Research group finds fungi spores contribute to cloud formation and rain in Amazon

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Solimões, the section of the upper Amazon River. Image: Wikipedia.

(Phys.org)—An international team of researchers looking to understand the way nature originally caused cloud formation and subsequent rain to fall, have undertaken a study in the Amazon River basin, where scientists say, the air is much closer to its natural state than in other areas due to the constant influx of fresh air from over the ocean and nearly constant rainfall. There they have found, as they describe in their paper published in the journal *Science*, that fungi spores covered with organic gel, attract moisture leading to cloud formation and rain, which results in a form of feedback loop as the water evaporates.

For clouds to form and rain to fall, water has to have something in the air to cling to, in most cases, that something is an aerosol, which is any sort of solid matter that is light and small enough to drift about in the air. To

find out which sort of aerosols might be present in the Amazon, the researchers climbed up a man-made tower that rose 262 feet into the air and collected air samples. Upon inspection, they found three major nano-sized aerosols, each with high levels of potassium and covered in an organic gel, the result of organic gas condensation. The team narrowed down the list of possible sources for the salty potassium cores, to fungi spores that drift up from the forest floor. They ruled out salt from the ocean as a source due to differences in structure and distance from the sea. The gel coating allows water to very easily cling to the aerosols leading to cloud formation and then of course rain. Because the spores come from the forest itself, the findings suggest that the Amazon River ecosystem is one giant feedback loop.

These new findings are important for earth scientists because in order to understand cloud formation in today's less than pristine environment, they need to know how the system originally worked, and because human's have caused such widespread changes, it's grown difficult to find places that still behave as they did before people started changing things. That's why the Amazon data is so valuable, it offers scientists a glimpse of the way things are supposed to work so that they can build accurate base models upon which they can add newer factors such as changes in ozone and carbon levels.

The researchers aren't yet sure exactly which mold spore species wind up as aerosol cores, but plan to do more research to find out, because doing so will shed more light on ways in which salt is involved in the whole process.

More information: Biogenic Potassium Salt Particles as Seeds for Secondary Organic Aerosol in the Amazon, *Science*, 31 August 2012: Vol. 337 no. 6098 pp. 1075-1078 DOI: 10.1126/science.1223264

ABSTRACT

The fine particles serving as cloud condensation nuclei in pristine Amazonian rainforest air consist mostly of secondary organic aerosol. Their origin is enigmatic, however, because new particle formation in the atmosphere is not observed. Here, we show that the growth of organic aerosol particles can be initiated by potassium-salt–rich particles emitted by biota in the rainforest. These particles act as seeds for the condensation of low- or semi-volatile organic compounds from the atmospheric gas phase or multiphase oxidation of isoprene and terpenes. Our findings suggest that the primary emission of biogenic salt particles directly influences the number concentration of cloud condensation nuclei and affects the microphysics of cloud formation and precipitation over the rainforest.

Press release