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INTER AGENCY AGREEMENT: ACTIVITY REPORT IN HYDRODYNAMICS DURING JANUARY-JUNE 1997

by

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<u>PREFACE</u>

The Research for the Management of the Fisheries on Lake Tanganyika project (LTR) became fully operational in January 1992. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Finnish International Development Agency (FINNIDA) and the Arab Gulf Program for the United Nations Development Organization (AGFUND)

LTR's objective is the determination of the biological basis for fish production on Lake Tanganyika, in order to permit the formulation of a coherent lake-wide fisheries management policy for the four riparian States (Burundi, Tanzania, D. R. Congo and Zambia)

Particular attention is given to the reinforcement of the skills and physical facilities of the fisheries research units in all four beneficiary countries as well as to the build-up of effective coordination mechanisms to ensure full collaboration between the Governments concerned.

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1. GENERAL

This is an interim report on the activities in hydrodynamic modelling which is a part of the Interagency Agreement (RAF/92/G32) between the UNDP/OPS and FAO/UN to undertake the project component of circulation modelling for the Lake Tanganyika Biodiversity Project and Lake Tanganyika Research Project, respectively. Hydrodynamic studies are being conducted through the subcontract between FAO and the University of Kuopio, Finland, with the Environmental Agency of Häme as an associated partner. The final report will be provided by the end of 1997.

During the reported period, the hydrodynamic modelling was continued in three main areas: (1) transfer of the model from VAX main-frame computer to Windows NT-Alpha Workstation, (2) development of GUI (Graphical User Interface) using IDL (fourthgeneration programming language) and (3) studies of regional sediment transport and circulation models.

Apart from the above, a complementary study to apply the HIRLAM weather forecasting system for the Lake Tanganyika region was started with partial support from the Academy of Finland.

Data collection in the field was continued with automatic meteorological and wind stations on shore, and thermistor chains off shore. Data have also been compiled with the current and CTD-profiler as well as with meteorological stations during the cruise 7-14.4.97 no. 14 on board the R/V Tanganyika Explorer.

Preliminary data analysis and reporting have been carried out by the national and international staff in hydrodynamics during the period reported. The international expert in hydrodynamics finished his assignment on 12.5.1997. A revision of the budget has been prepared and a new short term contract for international experts will be proposed to enable the hydrodynamic studies and final report to be completed.

In February 1997, four national counterparts, one from each riparian country, were engaged on a short-term basis to carry out the field activities including the sampling and preliminary data analysis. Their contribution will be necessary for the final report at the end of IAA, i.e. November 1997.

Counterpart training both on the use and techniques of ADCP (Acoustic Doppler Current Profiler), workhorses, the vessel's meteorological station and CTD-sonde and data analysis was provided as before during the cruise.

2. DATA COLLECTION

Data collection has been continued at all three stations during the report period.

A lake-wide cruise in hydrodynamics was conducted in April. The objectives of the expedition were: 1) to collect spatial and temporal data on water currents around the lake with ADCP (Acoustic Doppler Current Profiler) and outside some river estuaries particularly off the Malagarasi River; 2) to collect data with CTDsonde along and across the lake to determine the vertical stratification of temperature, conductivity and dissolved oxygen; 3) to collect meteorological parameters with the vessel's meteorological station; and 4) to collect sediment samples for sediment transport modelling at certain river mouths.

During the cruise, 330 Nm of transects were sailed to measure current flows, measurements at four workhorse stations were done and 72 CTD-profiles were assessed. The weather station onboard the R/V Tanganyika Explorer collected data on a non-stop basis during the cruise.

All the data will be used for verification of the 3-D hydrodynamic model, but will also be summarised separately in the final IAA report. Furthermore, the obtained results will give the outlines for planning the next hydrodynamic survey in August 1997.

3. DATA ANALYSIS

The analysis of meteorological data collected with the automatic recorders has been continued by the national and international personnel of LTR.

Preliminary analyses of vessel's meteorological station, CTD profiler as well as ADCP and workhorse data were started in February 1997. The ADCP data from the cruises in November 1996 and April 1997 have now been processed. The data are given as mean values and pictures of ship tracks and projected currents. Figure 1 shows two transects from November 1996 and April 1997. It includes the range and variability of the flow field and the strength of the currents during the dry season.

The results of November cruises were used for planning the April 1997 expedition as well as for planning the major dry season expedition in August 1997.

A new software package, Echobase, was introduced and personnel instructed in making analyses.

4. CIRCULATION MODELLING

Figure 2 shows a model result from Mpulungu Bay. It demonstrates the ability of the model to simulate the mesoscale gyres in the southern end of the lake.

Model development work was continued in three main areas:

1. Transfer of the model from the VAX main-frame computer to Windows NT-Alpha Workstation. Since graphical packages in VAX environment are incompatible with the Windows NT operating system, one major task was to rewrite the graphical postprocessing blocks of the general circulation model.

2. During the model development it became apparent that when handling large amounts of model data, more sophisticated tools are required to browse and visualise them and to control the program execution. Development of GUI (Graphical User Interface) has been started using IDL (fourth-generation programming language).

3. Development of regional sediment transport and circulation models. A map of the Zambian coast of Lake Tanganyika was digitised. A bilinear interpolation module was developed and tested, and it will be used in regional transport models to interpolate boundary fluxes calculated with lake-wide circulation model.

At the beginning of 1997 a project to apply the HIRLAM weather forecasting system to Lake Tanganyika region was started at the Finnish Meteorological Institute in cooperation with the University of Kuopio and Regional Environmental Agency of Häme. The project with a duration of three years is funded by the Academy of Finland. The goal of the work is to get a realistic description of the near surface wind field and other meteorological variables over Lake Tanganyika region, which can be used later as a forcing to the lake circulation model.

5. REPORTING

The data of automatic meteorological stations in 1995 have been analysed and partly reported in February 1997 (Verburg et al. 1997, Technical Document 59). Another TD will be coming out in July, Verburg et al. 1997. The data of 1996 will be analysed and published later this year.

A Field Manual for the preliminary data analysis in Echobase software will be published in the near future.

First ADCP results (June 1996) are being reported and will be published in the near future as TD, Kotilainen 1997.

For the IAA all the data will be combined and main findings and conclusions drawn for the final report in November 1997.



Figure 1

Calculated depth-averaged flow in southern part of L.Tanganyika. Simulated wind. Time 12:00



Figure 2