The author thanks the referee for the evaluation and especially for the recommendations to improve the manuscript. In the replies that follow, the referee comments are repeated (bold font) followed by the responses from the author (normal font).

Replies to Anonymous Referee #1

General comment

The paper gives a relevant theoretical contribution in the delicate argument of the fluxes of water vapor and other gasses taking place in close vicinity of leaves and other surfaces, where evaporation takes place. This argument was overlooked in the past, leading to some improper simplifications. The paper is well written and organised. I welcome this contribution and I recommend it for publication. I suggest only some minor changes in order to make it more accessible, clear and concise.

The author thanks the referee for this clear endorsement.

Specific indications

Line 12: The vertical bars indicating processes taking place close to the surface are relatively uncommon and introduced only later in the text. This could reduce the potential readership. I recommend describing the processes by simple words in the abstract (and in the conclusions). The author agrees and will adopt this strategy in revising the text.

Line 86: '. . .are the those properties. . .' I think the term 'those' is unnecessary. The same at line 90. The author agrees and will delete these unnecessary terms.

In equation 2 the letter k could be capital for consistency with 'K-theory' (Line 130). The author agrees and will modify this, both in the equation and also in Table 1.

Line 139: What is the condition of the water present in the pool at the beginning of the experiment? Only at line 150 it is reported that the pool has zero salt mass. The condition of the water present in the pool at the beginning of the experiment varies as a function of the case scenario. In the first scenario (specified at line 150), it has zero salt mass; in the second scenario (specified at line 181), it is freshwater with salinity equal to that entering from the tube. The author agrees that the original text leaves the reader wondering for too long, and proposes to modify the sentence at line 139 to say "into the bottom of a pool (Figure 1) of salinity specified according to the two case scenarios defined below".

Line 157: The concept that the tube (or better, the liquid present in the tube) is a source of salinity is somewhat repeated. The author feels that such repetition is necessary in order to clarify an important point, namely that after the moment t_{eq} the tube no longer represents a source of salinity, but rather dilutes the pool.

Line 170: I would recommend defining early in the text the initial conditions. The same in all case studies presented. This is indeed what has been done. The initial conditions of case scenarios 1 and 2 are specified early in the text (lines 148-152 for case scenario 1; lines 181-184 for case scenario 2). Furthermore, they are presented in italic font, consistent with the words "*characteristics of the two 146 case scenarios"* at line 146. The points of view regarding (a) salinity (starting at line 154) and (b) thermodynamics (starting at line 170) refer to the same case scenario.

The author appreciates that this was less than clear, and so proposes to modify the text at lines 152-153 to say that "This first case scenario is of interest from both (a) salt/solute and (b) thermodynamic points of view:", in order that the reader clearly appreciate that points of view (a) and (b)both refer to the same conditions.

Line 189: '. . .volume. . .at a point. . .', I cannot understand. A point has no volume by definition, at least in geometry. Although a point is infinitesimal and has no volume in geometry, in fluid dynamics it must have a finite size, based on the continuum hypothesis. This allows mathematical specification of both state and flow properties - which only have meaning when averaging very many molecules - and their derivatives. In this context, there is a tradition of writing equations in the constant-volume (Eulerian) fluid specification to describe the fluid "at a point". In the manuscript, the quotation marks in the manuscript denote the implicit assumption regarding both the fluid as a continuous medium and the finite volume of the point under consideration.

To make this somewhat more clear to the reader, the author proposes to modify the parenthetical remark at line 189 to say '(e.g., "at a point", in an Eulerian fluid specification)'.

Line 223 and following. Are these four cases, all similar, strictly necessary? A single case study of the size of a leaf (e.g., 1 cm2) would simplify the text. The author feels that the four cases are indeed worth considering, for the simple reason that the derived velocities represent spatial averages that are valid over a variety of scales, the larger of which are of particular interest to meteorologists. However, the manuscript neglected to make this explicit. As a result, the author proposes to change the paragraph that began at 282 to the following:

> The representative evaporation rate prescribed in Table 3 and vertical velocity resulting from eq. (4) are valid for most of the scales defined above. Thus, the boundary condition $w|_0$ is valid for the synoptic scale (notwithstanding vertical motion aloft, such as subsidence), for the micrometeorological scale, and even for the leaf scale. In the context of scale analysis, leaves may be approximated as having equal area as the underlying surface (i.e., a unit leaf area index, or LAI=1), and equal evaporation rates as the surface in general. This latter assumption does not neglect soil evaporation, but only excludes the possibility that it dominate leaf evaporation by an order of magnitude. Thus, it will be assumed here that the assumed evaporation rate and derived vertical velocities are equally valid at synoptic (A), micrometeorological (B), and leaf (C) scales. The order of magnitude is different, however, at the microscopic scale. To show this, it will be assumed here that all leaf evaporation (or transpiration) occurs through the small fraction of the leaf that is stomatal (σ), such that both the stomatal evaporative flux density and the lower boundary condition for the vertical velocity ($w|_0$) are a factor $1/\sigma$ greater than that at larger scales. Independent of scale, Eq. (4) states that, for a positive evaporation rate, the boundary condition for the vertical velocity is non-zero and upward.

Line 404. 'average air speed exiting a stomatal aperture is 3.1 mm s-1.' I would find interesting if the author could provide a plot or a table showing how the main physical (pore size) or environmental variables (T? P?) affect this velocity. The roles of such variables in modulating this velocity are quite small in comparison with its near-direct, linear dependence on the evaporation rate, as described by eq. (4). Such dependences do not, in the author's opinion, merit depiction via a plot or a table.

Line 436. 'described in many chemical engineering texts'. Any references? The author agrees to add references to three chemical engineering texts here (Kreith et al., 1999; Lienhard and Lienhard, 2000; Bird et al., 2002).

Line 471: Any more recent references about helox experiments? The author is unaware of more recent references regarding helox experiments, but points out that the Mott and Parkhurst (1991) paper has been cited more than 300 times (Web of Science).

Line 483: import->importance(?). The author agrees to make this proposed change.

Line 477 and following (Conclusions).I suggest to remove also from here uncommon symbols or to explain them all. More generally, I would still have a question: do the non-diffusive process described in the text have computational or only theoretical/descriptive effects?
The author agrees to explain the symbols in the conclusions section.

The computation of non-diffusive transport is given by equation (7). This is the amount of transport that should be subtracted from total transport in order to characterize diffusive transport, which is the quantity that is relevant to the derivation of flux-gradient relationships such as the eddy diffusivity and/or stomatal conductance. The purpose of the last three paragraphs of section 3.3 is to compute, for particular gases using representative flux magnitudes and environmental conditions, the magnitudes of these "corrections" to the eddy diffusivity and/or stomatal conductance.

In Figure 2, it could be helpful if the presence of Mercury, and the circumstance that the tube is open to the atmosphere, would be indicated in the design. The author agrees to annotate Figure 2 for the revised manuscript, inserting the information regarding the mercury in the manometer and the fact that the tube is open to the atmosphere.