

Report

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Contact CEH NORA team at
nora@ceh.ac.uk

**CEH Integrating fund project:
Linking hydrological and carbon cycle processes for tropical rainforest:
process studies and model development**

Year 1 (2000 –2001) Interim Report, Task 1.

Martin Hodnett, CEH Wallingford

This CEH Integrating Fund project is intimately linked with an EU Framework 5 project (CARBONSINK-LBA) in which CEH Wallingford is a partner. This EU project began in July 2000 and its main objective is to examine the controls that determine the magnitude and the behaviour of the Amazonian forest carbon sink, to provide improved estimates of the current rate of carbon sequestration by forest, and to predict the future behaviour and implications of the tropical forest carbon sink for global and European carbon management policies. The project is within the framework of the existing Large-scale Biosphere Atmosphere experiment in Amazonia (LBA) and is focussed on the LBA site to the north of Manaus in central Amazonia at which eddy co-variance measurements of carbon fluxes are already under way under an earlier EU funded project (LBA – EUSTACH).

Through earlier studies in Brazil, CEH Wallingford have developed excellent working relations with partner organisations there, but recently (in particular since Kyoto) there has been considerable political sensitivity (at a Governmental level) about foreign researchers carrying out research in the forests of Brazilian Amazonia. For previous studies, this was never a serious issue, but the growth in sensitivity led to a considerable delay in obtaining the necessary "expedition license" from the Brazilian Authorities and this has prevented the start of the fieldwork and data collection component of both the EU and IF projects. Clearance was eventually given in mid-September and fieldwork should now commence in November once the equipment has been shipped (not possible before license obtained) and a visa has been obtained. The latter is subject to a further delay caused by the need for the visa application to be supported by a police declaration about one's criminal record. This takes 6 weeks to obtain. The police declaration is a new requirement.

Activities

June 2000. Martin Hodnett visited Brazil. The main aims of this visit were twofold:

1. to attend the LBA Science conference in Belem to hear and discuss the most recent results on carbon cycle research being carried out in Amazonia by Brazilian, US and EU researchers.
2. to liaise with Brazilian collaborators in Manaus. A visit was made to the study area and the forest around the existing flux measurement towers was reconnoitred to identify likely gauging sites and suitable slopes for the instrumentation. Details of the instrumentation and logistical arrangements for operating the site were discussed.

October 2000. TOPOG demonstration. A Brazilian student, Debora Drucker, who had been working with the TOPOG model with EU collaborators at ALTERRA, Wageningen, visited CEH Wallingford to demonstrate the model to Martin Hodnett, Robin Hall and Ronnie Milne. While at ALTERRA, Debora developed a digital elevation model of the

study catchment and this has been made available to CEH.

Aug 2000 - . Following the visit to the study site in Brazil, a detailed equipment list was finalised with our EU partners. Suppliers of equipment were researched and the orders were placed. The equipment for certain parts of the study was designed and was made up in the CEH Wallingford mechanical and electronic workshops. Some of the purchased equipment was configured for the study or modified as necessary. Various sensors (mainly pressure transducers for water level measurement, and V-notches for flow measurement) were calibrated.

The equipment has been packed and labelled ready for despatch and detailed packing lists in Portuguese (required for the customs in Brazil) have been produced. The customs clearance process has been initiated (since receipt of the expedition license) using these lists. The equipment will be despatched when authorisation is received from our Brazilian collaborators.

May – June 2001. Following the already considerable delays, a further visit was made to Brazil to help “revive” the project and to further reconnoitre the study catchment.

Work to be undertaken in 2001 – 2002

The field equipment will be installed and counterpart staff/observers will be trained. Field observations will commence and any teething problems in data collection will be ironed out. Quality control of data and subsequent analysis can then commence.

As a result of the delays, the CEH Wallingford component of this project is currently markedly underspent, but this situation will change once the fieldwork gets under way. It is anticipated however that there will still be an overall underspend on staff time this FY, which we would like to move forward to the next FY.

Task 2: CEH Edinburgh Carbon process modelling.

R.Milne

The main activity has been the installation of the TOPOG catchment moisture modelling system on the Sun Unix server at CEH Edinburgh. Literature review of techniques to model the transport of soil carbon into streams has also been conducted.

TOPOG is a complex modelling environment developed at CSIRO with facilities for describing catchment topography using digitised contours and spot heights for which a mesh of finite elements is then generated. Climate data, particularly rainfall, is also input and used with the topography to generate moisture storage and movement through the catchment.

We have now installed the TOPOG system at Edinburgh. Topographic and example climate data has been prepared by colleagues at Alterra, in the Netherlands, for the ZF2 catchment in Brazil. The topography of the catchment is shown in Figure 1. We have verified that moisture fields can be generated for the catchment that match the examples provided by Alterra. These are shown in Figure 2.

The TOPOG system also includes a plant growth component and the structure of this is now being studied in detail and will be tested against further example data.

Work to be undertaken in 2001 – 2002

The plant carbon component of TOPOG will be developed to describe the flow of carbon into the soil via the processes of turnover of above and below ground plant parts. Descriptions of the transfer of this decomposing material into soil organic matter will also be added. Once these improvements have been carried out descriptions of the amount of carbon taken up by soil water will be implemented.

Testing and parameterisation of these new components in TOPOG will be carried out in 2002-2003 using field data to be collected by CEH Wallingford in the campaigns presently being planned.



Figure 1 Topography of full catchment with area of study marked.

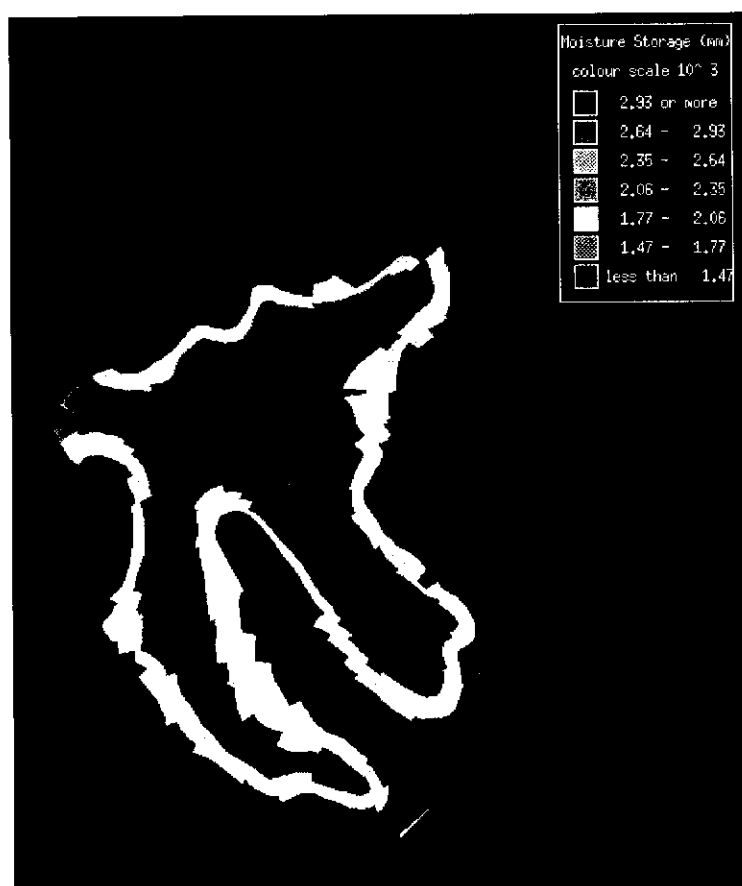


Figure 2. Example of stored moisture file from TOPOG model.