

## ***Interactive comment on “Biotic pump of atmospheric moisture as driver of the hydrological cycle on land” by A. M. Makarieva and V. G. Gorshkov***

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After the reply of the authors to my own and others comments, I was digesting all this information without further intention of making comments. But as a working meteorologist who handled lots of weather forecast datasets I felt that one comment made by the panel needs to be addressed. Their third comment seems to imply that as far as due to mixing molecules of water vapor collide with molecules of all other gases, for this reason the lower atmosphere does not 'feel' condensation in the upper atmosphere. Quote: "condensation at higher atmospheric levels does NOT affect the weight of the

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column of air experienced by the water molecules in a turbulent non-static environment".

This conclusion should be, in my view, reanalyzed. Yes, the atmosphere is well-mixed both in horizontal and vertical direction, and molecules of all gases collide with each other and experience weight of the entire atmospheric column. (By the way, in my perception the authors do not say that "the presence of extra forces acting on particular gases ... does not affect the set of forces acting on other gases, following Boltzmann's law." The authors several times emphasized that a force created by factors concerning one gas (like condensation for water vapor) acts on *all* gases in the mixture.)

But with all this mixing and collisions the atmosphere does react to pressure gradients. Don't we know very well that if the atmospheric pressure drops by a tiny several millibars, we can expect strong winds bringing air that 'felt' this pressure change from a thousand kilometers away? Why then cannot the lower atmosphere be affected by a drop of pressure due to condensation, when water vapor disappears from the gas phase? To say so would mean to me to discard a well-established basis of meteorological observations - the dictate of air pressure change for circulation processes.

The only thing is that we meteorologists are used to monitor horizontal pressure changes in the first place, while the authors invite us to reconsider what is happening along the vertical. I have re-read several texts that I consider fundamental as far as the bases of modern understanding of the atmospheric processes are concerned. Here I would like to quote in back translation from my Russian book, the words of Lorenz (1967, "The Nature and Theory of the General Circulation of the Atmosphere", WMO, Chapter IV Processes maintaining circulation, Section 1, p. 93 in Russian edition, italics is mine): "It should be stressed that evaporation and precipitation condition the transport of moisture only in that sense that if they exist, the transport should exist as well. *They cannot be considered as the cause of transport.*" To me this is perhaps the most authoritative witness that the biotic pump transfer mechanisms described by the authors so far have not been taken into account, even implicitly or indirectly, in the

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meteorological thought.

Addendum. While I was preparing my comment, two more comments, by the authors and by Dr. Nobre, were published under the same subject. I understand and to some degree share the concern of Dr. Nobre in his NOTE. This discussion is not easy (for me), but it is open and responsible, and in this breath of fresh air any admixture of anonymity is felt at once. Unlike Dr. Nobre I cannot see from what the referees might wish to be protected by anonymity in this purely academic and exemplarily respectful discussion. And I understand and partially support the attitude of Dr. Hurk, too. Dr. Hurk took the labor of summarizing and presenting those group views, which are perhaps not all his own, under his name. In this way that was an action against anonymity and towards openness, because otherwise these views could remain anonymously circulating, unanswered but influencing public opinion.

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