6-7-2010

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UNH Scientist To Estimate Pre-Columbian Amazonian Population Using Satellite Imagery

June 7, 2010

DURHAM, N.H. – University of New Hampshire tropical ecologist Michael Palace has been awarded a $364K grant from NASA’s Space Archaeology program to estimate the population of pre-Columbian indigenous peoples in the Amazon Basin lowlands by means of satellite remote sensing technology.

Currently, population estimates vary widely – from 500,000 to 10 million – and are the subject of much controversy and debate. Among other things, knowing with more accuracy how many people might have impacted the rainforest through agriculture and development prior to European contact will help scientists understand how the Amazon Basin might withstand current pressures from deforestation, selective logging, and development.

Palace, a research assistant professor at the Complex Systems Research Center (CSRC) within the Institute for the Study or Earth, Oceans, and Space, is an expert in using satellite-borne imagery to study various aspects of tropical forests. In this project he will use hyperspectral imagery taken by NASA’s Hyperion sensor onboard the Terra satellite.

The Hyperion camera “sees” in 242 spectral bands of light, allowing scientists to identify the chemical makeup of tree leaves, which in turn is related to nutrients in the underlying soil. The more nutrient-rich leaves or specific groups of tree species seen by Hyperion will be the signature for what Palace is looking for – Amazonian black earths – sites containing soil rich in organic matter, charcoal, and nutrients and frequently associated with large accumulations of potsherds and other artifacts of human origin.

Also known as “terra preta” soils, they were created hundreds of years ago when indigenous populations slowly burned trees to make soil equivalent to “biochar,” which is extremely efficient at storing carbon and nutrients and provides fertile, productive farmland.

“There are terra preta sites all over the Amazonian basin, particularly near rivers, but no one really knows their whole distribution,” says Palace, who will collaborate with Mark Bush, an ecologist from the Florida Institute of Technology, and Brazilian archaeologist Eduardo Neves of the University of San Paulo. Also collaborating on the project are Stephen Hagen, a research scientist at Applied GeoSolutions of Newmarket who received his Ph.D. at UNH, and former CSRC faculty member Rob Braswell, now at Atmospheric Environmental Research, Inc. of Lexington, Mass.

Having identified terra preta sites in the Hyperion imagery, the researchers will then build a model to “scale up” the data and identify the location of other sites across the entire Amazon landscape. Says Palace, “This will allow archaeologists to go to these sites and determine if they are indeed terra preta. We should then be able to accurately estimate the indigenous population prior to colonial contact.”

At six million square kilometers, the Amazon basin contains the largest continuous rainforest in the world and constitutes 40 percent of what remains of this ecotype. Current scientific knowledge of the forest views its past as pristine with little human influence. If Palace’s research indicates there was a large population of indigenous peoples using the forest to maintain a highly productive agricultural system, it is likely that Amazonian forest vegetation was significantly altered and may be thought of as a cultural artifact, resilient to human disturbance and not an undisturbed forest.

NASA’s little-known space archaeology program is getting its share of headlines primarily through research being conducted in South and Central America, including recent work that uncovered one of the largest Mayan cities in Belize.

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institution, enrolling 12,200 undergraduate and 2,200 graduate students.

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