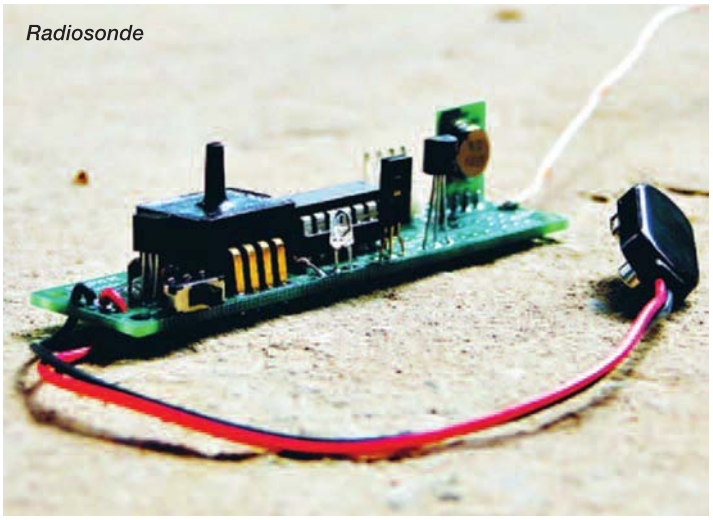
POSTGRADUATE PINPOINT

The first in a series of features on inspiring work by our postgraduates



Radiosonde

The changing atmosphere of **rainforest research**

Thomas Lafon, MPhil student in the Faculty of Technology, Design and Environment outlines his work with Jennifer Fowler, from the University of Montana, to find a viable alternative to collecting atmospheric readings

Recording atmospheric data is of great importance to many scientific fields. Research suggests that deforestation of the Amazon Rainforest will affect both local precipitation patterns and water distribution over parts of North America, Europe and South Africa.

Lack of basic data

Although the importance of the Amazon has been emphasised in numerous studies, the impact of its vegetation on precipitation is still poorly understood. Scientists agree that this largely results from the lack of basic observational data systematically collected over time and space. In order to study the Amazon basin with a certain degree of confidence, it is imperative to have both ground data and the more costly atmospheric observations.

Atmospheric soundings are vertical measurements of the state of the atmosphere; typically including data on temperature, humidity, pressure and winds. These variables are collected during a 'sounding' flight that uses a set of sensors called a 'radiosonde' or 'sonde' – 'radio' because it transmits the data using electromagnetic waves and 'sonde' from the French word for probe.

The radiosonde is sent up into the atmosphere tied to a balloon filled with a lifting gas, usually helium or hydrogen. During its ascent, the radiosonde transmits its readings to a receiving station on the ground. Upon reaching the upper parts of the atmosphere, the balloon pops and the radiosonde then descends back to earth using a parachute.

Prohibitive costs

The primary reason for the lack of sounding data is, quite simply, cost. The price, based on completing two flights a day, is on average £100 per sonde for a large agency, such as a national weather institute. A station will spend approximately £73,000 per year on sondes alone, excluding other expenses such as balloons, gas, lines and parachutes.

It is important to recognise that cost is a recurrent issue in the developing countries of Africa and South America, where the budgets allocated to soundings are often limited. This inhibits the vast majority of developing countries from complying with the standards set by the World Meteorological Organisation.

Developing a cheaper alternative

A cheaper alternative for daily soundings would be to have the radiosonde return so that it could be reused. Once a balloon has been launched it is often impossible to get the equipment back: the sonde can drift tens of kilometres away. In parts of the globe where topography or land-cover render the landing site difficult to access - for example, in the dense vegetation of the Amazon Rainforest - the issue is even more apparent.

The development of a new technology to recycle radiosondeswas initiated in 1997. This system sees the lifting of a miniature plane using the same balloon and lifting gas method as that of a regular sounding flight. However, once the balloon reaches its upmost altitude and pops, the plane free-falls and then glides back to a designated point using an onboard GPS and flight navigation computer.

Two issues currently hamper the development of glidersonde technology:

- how to introduce reusable radiosondes while maintaining the market for sondes
- the difficulty in obtaining flying permits, as glidersondes fall in the same category as drones.

Climate models are key and powerful tools, with which most future predictions are archived today. However, for as long as our observed data remains uncertain, so will our models' predictions. Therefore, it's imperitave to broaden interagency and private industry cooperation in order to solve these issues. It should be clearly understood that the required data are equally beneficial for all involved parties.