PRECISE MEASUREMENTS OF THE CHANGES OF THE GROUND WATER LEVEL IN LAMKOWKO SATELLITE OBSERVATORY. PRELIMINARY RESULTS

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CONTENTS

1. SHORT HISTORY OF THE LAMKOWKO SATELLITE OBSERVATORY

- 2. THE MEASURING SYSTEM DETECTING CHANGES IN THE LEVEL OF GROUND WATER
- 3. THE RECORDING SYSTEM AND ELABORATION OF MEASUREMENTS
- **4. PRELIMINARY RESULTS**
- **5. CONCLUSION**

SHORT HISTORY OF THE LAMKOWKO SATELLITE OBSERVATORY

The Satellite Observatory of the Warmia and Mazury University was established 45 years ago, in 1961. The Observatory was registered in COSPAR as an international tracking station of artificial Earth's satellites and assigned the number 1151.

In 1961-78 there were performed visual observations in the frame of ephemeris service, and since 1964 also in the frame of international programmes for studies of upper atmosphere layers (INTEROBS, EUROBS, ATMOSPHERE).

In 1978 the Observatory moved to a small village Lamkowko, separated about 30 km from Olsztyn. At the new place the AFU-75 camera was installed. It was applied in the research programmes ATMOSPHERE and PHOTODOPPLER, coordinated by INTERCOSMOS. In 80's theoretical as well as experimental works were carried out in the field of application of the Doppler observations to regional geodynamic studies and to realization of various engineering purposes.

The GPS observations was started in the Lamkowko Observatory after purchasing the first own GPS receivers, in February 1991.



The main building of the Lamkowko Satellite Observatory

Since 1994 the Observatory started to carry out permanent GPS observations with the Turbo Rogue SNR-8000 and Ashtech Z-12 receivers in global (IGS and EUREF) and regional programs (CERGOP, EXTENDED SAGET, EUVN and BSL)

ONSALA - NYALESUND

The results of permanent GPS observations, obtained in IGS , are the bases of own studies:

- 1. Monitoring of the Polish Lamkowko-Borowiec vector, perpendicular to Teisseyre-Tornquist's Zone.
- 2. Monitoring of the selected European, Arctic and Antarctic vectors of the IGS network.

Obtained results show, that in spite of large distances between stations, permanent GPS observations permit high precision positioning.



NYALESUND - BOROWIEC



Day-to-day changes of the Onsala-NyAlesund and Borowiec-Nyalesund baseline length between 1998-2004 Since 1995 the ionospheric studies have been carried by Institute of Geodesy of the W-M University in Olsztyn (Poland) jointly with West Department of the IZMIRAN of the Russian Academy of Sciences in Kaliningrad.

In the years 2003-2005 in the Lamkowko Satellite Observatory a measuring well equipped with a measuring float for detecting changes in the level of ground water was constructed.



The TEC maps over Europe for 7 November 2004

THE MEASURING SYSTEM DETECTING CHANGES IN THE LEVEL OF GROUND WATER

- The measuring system consists of :
- The precise digital balance,
- The stainless steel float,
- The recording system with the controlling computer ,
- The internet connection.



The measuring system (the precise digital balance) with the controlling computer 7

THE MEASURING SYSTEM DETECTING CHANGES IN THE LEVEL OF GROUND WATER

horizontal section

vertical section

The draft of the measuring system

THE RECORDING SYSTEM AND ELABORATION OF MEASUREMENTS

- The changes in the water level are measured with accuracy better than 0.1mm.
- The measurement resolution of the digital balance (1.7 10⁻⁶⁾ allows to detect several phenomena: meteorological, geodynamics, Earth tides.

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The recording and elaborating software

PRELIMINARY RESULTS

Changes in the level of ground water between January and April 2006

PRELIMINARY RESULTS

Changes in the level of ground water for several days in Fabruary (a), March (b) and April (c) 2006

CONCLUSION

- The following meteorological and geodynamical phenomena affecting the level of ground water, which can be observed by the measuring system in Lamkowko Satellite Observatory can be listed:
 - meteorological effects (precipitation, snow)
 - climatological effects (changes of atmospheric pressure)
 - Earth tides effects,
 - human influence on the environment.
- The analysis of the first semiannual measurement series allowed to preliminary recognize the complexity of the signals modifying the level of ground water in Lamkowko Satellite Observatory. Preliminary results enable to detect diurnal and semisiurnal oscillations.