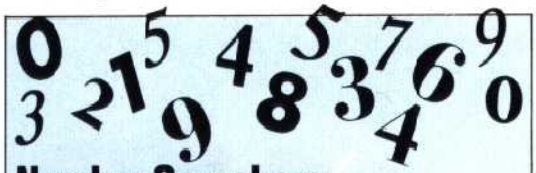
then predict what will happen as these climatic phenomena approach the land mass, according to the known behaviour of similar phenomena in the past.

Before March 1979, when the Meteosat 1 weather satellite was launched, the only method of prediction available to forecasters was to plot reports from the weather stations onto a map to build up an isobaric chart. Isobars are imaginary lines that join points of equal barometric pressure, rather as contour lines on a map join points of equal height. From these it is possible to decide on the speed and direction of warm and cold fronts — and their associated cyclones and anticyclones — and thus make what are best described as educated guesses about the expected weather conditions.

While isobaric charts are by far the most common, they are by no means the only maps that the Meteorological Office produces. From the vast weather database held in its computer system it can produce charts that show average temperature, rainfalls, hours of sunshine per day, and so on.



Number Crunchers

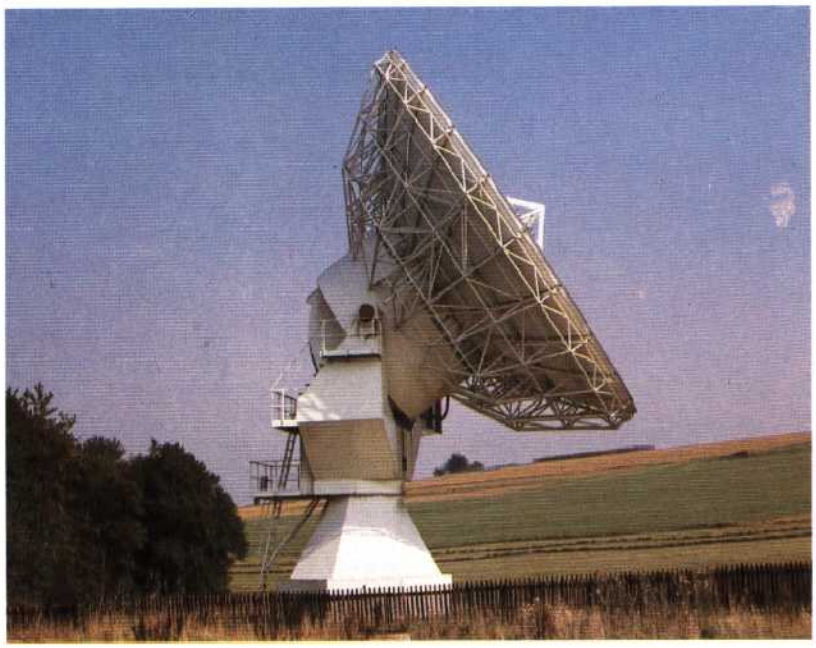
One of the chief uses of large computers in scientific research is to process purely numerical information in the form of very large and complex equations. Pure science applications such as nuclear physics, and applied science applications such as meteorology have similar requirements. While one could perform calculations of this complexity on a home micro, the length of time taken would be prohibitive — as a result not only of the number of terms in the equation, but also of the sheer magnitude of the numbers involved, which can go to 30 or more decimal places. In order to perform this function in a reasonable time, one needs very fast computers with very large amounts of memory

The Meteorological Office still follows this procedure for its accurate charts of current conditions, but now also uses the images received from Meteosat. These are analogue signals which are digitised for processing and display by the computer in the form of artificially coloured maps. The images create a live picture of the weather pattern as it occurs. They are regenerated approximately every four minutes, so the forecaster is able to observe the creation of weather systems in real time.

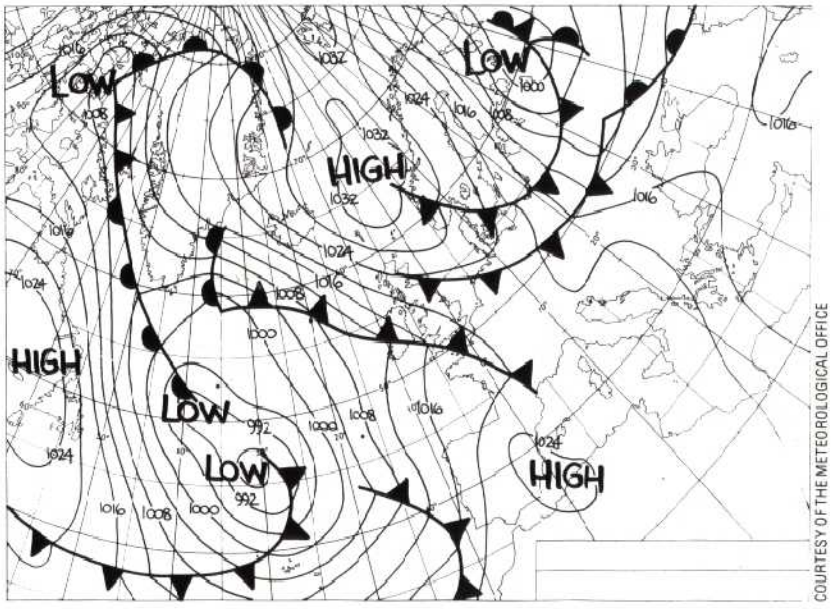
Meteosat 2, which replaced the earlier satellite in June 1981, sits in a geostationary orbit some 35,880 km (22,300 miles) above the Equator. It gathers data from a large number of earth stations spread out across the surface of the globe, and relays that information to anyone who wishes to subscribe to the system.

It would be theoretically possible to analyse and interpret this information (though not in real time) on a home computer by writing the received data to disk as it arrives from the satellite. However, the signal is an analogue one, so the conversion might be difficult. You would also need to install your own dish aerial precisely aligned with the satellite. The processing of these satellite images is only one very small function of the Meteorological Office's computer system. Along with other similar organisations in other parts of the world, it maintains a global weather system model and extracts from this model a vast amount of statistical data. This forms the database of historical information from which trends in global and local climate are plotted. It includes not only barometric data, but also details of wind speed and direction, rainfall, and temperature — not just at sea or ground level but also at specific altitudes.

Collection of this data is important for historical analysis. It is vital to agriculture, to many industries, and to the economy and ecology of whole continents, for it is only by this means that changes in climate can be recognised. Examples of this include the results of the progressive destruction of the Amazon rain forest and the increase in size of the polar ice-caps that could indicate the approach of another ice age..



Earth Stations
Satellite receiving aerials (known as dish aerials, after their shape) can vary immensely in size and complexity. The one shown here is capable of both receiving and transmitting, and is not confined to signals from geostationary satellites. It has sophisticated computer control that allows it to track an orbiting satellite precisely



COURTESY OF THE METEOROLOGICAL OFFICE

Isobaric Charts
The 'weather maps' that we see on television or in our newspapers are actually charts of barometric pressure. The concentric lines join points of equal air pressure. Winds flow anti-clockwise around a 'low', clockwise around a 'high' (the reverse in the southern hemisphere), and wind speed is directly related to the distance between the isobars