

POLISH POLAR RESEARCH (POL. POLAR RES.) POLSKIE BADANIA POLARNE	5	3—4	293—294	1984
--	---	-----	---------	------

Andrzej KOBLAŃSKI, Stanisław MAŁOSZEWSKI, Janusz ŚLIZ

Institute of Geophysics, Technical University of Mining  
and Metallurgy, Cracow, al. Mickiewicza 30

## Gravimetric connection between the age points $P_1$ (Wilczekodden) and $P_3$ (Gåshamna) in the area of the Hornsund Fiord in Spitsbergen

### Communication

In the recent years the results of repeated precision levelling have proved that Scandinavia is rising after the Pleistocene glacial cover retreats. The phenomenon of slow glacier thawing can now be observed in Spitsbergen. With the postglacial stress relief, the compressed part of the lithosphere rises, the removed masses of sima return to their original place and the adjacent areas submerge as a result of the retreat from under them of part of the sima. There is also isostatic motion in Spitsbergen.

Geomorphological observations indicate that here the process of land elevation is rather rapid. In the Hornsund area, on the basis of traces of the position of whale bones from the 17th-century hunts, Birkenmajer (K. Birkenmajer, 1958, 1960) evaluates the velocity of the vertical displacement at about 2.3 m per century.

These phenomena can be expected to affect a change in the gravity as a function of time over several or dozen-odd years. In the Hornsund area, the changes could best be observed with the net of magnetic age points set in 1957 (J. Kowalczyk, K. Karaczun, 1963). The convenient situation of the points around the fiord should permit the investigation of local changes which result from differences in the geological structure of the subsurface parts of the crust.

In the course of the geophysical investigations performed in Spitsbergen in the summer of 1979 the present authors attempted to connect gravimetrically two age points:  $P_1$ —Wilczekodden and  $P_3$ —Gåshamna (Konstantinovka).

The measurements were carried out with a Worden gravimeter by the method of triple repetition. There were intervals of about 50 minutes between successive measurements. The results of these observations, expressed in the form of relative gravity increase, are the following:

$P_1$ —Wilczekodden	0.000 mGal
$P_3$ —Gåshamna	$-5.177 \pm 0.009$ mGal

The value of  $g$  is given without the Bouger correction.

Measurements of the vertical gradient of gravity were also carried out close to the age point  $P_1$ . They were carried out on a purpose-built tower, with a difference of 320 cm between observation levels. As the previous ones, these measurements were also performed with a Worden gravimeter in seven independent series. The mean value of the vertical, tower gradient determined from these measurements was  $W_{zzw} = 3034 \pm 31E$ .

Work should continue on the problem of the observation of time changes in the gravity which the present paper suggests. In the nearest future, similar measurements should be carried out at all the five age points, including the determination of the absolute value for  $P_1$ . The observations should be repeated in the same cycles (of about 2–3 years) as those of measurements of the elements of terrestrial magnetisation. The Hornsund area could thus become a model testing ground for the investigations of developments in the contemporary geodynamic processes.

## References

1. Birkenmajer K., 1958 — Z badań utworów i fauny podniesionych tarasów morskich i zagadnienia holocenijskich ruchów izostatycznych we fiordzie Hornsund. Sprawozdanie wstępne (Investigations of the formations and fauna of raised sea terraces and the problems of holocene isostatic motion in the Hornsund Fiord. Preliminary report — in Polish). Przgl. Geofiz. R. III (XI). z 2 Warszawa.
2. Birkenmajer K., 1969 — Course of the geological investigations of the Hornsund area, Vestspitsbergen, in 1957–1958. Stud. Geol. Polon., Vol. IV, Warszawa.
3. Kowalczyk J., Karaczun K., 1963 — Obserwacje elementów magnetyzmu ziemskiego w fiordzie Hornsund na Spitsbergenie w 1957 (Observations of the elements of terrestrial magnetism in the Hornsund Fiord in Spitsbergen in 1957 — in Polish). Zeszyty Naukowe AGH, Geologia z. 5, Kraków.

Paper received 1981 October 7