

gradually run down? The researchers do not know yet, but the project is intended to continue for another 20 years. Along the way, the project should provide many

data to test theories of island biogeography and come up with some practical idea on how groups of Amazon species can be maintained. □

INPE-SPACE INSTITUTE

At the centre of a storm

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It is a curious circumstance that if it were not for a quarrel over deforestation of the Amazon, the National Institute of Space Research (INPE) would be little known abroad. International recognition, or at least the attention of the international media, came to the institute earlier this year when President José Sarney claimed that satellite data analysed at the institute showed that a mere 5.12 per cent of the Amazon had been cut down since 1500. In the quarrel over the validity of the figures that followed (see *Nature* 339, 86; 1989), the world press descended on the institute.

Remote sensing is in fact only one part of what INPE does. It is Brazil's biggest single research institute, employing more than 1,700 researchers in the fields of atmospheric science, astrophysics, space science and meteorology. The institute is responsible for Brazil's satellite programme and will soon see the completion of the nation's first indigenous satellite, SCD-1, being fabricated at the aeronautics company Embraer to INPE's specification.

The 115-kg SCD-1 is a relatively unsophisticated satellite, designed to collect meteorological data from 10 land stations at remote sites across the nation and retransmit them to a receiving station in Mato Grosso. But the satellite is also a key engineering test bed. By 1995, Brazil plans to launch seven satellites for use in telecommunications, search-and-rescue,

meteorology and exploration for mineral resources. That, at least, is the plan.

A major difficulty is that a separate programme to develop rocket launchers being carried out by the Space Activities Institute of the Aeronautics Ministry is way behind schedule. A one-third size scaled-down version of the rocket was launched successfully last May but there is little chance that the full-scale rocket can be ready before mid-1992, more than two years after INPE could have its satellite complete.

The rocket programme has been held up partly because of the unwillingness of the industrialized powers to transfer technology to a programme that is controlled by the military and could easily be diverted for use in long-range ballistic missiles. US refusal to sell inertial guidance systems to Brazil triggered a minor diplomatic row in April. But things are unlikely to change, given that Brazil is an important arms supplier to developing nations and provided rockets, tanks and armoured cars in the recent Middle East conflict.

Many within INPE would like to see a foreign launcher used to put the first satellites into orbit and so keep their part of the programme on schedule. A separate agreement has already been reached to build a remote-sensing satellite for China and launch it on a Chinese rocket. But the military insist that Brazil's programme must await Brazil's own launcher.



Bitter about media treatment, remote sensing director da Cunha.

Meanwhile, Roberto Pereira da Cunha, director of remote sensing at INPE, still feels bitter about press handling of the dispute that thrust prominence on INPE last April. The project was important because it was the first complete satellite image study of deforestation in a decade. But the message was lost amid controversy over the figures.

"The problem is that everyone likes to do sophisticated things", says da Cunha, "everyone likes to talk about the influence of deforestation on climate and global warming but no one wants to do the dirty work of gathering the data. It is a very trivial job for scientists." Deforestation estimates varied from 44 per cent to the World Bank's 12 per cent, but all were projections from old figures. INPE scientists calculated from a mosaic of 101 Landsat images that in fact 5.12 per cent of the government-defined 'Legal Amazon' had been deforested in recent times (not since 1500 as Sarney claimed — there are large areas of very old deforestation).

Arguments continue over whether deforestation should be related to the Legal Amazon, or to the total area of rainforest or some other number but da Cunha says these are not really important.

Absolute values matter little compared with continuing rates of deforestation. He is now trying to obtain funds to study changes through to 1992 as part of the International Space Year, in collaboration with the US National Aeronautics and Space Administration and the European Space Agency.

Da Cunha stresses that remote sensing has many uses and his group, almost 200 strong, puts much of its effort into research in image-processing and generation as well as applications research and technology transfer. Satellite data have been used to settle legal disputes over whether land is in use or not (a key factor in maintaining ownership), to estimate the areas of flooding of the giant reservoirs and to monitor development projects. And in a more esoteric project, some of da Cunha's group are using satellite data to study the gigantic and enigmatic patterns of lines in the desert at Nazca in Peru, to see if they were drawn according to astronomical principles. □



The Amazon basin in mosaic form from INPE. The fine grid of lines at the bottom is the road system in Rondônia. Around it much of the forest has been cut down.