

Foreword

This volume is a special issue of the Memoirs of National Institute of Polar Research. It is entirely devoted to the Proceedings of the Symposium on "Substorm Observations in Antarctica with Special Emphasis on Unmanned Observatories", which was organized by the IAGA Antarctic Committee in September 1975 in Grenoble, France. A comprehensive study of substorm phenomena is one of the most important research items in Antarctica. However, because the total area of the Antarctica surrounding the geomagnetic and the geomagnetic axis poles is so large, *i.e.*, about 12.5×10^6 km², and accessible locations for manned stations for research purposes are so limited, it seems highly necessary that a number of ground-based unmanned observatories should supplement the existing manned stations in order to fulfil the space gaps among them.

On the other hand, the "unmanned observatories" could be interpreted in a broad sense to comprise not only ground-based unmanned observatories but also polar-orbiting satellites and high altitude balloons. In a similar sense, sounding rockets could also be included in the category of unmanned observatories even though the data collection time in this case is very much limited as compared with the other cases. In accordance with the suggestion of the IAGA Executive Committee as mentioned above, the "unmanned observatories" were so defined in the Symposium that they comprise any observing system which is not directly handled by man.

The necessity of ground-based unmanned observatories for substorm study purposes has been strongly recognized and some logistic and technical efforts have been made towards this aim by scientists in Australia, Japan, the UK, the USA and the USSR. Some of the results of these efforts are summarized in this volume. The utility of satellite telemetry data in conjunction with the simultaneous ground-based data also has been recognized, particularly in Antarctica, where it is isolated from the other observation networks. Technical problems involved in the instrumentation and some results of satellite data analysis are discussed in this volume. Examples of rocket-borne measurements in coordination with simultaneous ground-based observations are also included together with some relevant studies.

The comprehensive studies of substorm phenomena with the aid of "unmanned observatories" in coordination with ground-based manned observatories have only recently begun in Antarctica. Therefore, experimental and technical results summarized in this volume may still be far from the final goal. It is hoped, however, that this summary of technical problems and observation results of the "unmanned observation" of substorm phenomena can be reasonably well evaluated as the

necessary first mile-stone along the expected direction of studies.

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