

# The TRUTH is Down Here

**How to be sure Earth-viewing satellites tell the straight story?  
Get down on the ground and check.**

by Bijal Trivedi

Every day for more than a year, Ane Alencar bounced her jeep across the potholed dirt roads of Para, Brazil, past miles of silent, ash-black pastures. In the dusty dry months and in the rainy season, when the roads became rivers of mud, she drove to remote farms and cattle ranches to document how much of the rainforest landowners had logged or burned. She'd seen it already, but then again she hadn't. Alencar's treks were part of an experiment to determine whether satellite data—in this case Landsat photography of deforestation in the Brazilian Amazon—was accurately portraying conditions on the ground.

The work began after Daniel Nepstad, a field ecologist at the Woods Hole Research Center in Massachusetts, noticed discrepancies between satellite pictures and his own field experience studying forest recovery on abandoned farms in the Amazon. Landsat, it seemed to him, was missing huge gashes of forest that he knew had been destroyed by burning and logging. If true, it meant that Landsat-derived estimates of deforestation—the kind most commonly used by scientists and governments—were far too low.

Nepstad enlisted field teams from the Amazon Institute of Environmental Research, where Ane Alencar works, to do 200 household interviews. Another Brazilian research institute helped interview 1,400 sawmill operators. In three years, the teams surveyed properties covering 3,500 square miles of territory. "The [landowners] talked to

me gladly," Alencar says. "Some would invite me for dinner, some proposed marriage, some would try to convert me to their church. I couldn't do this work only asking about satellite maps, burning, and forest fires. I first had to get into their life."

Eventually she would pull out satellite pictures and show them to her hosts. At first they couldn't understand the images, but then they would say, "Oh, this is my pasture" or "That's my forest." Alencar would ask the owners to sketch areas on the map that had been logged or burned.

Three years of this kind of patient ground work confirmed Nepstad's suspicions: Landsat pictures were missing at least half the areas actually being destroyed or damaged. It turned out that mild disturbances like light logging or pasture burns registered only in satellite images taken within a year or so of the destruction. Any longer than that, and the area would be overgrown with vines and small trees, effectively fooling Landsat—which records the spectral signature of vegetation—into thinking it was still lush forest.

Therein lies one of the problems with satellite data. It can't always be trusted, at least not absolutely. For example, current satellite vegetation maps, which show, for example, the boundaries between cropland and forest, are only about 70 percent accurate, estimates Tom Loveland, a remote sensing scientist with the U.S. Geological Survey in Sioux Falls, South Dakota. Loveland was part of a team that pro-



*Satellites will never get this good a view of Costa Rica's rainforest, but they come closer every day.*



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