states and fast states for the Si–SiO_2 system. From theory Dr A. A. Cottey (University of East Anglia) predicted that there may be a size effect associated with a little known state of an electron at the band edge in a crystal.

Continuing on size effects, Dr R. J. Cruickshank (University of Aston) discussed results which showed that the galvanomagnetic properties of Bi were an oscillatory function of thickness. This was explained in terms of standing Bragg waves in the crystallites.

Professor H. Mayer (Clausthal) reported experiments using the photo-electric effect to excite surface and volume plasmons in alkali halide films. He pointed out that the use of thin films enabled the surface plasmon frequency to be measured. Dr R. H. Ritchie (Oak Ridge National Laboratory) also considered plasmons when he reported some novel ways for studying the surface structure using coupling between surface modes.

METEOROLOGY

No Clouds for Nimbus

THE most detailed mapping ever of the temperature of the atmosphere has just been sent back from a British experiment on the American Nimbus 4 satellite, Dr B. J. Mason, director-general of the Meteorological Office, told a meeting of the Royal Meteorological Society in London last week. In the six days since Nimbus 4 was launched on April 8 more than 30,000 temperature profiles were accumulated from infrared spectra of carbon dioxide in the atmosphere, providing valuable information for future long range weather forecasting. With the satellite sweeping out thirteen orbits of the Earth each day it is hoped to compile an accurate chart of the atmosphere up to an altitude of more than 50 km.

Encouraged by the results of the Nimbus programme, in which two satellites still remain to be launched, Mason believes that satellite experiments may revolutionize the study of medium scale air motions, which affect areas up to three or four hundred miles across. Large scale air movements across whole continents can usually be well simulated in numerical models, he explained, but motions on a smaller scale are poorly understood and have to be represented on a statistical basis. The physics of medium scale motions are still too unclear to know just how inherently predictable the atmosphere is.

A large tropical observing experiment is to be mounted in 1974 to study how heat is transferred from the tropics to other regions and to investigate the air–sea interaction. Mason hoped that Britain would participate in this research, and foresaw a further two or three similar experiments being set up before the end of the century.

The most significant advance in forecasting in the next ten years is likely to occur in five to seven day predictions. The demand for forecasts is growing by 20 per cent each year and the gas and electricity authorities are now asking for hourly temperatures predicted up to three days in advance. This is not yet possible, but it is hoped to introduce rainfall predictions for up to two days ahead on a 40 km grid across Europe as soon as a new computer is introduced in 1971.

Thirty day forecasts are improving all the time. Mason pointed out that there was only one total failure in Britain last year out of twenty-four predictions, compared with five for 1968. He saw this as the area of forecasting most likely to benefit from an improved understanding of the atmosphere during the next thirty years.

The best chance of improving long term forecasts lies in numerical models, Mason said. At present the limiting factor is the speed of computer calculations, but tardy dissemination of data is also a serious handicap. A chart which takes twenty seconds to produce on a computer can take up to twenty minutes to transmit elsewhere. Digital techniques are now being deployed in the United States to reduce this time to less than a minute, and for a station such as that at Bracknell producing 400 charts a day this is clearly an important bottleneck to loosen.

ANTARCTICA

Glacial History

from our Geomagnetism Correspondent

THE most important questions to be asked about the Antarctic Ice Sheet are the obvious ones: What is its history? When and why did it form? Has it existed continuously since its origin or has it ever partly or completely disappeared? Has it undergone changes in area and volume, and if so, were these changes contemporaneous with worldwide glaciations? And from the past, what can we infer of the future? Will the future behaviour of the ice sheet involve large surges, widespread melting, stability, or continuation of the present growth?

These are some of the questions which Denton *et al.* (*Antarctic J.*, **5**, 15; 1970) set out to answer, at least partially, by an investigation of the ice-free zones in the region of McMurdo Sound, Victoria Land. This is a unique area for a study of glacial history in that it is a melting pot for no less than three major glacial systems (see map). First, the East Antarctic ice sheet is dammed west of the Transantarctic Mountains, although two small tongues of the ice sheet, the Taylor and Wright Glaciers, spill over into the western ends of glacially carved valleys. Second, in the east the Ross Ice Shelf floats on the surface of the Ross Sea. And finally, between the two glacial systems, occur independent alpine glaciers.

Denton and his colleagues have tried to compile a chronology for the three-glacier system which is, as far as possible, absolute, and they have been fairly successful. The various advances and recessions of the ice were, of course, deduced from a systematic examination of the glacial erosion features through the McMurdo Sound region. The dating of these changes was more difficult, because it depended much more on luck. Thus in some cases it was necessary to set glaciation limits in time by the potassium–argon dating of lavas and volcanic cones erupted between two glacial periods. In other cases, carbon-14 ages on shells in marine beds, freshwater algae in moraines or mummified seals resting on ice-free surfaces were used likewise.

The principal conclusion to emerge was that the huge ice sheet in East Antarctica had attained a "full-bodied stage" at least 4 million years ago. The build-up of ice and the corresponding 55 m fall in sea level must