

## Report on the activities of the research expedition of the Polish Academy of Sciences to Spitsbergen 1980/1981

The aim of the expedition was to continue the investigations carried out in the region of the Hornsund Fiord during 1978—1980, involving researches in the field of geophysics, ecology, geodesy, geology and geomorphology. The expedition was organised by the Institute of Geophysics, Polish Academy of Sciences, with a good deal of help given by the Ministry of National Defence.

The expedition consisted of 47 participants, including 6 people of the technical team and 6 people of the transport group dealing exclusively with the unloading of the vessel m/s "Antoni Garnuszewski". The scope of the rights and duties of the members of the expedition was determined by the instructions issued by the Scientific Secretary of the Polish Academy of Sciences and regulations of the Director of the Institute of Geophysics, Polish Academy of Sciences.

The expedition worked under the leadership of: Dr. J. Niewiadomski, the Head of the Expedition, Eng. J. Wysocki, the Deputy Head dealing with Technical Matters and Com. A. Fijałkowski, the Deputy Head dealing with Maritime Matters. The members of the expedition included scientists from various universities, departmental institutes and research institutes of the Polish Academy of Sciences.

### 1. Records of the expedition

26 June 1980. m/s "Antoni Garnuszewski" set out from Gdynia for Spitsbergen, taking on board members of the Expedition of the Polish Academy of Sciences, regional groups of participants (Expeditions from the Cracow, Toruń and Wrocław Universities) and 282 tons of cargo (total equipment of the expeditions).

2. July 1980. Entry to Hornsund, beginning of unloading of the vessel.

7 July 1980. End of unloading and loading of the luggage of the precedent expedition, the equipment of the transport group and wrecked material. Embarking of the members of the precedent expedition. Sailing away for Barentsburg and Longyearbyen with the aim to pay visits to the Consul of the USSR and the Governor of Svalbard.

9 July 1980. Departure of the vessel back to Poland. Beginning of field work by members of the summertime group.

7 September 1980. End of the work of the summer group. Entering of the m/s "Łużyca" into the Hornsund Fiord. Beginning of embarkation of the summer group and their equipment on the vessel.

9 September 1980. End of the loading of the vessel and departure of the summertime group of researchers back to Poland.

26 July 1981. The d/e "Perkun" sails into Hornsund with members of the next expedition on board.

1 August 1981. After the reloading of the vessel and paying the leave-taking visits in Barentsburg and Longyearbyen the vessel sails back to Poland.

13 August 1981. The vessel with all the members of the Expedition on board enters Gdynia. Ending of the Expedition.

## 2. Realization of the scientific programme of the summer group of researchers

The summer group of the explorers carrying out the scientific programme consisted of 26 people divided into specialistic teams. There were altogether seven teams of scientists dealing with: Ecology — 5 persons, Geophysics — 8 persons, Geodesy and Geology — 2 persons each, Paleontology — 3 persons, Geomorphology — 5 persons and Hydrochemistry — 1 person.

### Ecological team

This team carried out the program concerning energetic balance of of the Arikammen-Fugleberget catchment area and material balance of the Station. That program comprised: determination of biogens in water samples, determination of phosphates and nitrogen, taking phytosociological pictures, determination of primary production and the balance of water at the Station, determination of dustiness, determination of liquid fuel content in the soil, bacteriological tests of the air.

### Geophysical team

Magnetic pictures were taken in the vicinity of the Base, electromagnetic profiling was made using the VLF method, occurrence of magnetic anomalies was localized in the area under investigations. Measurements of total intensity of magnetic field were made at four age points.

Microtremors in the Hans Glacier were registered using seismological methods. Radio-sounding of the Werenskiöld Glacier was carried out.

### Geodetic team

Geodetic and photogrammetric surveys of the area surrounding the Base were made for a topographic map in the scale 1 : 25,000. Measure-

ments and photogrammetric pictures of the Hans Glacier and a group of glaciers surrounding Brepolen were taken.

#### Geologic team

Sedimentological exploration of carbonate and clastic formations of the Cambrian, Ordovician, Pre-Cambrian and Carboniferous Periods was carried out in the regions of the northern part of the Sørkapp Land. Samples were taken for later analyses at the Institute, after return to Poland.

