Sections from the TACIS Report:

Tacis	**FINAL REPORT**

Project Title:

Implementation in Ukraine of the RODOS System for Off-Site Emergency Preparedness and Response

Project Number:	TA REG 02/3
Country:	Ukraine
Beneficiary:	Ministry of Environment and Natural Resources (MENRU)
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0. Introduction

0.1 Project background and objectives

Recognising the lack of appropriate off site emergency arrangements for nuclear accident, the European Commission sponsored a study to determine the status of the off site emergency preparedness and identify specific needs for improvement. The "Needs Assessment" study encompassing 14 Central European countries and the New Independent States was completed in February 1996. The results of this study have been evaluated by the EC OSEP (Off-Site Emergency Preparedness) Inter-Service Group. Several areas where immediate support is needed were identified and the appropriate projects were initiated. One of the areas where significant deficiencies were identified is the decision making support during emergencies.

The European Commission, under the auspices of its 3rd , 4th and 5th Framework Programs, supported the development of a comprehensive and generally applicable, Real time, On-line, decision Support (RODOS) system for the off-site management of nuclear emergencies. In 2000 the pre-operational version of the system was completed that is applicable to the early and intermediate phases of an accident. Further development of the system is continued and new updated version of the system are periodically issued by the main RODOS developer FZK Karlsruhe on behalf of the Consortium of RODOS developers which consists of institutions from different countries including Ukraine (Institute of Mathematical Machine and System Problems of National Academy of Sciences – IMMSP).

A large number of institutes from countries in both Eastern and Western Europe have participated in the development of RODOS and many have expressed an interest in the use of this system within national emergency arrangements, in particular to explore its efficiency in this context.

The overall objective of the project is to implement RODOS for pre-operational operation as a decision support tool within the framework of emergency arrangements in Ukraine. This includes procurement, delivery and installation of the hardware and communication lines, installation of RODOS software and adaptation to local conditions as well as development of maintenance programmes, operating procedures and the provision of training for RODOS operators and users. Subsequently a phase of pre-operational use of the RODOS system is envisaged. Experience gained in the pre-operational use of the system would determine the extend to which it would subsequently be formally integrated into national arrangements.

The main focus of the project is to establish the hardware for operation of the system, to customise the RODOS software for the particular site and monitoring network and to provide organisational support for its implementation. More specifically, the main elements comprise:

? Procure and install the computer hardware for RODOS system in accordance with the specification provided.

? Establish the dedicated communication lines (e.g. leased telephone lines) between the organisations involved in the operation of RODOS system, including procurement and installation of hardware and software in accordance with specifications

? Install RODOS system software to dedicated hardware and adapt specific functions of RODOS to local conditions (Zaporozhe NPP site)

? Test and verify the operability of the whole system (central unit, remote units, interfaces) and its operating parameters in all of its operating modes, including all links and connections with other system (e.g. Gamma 1)

? Develop and implement procedures for the operation of RODOS in national centre.

? Develop and implement the maintenance procedures for hardware installed in the framework of the project

? Develop and implement the training program for the personnel of the national RODOS centres and other organisations involved in operation of the RODOS system. The personnel to be trained include both, the core staff for normal operation of RODOS as well as personnel involved in operation of RODOS during emergencies.

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3.6 Development of the RODOS interface with numerical weather forecasts model MM5 customised for the area of Zaporozhe NPP

The Atmospheric Dispersion Module of RODOS (ADM), that includes ALSMC – Atmospheric Local Scale Model Chain and MATCH - long-range atmospheric transport model, requires the results of a Numerical Weather Predictions (NWP) model as an input data for the simulation of atmospheric dispersion of radionuclides and fallout.

ALMC uses for its calculations meteorological data of the automatic stations near NPP and it requires the prognostic meteorological data from a NWP with horizontal resolution on the grid 10 km*10 km in 160*160 km domain around a NPP on 12 vertical layers.

The Long Range model MATCH requires as input data the NWP model data, with 1-hour time resolution and at least 48 km horizontal resolution for an area covering Ukraine and large parts of the neighbouring countries.

