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INTERNATIONAL REMOTE SENSING EXPERIMENT: "TELEGEO-87-NAREW"

The present remote sensing experiment — "Telegeo-87-Narew" — has been designed as one in the series of remote sensing experiments scheduled within the programme of cooperation of the Intercosmos Committee: the Remote-Sensing Workshop; the common name of the programme is: "International studies on the dynamics of geosystems by means of remote-sensing methods". It is one of the programmes of the Council for Mutual Economic Aid in which we participate.

Until 1987, experiments of this type were set up in the USSR — in Azerbaijan in 1984 and in the vicinity of Kursk in 1985 as well as in East Germany in 1986. These experiments were all carried under the common name of the programme, but still the sites where experiments were performed had been chosen arbitrarily; also, the problems which had been studied appeared to be diverse. This also explains why each of the above-mentioned experiments had a different programme of research which aimed at solving problems that were specific of a given area. And thus, this series of experiments, apart from common or similar methods of data recording, was not coherent enough to make the description of regularities in the dynamics of the particular geosystems possible; neither did it allow for the development of a remote sensing method for studying the dynamics of the environment which would be applicable to different geographical conditions. The results were fragmentary methodological contributions or some sparse data on variations of some elements of geographical environment that characterized randomly chosen and incomparable geographical contexts.

The "Telegeo-87-Narew" experiment which was conducted in Poland in 1987 was specific in its own way. The general aim of this experiment was to describe, test and evaluate the effectiveness of a complex land-based remote sensing method of examining changes that a geographical environment undergoes when exposed to drainage. It was assumed that the changes would bo examined per season as well as in many

years' periods within the time span of 1956—1987. Another goal of the experiment was to assess the economic effectiveness of drainage that had been carried out in the area under study a few years before the experiment took place. It was further assumed that the methods of research to be worked out on the basis of this experiment would then serve as basis for examining general tendencies in the development of comparable geosystems in the north-eastern part of Poland as well as in Lithuania ant Byelorussia.

In the experiment, the area along the Narew valley, situated in between Suraż and Nieciece, north of Białystok, was examined. This site covers 445 km². In the period between 1974—1982, the northern part of this land was reclaimed while its southern part remained largely unchanged. There is a big area in the South there which forms the Landscape Park; the Park was founded in 1986 to preserve the uniqueness of the natural environment in this area.

According to the programme of the experiment, the research was to be conducted with the help of the representative method. Within the area under study, four key sites were isolated; they all covered 192 km², i.e. 43% of the whole area. It was assumed that the data and the results obtained on the basis of the analysis of the key sites would establish the foundation for the analysis of the whole area, and the latter, in turn, would constitute the key site for research on a minor scale; this research was meant to cover the previously mentioned north-eastern parts of Poland as well as Lithuania and Byelorussia. According to the research programme, aerial as well as satellite images, both photographic and scanner ones, and also various types of radiometric data were all to be compiled. It was expected that the data would be collected not only by means of remote sensing techniques but also on the basis of site investigation of selected components of the geographical environment, such as: relief, water relations, vegetation, soil, weather conditions, land usage.

In order to describe seasonal variability of the selected components of the environment, site investigations were carried out three times and also three series of aerial photographs were taken. There were also satellite images taken by the COSMOS satellite on May 27th, 1987 and by the LANDSAT satellite on August 25th, 1987. Site investigations were conducted in May, July and October. A supplementary site investigation was made in July 1988, and in the same moth aerial photographs were also taken.

Panchromatic aerial photographs of the whole area under study were taken in April, July and October, and the scale was 1 : 25,000. Panchromatic pictures taken in July were also on the scales of: 1 : 20,000,

1 : 40,000, 1 : 100,000. Multispectral pictures were taken by MSK-4 camera on the scales of: 1 : 20,000, 1 : 35,000, 1 : 80,000; scanner images were obtained from the height of 2,150, 4,250 and 10,050 metres. In May, radiometric measurements within the range of VHF were made, and, furthermore, thermal images were obtained with the help of the THP-1 scanner. The specialists from Poland, the Soviet Union and former GDR took the aerial pictures and made the radiometric measurements.

Site investigation were conducted by the specialists from Poland, Bulgaria, Czechoslovakia, Germany and the Soviet Union. Also, Cuban specialists had the status of observers in the research. The site investigations (on the ground surface) were, by and large, restricted to the four key sites, and the scale was 1 : 10,000. The data obtained on the basis of this research served to describe seasonal variability of soil moisture on the ground surface; the soil moisture was measured in percentage by weight. The total number of soil samples taken at the depth of 25—30 cm was 2.000. Also, the data to describe the seasonal variability of the depth of the first water level was collected. In order to get the latter type of the data, three water stages had been measured in 610 households wells. For the four key sites, maps of vegetation were made on the scale of 1 : 10,000. In the case of two water stages, measurements of the state of biomass of selected areas were also made. A inventoryof cultivated plants of ample parts of the key sites was constructed. For the sake of this experiment, three special meteorogical stations were founded to make the measurement of basic meteorogical parameters possible; these measurements were taken at three water stages; also, bench-mark measurements of soil temperature were established for several dozen points, which was necessary for interpreting thermal images. Biometric studies of cultivated plants were undertaken and biometric measurements of cultivated plants were made. By means of site investigation techniques coefficients of soil spectral brightness were also established.

On the basis of the interpretation of aerial pictures, surveys of site investigations as well as analyses of the cartographic and descriptive data, a lithologico-pedological characteristic of the whole area under study was constructed on the scale of 1 : 25,000; on the same scale, a geomorphological map was also made.

Both the remote sensing data and the data from site investigations that were compiled in 1987 and 1988 permitted a formulation of preliminary conclusions about seasonal variability of selected components of geographical environment, i.e. soil moisture and variations of the ground water level; furthermore, it was possible to present an up-to-

-date evaluation of both topoclimatical conditions as well as of the influence of drainage on water relations.

On the basis of soil moisture characteristics that had been established for the key sites, seasonal variability of the surface soil moisture was evaluated. Within the whole area under investigation, eight site units with definite relations and variability of surface soil moisture were distinguished. The highest variability — about 70% — is characteristic of the Narew valley bed. At the bottom of denudation valleys, variability of the soil moisture reaches 10%. The areas beyond those valleys are characterized by low variability of the soil moisture.

Analysis of ground water level variations revealed that from May until October the water level regularly falls down about 0.2—0.6 m. Analysis of the effect of drainage on water relations in the area under study made the distinction of seven sites possible, each with water relations modified in a different way because of different kinds of drainage. Also, various techniques of remote sensing and remote sensing data were evaluated from the point of view of their usefulness in analysing both seasonal dynamics of hydrological phenomena and the soil moisture. After a detailed analysis of the results, the remote-sensing equipment made in the Soviet Union was given a positive mark for its applicability in establishing the amount of gravitational water in topsoil.

The analysis and the description of the data that has been accumulated in the experiment are still in progress. The research aims to present changes that affected the geographical environment in the time span of 1956—1987.