#### Paleontological team

Echosounding profiles were recorded in the region of Hyttevika and Nottinghambukta over a distance of about 30 km (total length). The morphology and identity of the types of sediments were much alike in the investigated stretches of the sea bottom and lofty terraces in the region of Hyttevika. Samples with intact structure were collected from the bottom of the fiord. These samples will serve for detailed paleozoological examinations. It is worth mentioning that the convenient topographical conditions predispose this area for a model type of researches in the tidal seas of the polar regions.

#### Geomorphological team

The forms of the sculpture of the earth's surface in the littoral area of the northwest part of the Sørkapp Land (about 200 km<sup>2</sup>) were mapped, i.e. glacial and periglacial forms, mass movements, etc. Medial moraines of the Torrel Glacier were also mapped. The advance and recession of the glaciers in the Holocene were studied, as well.

#### Hydrochemical team

Within the scope of the research theme: "Chemical denudation in the selected catchment areas of Spitsbergen" 270 chemical analyses of water samples from the Arikammer-Fugleberget catchment area and from the neighbourhood of Hornsund were made. The pH and electrical conductivity of the collected water samples were determined. A complete, basic chemical analysis of the water samples was made once a week. Water level and the rate of flow were registered regularly in the catchment area.

### 3. Realization of the scientific programme of the wintering group of researchers

The wintering group consisted of 10 people: the Head of the Expedition, a seismologist, a physicist (expert in magnetism), a geomorphologist-glaciologist, three meteorologists an electrical engineer, a physician and

a radio-opertaor. The wintering group spent 13 months on Spitsbergen performing, besides the scientific programme, all the necessary technical services associated with the maintenance of the Base in good state.

### Seismologic programme

The programme comprised registration of quakes originating from the agency of glaciers and tectonic faultings in the region of Spitsbergen. To this end the "Górnik" type automatic registration seismic apparatuses were used. The one-channel standard set of seismic apparatuses made possible to register tectonic earthquakes on a global scale.

### Magnetic programme

The scheme comprised absolute measurements to calculate the bases of the three component elements of the magnetic field ( $H$ ,  $D$ ,  $Z$ ), routine attending the Portable Magnetic Station and working out the results (calculation of the mean hourly  $H$ ,  $D$ ,  $Z$  components from magnetograms, calculation of the weekly indicators of magnetic activity, description of specific magnetic phenomena).

### Geomorphological-glacial programme

The ablative part and the forefield of the Hans Glacier were under investigations. Systematic measurements of ablation and accumulation were taken in several spots on the Glacier. Ice-temperature was measured in holes bored with a hot point drill down to the depth of 18 m. Hydrological observations were carried out in the valley of the Rev river with especial attention given to the mechanisms of the formation of ice deposits.

### Meteorological programme

It consisted mainly in the standard programme of meteorological measurements for synoptic purposes. A part of the results worked out forthwith was transmitted to the Norwegian Meteorologic Data Collecting Centre.

Problems connected with specific research comprised actinometric measurements, gradient measurements of meteorological elements in the air layer nearest to the earth, observations of the deflections of air flow caused by local orography in the region of Hornsund.

### Programme of the physics of the atmosphere and ionosphere

Measurements of air clearness were carried out to determine the content of ozone and atmospheric aerosol. Measurements were made with a Universal Ozonometer, type M-3. A series of pictures of aurora borealis were taken with an all-sky camera rendered accessible by the Finnish Meteorological Institute.

## Technical programme

Technical services during the summer season were performed mainly by the workmen of the technical group. However, it is worth mentioning that the scientific members of the expedition participated likewise in these activities. After the depart of the summer group all the technical services were performed exclusively by the wintering group of scientists.

During the summer season the technical group has completed the building of the summer base, started in 1979. The services comprised: assemblage of equipment, furnishing, installation of electric lighting system and water-supply systems. Moreover: construction of a tower for the all-sky camera, renovation of the cottage at Treskelen Peninsula, and all sorts of reservation, repairs and general caretaking tasks.

The wintering group, besides the typical jobs connected with the maintenance of the base in good condition, during the remaining part of the year, accomplished the renovation of the cottage at the Gashamna and restored again the cottage at Treskelen Peninsula (destroyed by polar bears).

## 4. Conclusions

The Base at Spitsbergen is a fairly well equipped scientific station. The geographical situation predisposes this region for researches concerning all the branches of the science of the earth. At present, the Base is equipped with fairly modern scientific apparatuses for the studies in the field of seismism and earth's magnetism. However, apparatuses and instruments for meteorological observations, geodetic surveying and cartography are not of the latest type.

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