At the moment of the start of the TACIS project the Hydrometeorological Service of Ukraine has not operational NWP that can produce described above meteorological prognostic data for RODOS –ADM.

Institute of Mathematical Machines and System Problems of National Academy of Sciences of Ukraine (IMMSP) in cooperation with Ukrainian Hydrometcenter outside the scope of the RODOs-Ukraine Tacis project has provided the experimental customisation in Ukraine the Penn State University/UCAR (USA) numerical weather prediction model MM5. The developed software system MM5-IMMSP provides the forecasting for the Ukrainian territory in resolution 30*30 km on the basis of the rare gridded forecasting data from the German meteorological center Offenbach and operational data from Ukrainian meteostations processed by Ukr Hydrometcenter. The MM5-IMMSP is in pre-operational testing and it is planned that this NWP will be installed in nearest period in Hydrometcenter for operational use.

In the frame of the TACIS project it was planned that the software tools will be developed for the transfer of the MM5 forecasting data into MM5, preliminary downscaled on the grid 10km-10 km around the Zaporozhe NPP. The interface subsystems (programs mm5dmi and mm5lsmc), which reformat the data, output by the MM5 meteorological model, into formats, acceptable by the MATCH and ALSMC has been developed. The descriptions of these software tools are

presented in the Annex 2 to this report. The functionality of the interface is described a brief below.

The developed configuration   of the model that provides necessary downscaling of meteorological forecasting fields processes around Zaporozhe NPP includes 3 nestled grids (Fig.8,9)

 D00. Eastern European Grid -   37x37 nodes, grid mesh size 81 km,

 D01. Nestled Ukrainian/Black Sea Grid - , 73x73 nodes, grid mesh size 27 km,

 D02.   Nestled Local – Zaporozhe NPP Grid - 22x22 nodes, grid mesh size 9 km.

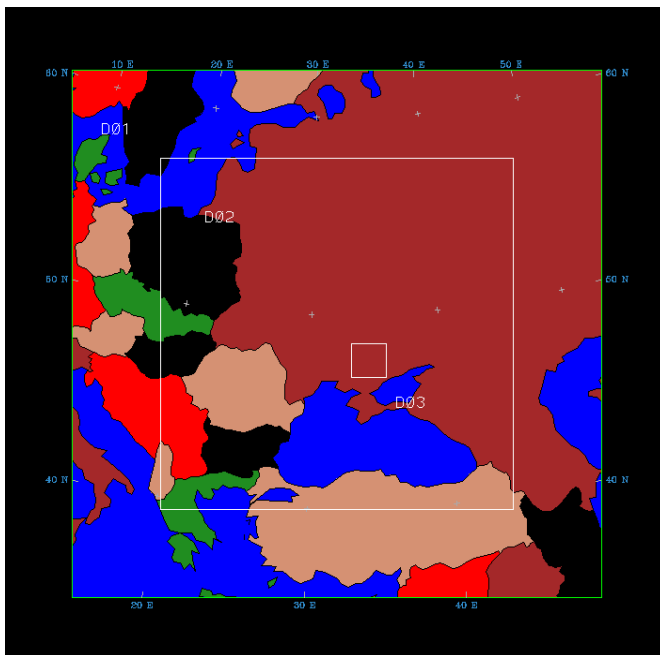Each grid includes 31 vertical sigma-level.

