume horizontal homogeneity.