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OBSERVATORY

Rain Forests, It Seems, Need the Dry Season

By HENRY FOUNTAIN

To the uninitiated, the Amazon rain forests are a vast ocean of trees that are unchanging throughout the year.

Scientists know better. Like trees in more temperate regions, those in the tropics display what is called phenological behavior — budding and other events that recur seasonally.

“We always find there seems to be some sort of seasonality” in the rain forests, said Ranga B. Myneni, a professor in the department of geography and environment at Boston University, that corresponds to the rainy and dry (or rather, not so rainy) seasons.

But the overall impact of this seasonal behavior has been largely unstudied. Now, Dr. Myneni and other researchers have discovered one effect: leaf area in the Amazon changes significantly between wet and dry seasons.

The researchers used data from NASA’s Terra satellite, which can measure reflected sunlight from the ground at various frequencies, to analyze the “greenness” of given areas over time.

They found that compared with the annual average, the Amazon had 25 percent more leaf coverage in the dry season and 25 percent less in the rainy season. The findings are reported in The Proceedings of the National Academy of Sciences.

Dr. Myneni said the results were counterintuitive, because rain forest trees have been thought to be limited by available water.

But the study shows that the trees are worse off in the rainy season, when many leaves die but relatively few new ones are produced. In the dry season they thrive; far more new leaves are produced than are shed, allowing the tree to benefit from the season’s increased sunlight. In fact, Dr. Myneni said, it appears that the trees anticipate the dry season, putting out leaves earlier, suggesting that they have evolved to take maximum advantage of the light.

The findings show that water is not the limiting factor. “These plants are kind of clever,” Dr. Myneni said. “They have deep roots and are able to tap water deep in the soil. What’s really limiting them is light.”

The results also may help answer a longstanding question as to how the rainy season starts. More leaves mean more water vapor in the atmosphere through transpiration. So the additional growth during the dry season, Dr. Myneni said, “seems to be a strong driver for triggering the onset of the wet.”

Urban Ants Take the Heat

There may be some remaining pockets of resistance to the idea that the planet is heating up, but no one can deny that cities have been growing warmer. Urban areas can be as much as 20 degrees hotter than nearby rural ones, a result, among other factors, of all that concrete and asphalt pumping out heat as sunlight hits it.

Sweltering temperatures affect humans, of course, but are there other biological consequences of what are known as urban heat islands? A study by Michael J. Angilletta Jr. of Indiana State University and colleagues shows that there is. Urban ants, they report in PLoS Biology, can stand the heat better than those from out of town.

The researchers studied leaf-cutter ants in and around São Paulo, Brazil, where surface temperatures at midday in summer can rise above 110 degrees Fahrenheit. This is hot enough to stop an ant in its tracks, so ants that can better tolerate heat would be better able to reach shelter as temperatures approached the danger point.

To compare the heat-tolerating abilities of urban and rural ants, the researchers exposed both to temperatures near the maximum, about 108 degrees, and measured how long it took before they became immobilized. Ants from within São Paulo lasted 20 percent longer than those from rural areas outside the city.

The researchers say they do not know whether the difference in tolerance has been wired into the ants genetically or whether it is more that all individuals can become acclimatized to environmental conditions.

Either way, they say, their study shows that urban heat can affect species. And since, when it comes to warming, cities are far ahead of the rest of the globe, studies like this can give researchers an idea of the types of changes that may occur with other species as the whole planet heats up.

Arsenic Levels in Rice

Rice may be a great accompaniment to a main dish, but some rice apparently comes with an accompaniment of its own — the toxic element arsenic.

In the journal Environmental Science and Technology, P. N. Williams and colleagues at the University of Aberdeen in Scotland report on a study of rice bought at American supermarkets. Comparing products from the nation's two major growing regions, the researchers found that rice from South-Central states like Arkansas and Louisiana had about 30 micrograms of arsenic per gram, or nearly twice the level found in rice from California.

The most likely reason for the difference, the researchers say, is that rice growers in South-Central states are increasingly using old cotton fields, where years of application of inorganic arsenic as a pesticide has contaminated the soils.

Arsenic is a carcinogen and can cause skin, reproductive, developmental and other disorders. Given that most Americans do not eat large amounts of rice, the arsenic levels in the tested rice may not result in excessive exposure to arsenic.

But the researchers note that some population subgroups — among them Hispanics, Asian-Americans and

people who suffer from celiac disease and must avoid wheat products — eat much more rice on average. So for them, the researchers calculate, exposure may exceed the limits established for arsenic intake from water, the main source of the element for most Americans.

Satellite Resuscitation

It's a sad fact of orbital life, but all satellites eventually die, eventually running out of propellant or other consumables needed to keep them in orbit.

But a satellite experiment launched last week called the Orbital Express has the potential to change that. The experiment, the work of NASA and the Defense Advanced Research Projects Agency, will test the robotic repair and refueling of satellites in orbit.

It consists of two satellites, one carrying extra propellant and batteries and equipped with a small robotic arm. The two spacecraft will practice autonomous rendezvous and docking maneuvers, and the servicing satellite will try to transfer propellant and batteries to the other.