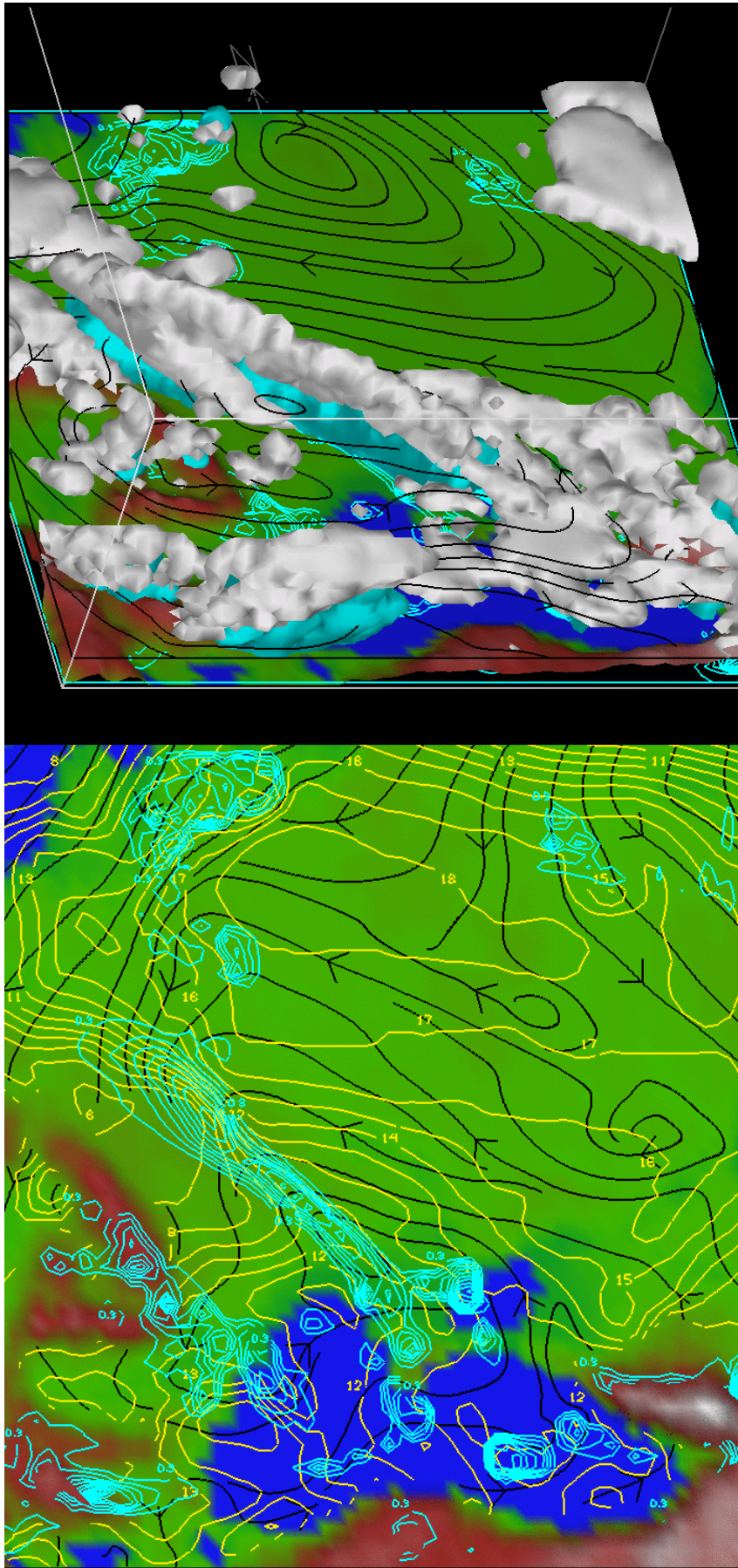Fig.8. Domains of 3 nestled grids used for the numerical weather predictions for the region of Zaporozhe NPP.

