

Biotic Regulation: Biotic Pump

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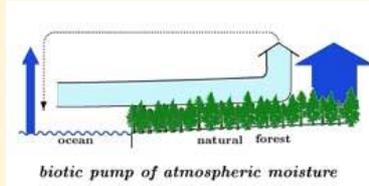
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Introduction

If you cut your forest, the winds will not blow from the ocean and will not bring you rain. **Natural forests draw atmospheric moisture inland from the ocean and compensate river runoff. Forests make rivers.** [...](#)

Due to their high leaf area index, natural forests maintain high transpiration fluxes (thick dark blue arrow), which exceed the evaporation fluxes over the ocean (thin dark blue arrow). The evaporated moisture undergoes condensation and disappears from the gas phase. Air in the atmospheric column above the forest rarifies. In the result, there appears ascending air motion over the forest canopy, which, in its turn, "sucks in" moist air from the ocean (light blue arrow). It then returns to the ocean in the upper atmosphere (dotted arrow) after precipitation of moisture over the continent.



Main findings

The-chicken-or-the-egg problem of whether forests grow where it is wet, or it is wet where the forests grow, solves unambiguously in favor of the forests' priority. Physical foundations for this conclusion (**the non-equilibrium vertical distribution of atmospheric water vapor and the associated upward-directed force of osmotic nature, termed the evaporative force**), as well as the empirical evidence (precipitation dependence on distance from the ocean in forested versus non-forested areas) illustrating the action of forest moisture pump and its decisive role in the maintenance of water cycle on land, are described. [...](#)

Publications

Links to all our publications relevant to biotic pump. [...](#)

Biotic Pump Overview 2012

Interview to Mongabay.com. [...](#)

Biotic Pump Overview 2009

15 responses to the Spanish Meteorological Magazine. [...](#)

Discussion

The biotic pump idea was first put forward in the end of 2005. Since that time many interesting comments and questions became available. Comprehensive discussion was hosted on the pages of the Hydrology and Earth System Sciences Discussions journal of the European Geosciences Union, where the biotic pump was first published and where it became one of the most commented papers. Some comments were made informally to the authors and some are anonymous. Here we give an overview of all the reactions, with our comments and responses to criticisms. Note that the Russian version of this section is not a translation of the English version. Instead, it publicizes our correspondence (in Russian) with the Editorial Boards of the Russian journals "Water Resources" and "Physics of Atmosphere and Ocean", including anonymous reviews and the authors' responses to them. [...](#)

Miscellaneous

This section includes presentations of biotic pump at conferences; mass-media articles on biotic pump; and all other relevant issues not covered in the above sections. For example, in October 2007 an interesting prediction of the biotic pump theory was confirmed, namely that natural forests should increase transpiration during droughts (Saleska et al. 2007 Science 318: 612). Increased evaporation leads to intensification of the upwelling fluxes of moist air and of horizontal influx of moist air from the ocean, to offset the adverse effects of the drought. Forests that do regulate the water cycle are expected to behave like this. This behaviour was confirmed with satellite data on leaf area index in Amazon forests during the 2005 drought. [...](#)

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New to Biotic Regulation?
Start your reading here then!
To know why it rains
where forests grow
and not vice versa, read here.

Biotic Regulation news

Your questions 11 Dec 2012
Does biotic pump work on a small scale? [...](#)

Publications 30 Nov 2012
Condensation of water vapor in the gravitational field (JETP) [...](#)

BR for Everyone 18 Aug 2012
2012 London Olympics: Energetic records of animals and man [...](#)

This might be interesting

Frictional dissipation in a precipitating atmosphere [...](#)

Oil and economic slavery in the 21st century [...](#)

On the nature of intraspecific genetic variability [...](#)

Biotic regulation versus genetic adaptation and nutrient limitation [...](#)

Reply to Bister et al. [...](#)

On the blog

Thoughts on Russian science and biotic pump prompted by a Washington Post article [...](#)

Temperature and flooding in Thailand [...](#)

Text that was not included in our reply 2 to Dr. Isaac Held [...](#)

Pump Physical Basis