Scientists' statement on recent press release on Amazon susceptibility to reductions in rainfall: no Amazon rainforest "myths" have been debunked.

March 18, 2010

The scientists who signed this statement conduct research on Amazon forests, climate, and/or fire

The press release from Boston University[1] describing a recent article in the journal Geophysical Research Letters[2] by BU researchers on the response of Amazon forests to the 2005 drought is misleading and inaccurate. It claims that the study "debunks myths about Amazon rainforests", which is simply not true. First, there is no myth. Rather, there are multiple, consistent lines of evidence from ground-based studies published in the peer-reviewed literature that Amazon forests are, indeed, very susceptible to drought stress. Second, nothing is debunked by the new study. The new study contributes to our understanding of interpretations of data retrieved from satellites, but it does not prove or disprove anything about what is really happening on the ground. The BU press release also claims that the new BU paper demonstrates that the IPCC statement about the sensitivity of Amazon forests to small reductions in rainfall[3] is inaccurate, which is also not true. While the IPCC statement could be criticized for citing a review paper rather than original research papers, the main conclusion of the IPCC statement – that Amazonian forests are very susceptible to reductions in rainfall – remains our best understanding of the data available at the time of the IPCC report and also today.

The article published by the BU group (in contrast to the BU press release) makes a scientific contribution to our knowledge of Amazon forests. It presents new analyses of the forest canopy conducted using satellite data from the MODIS sensor. The article challenges the findings of a previous analysis of forest response to the 2005 drought using similar data from the MODIS sensor. This earlier study, published in Science in 2007[4], concluded that southwestern Amazon forests fared well during the severe drought of 2005, reporting that these forests were greener in 2005, not browner as would be expected if the forests were stressed by drought. The new study found that the forests fared neither better nor worse, as indicated by the color of the canopy as seen from satellite images during the 2005 drought. Scientists are likely to continue to debate the differences in their analyses of the satellite imagery, and the articles in question illustrate the scientific learning process as we explore the potential and the limitations of satellite-based measurements to give us information about forest response to drought in the Amazon region.

Forest tree measurements made under the forest canopy following the 2005 drought provide a very different picture of the sensitivity of Amazon rainforests to drought. In tree inventories conducted in 55 long-term forest plots scattered across the Amazon forest, the drought of 2005 was associated with a large surge in tree mortality and no gains in growth[5]. These findings, published in the journal Science in 2009, are consistent with the results of two large-scale experiments, in which large canopy trees began to die after three years of experimentally reduced rainfall[6]. The forest plot results are also consistent with studies of historical rainfall and soil water storage capacity[7] and with simulation model analyses[8]. These studies, published in some of the best peer-reviewed science journals, provide several consistent lines of evidence that the forests of the Amazon Basin are susceptible to small reductions in rainfall. We do not know why the drought stress and tree mortality documented in the field studies published in the 2009 Science article and predicted based upon rainfall patterns were not detected in the analyses of satellite images by the Saleska- and Samantha-led teams. It could be that tree deaths, which affect only a portion of the tree canopy, are hard to see in satellite images, especially if this tree death is accompanied by the growth of vines and plants on the forest floor. It could also be that the tree mortality induced by drought was sufficiently delayed to be invisible in the imagery of 2005. This should be the topic of further research.

Reductions in rainfall can affect Amazon forests by increasing tree mortality, but also by increasing their susceptibility to fire. The initial fire kills trees, increasing the likelihood of subsequent fires for years afterwards in a vicious positive feedback loop[9]. In 2005, more than 2000 km^2 of forest caught fire in the tiny state of Acre alone[10]. During the severe drought of 1998, approximately 40,000 km^2 of forest caught fire[11]. These are indisputable facts. It is important to remember that these droughts are part of the current Amazon climate regime. If climate change increases the frequency, severity or duration of these episodic droughts, then increased forest fire and tree mortality and reduced river flow are the likely results.

The IPCC must be held accountable for the best scientific information that is available in the peer-review literature at the time of its writing. The passage in the IPCC that refers to the susceptibility of the Amazon forest to drought cites a World Wildlife Fund review report which, in turn, cites an article in the journal Nature[12]. Ideally, the IPCC should have cited the Nature article as well as several other existing articles in support of its statement, and not a WWF report. The point is, however, that the statement made by the IPCC about the sensitivity of Amazon forests drought was consistent with our knowledge at that time, and has been reinforced by new studies.

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