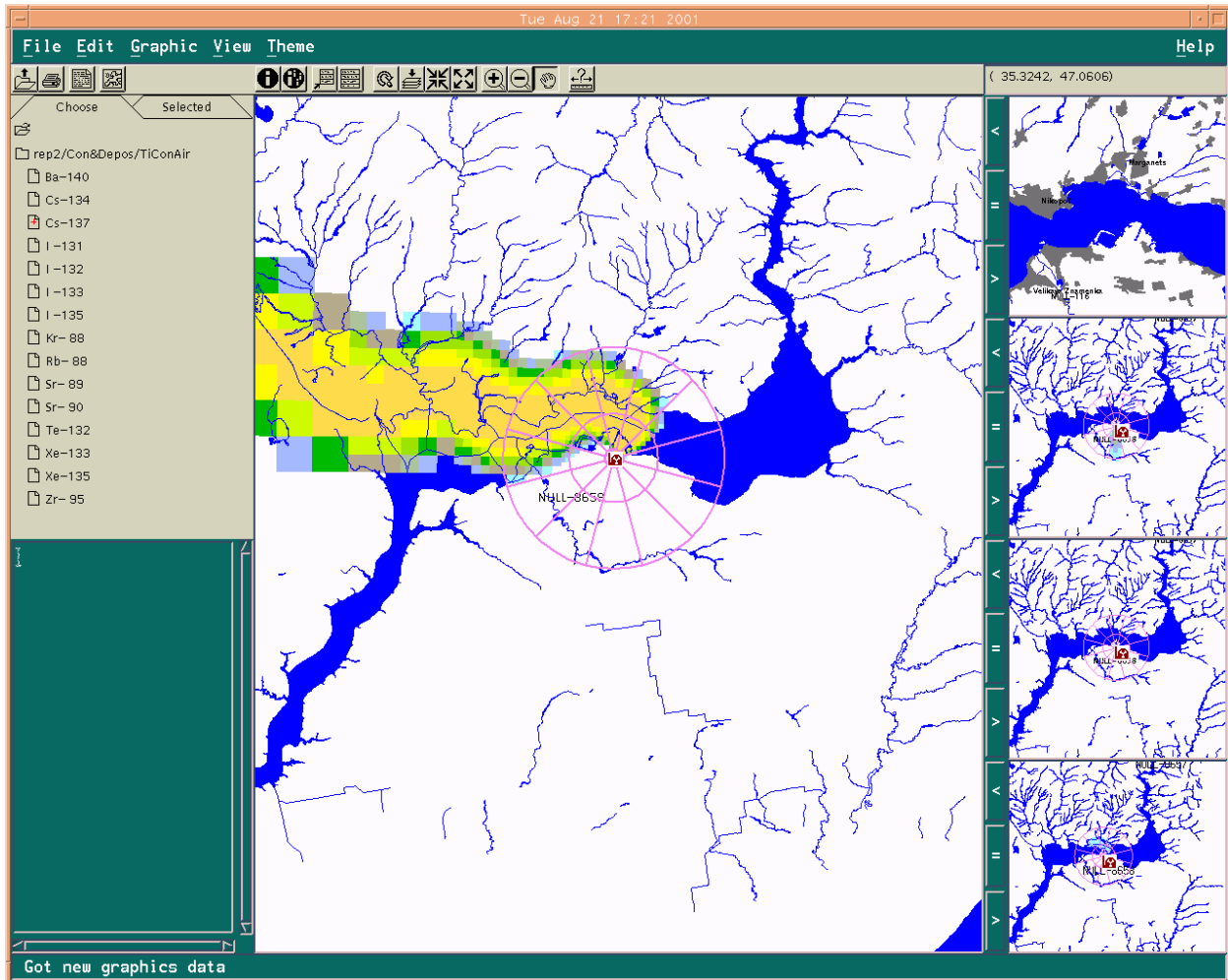Fig.9 Example of the simulated by MM5-IMMSP meteorological fields in the domain D02.

Fig.10 Simulation by RODOS of the atmospheric dispersion of radionuclides for the releases from Zaporozhe NPP on the basis of the meteorological fields predicted by MM5

The developed software tools convert the NWP results of MM5 into the formats required by the the MATCH and ALSMC modules of RODOS-ADM (Fig.10).

In pre-operational phase of RODOS use the MM5 simulated results (forecasts for next 48 hours) are transferred to the National RODOS Center from IMMSP via installed dedicated telephone line. After installation of MM5 system in Hydrometcemter, the operational forecasting will be provided in Hydrometcenter and the results will be transferred from this location to the Rodos Center.