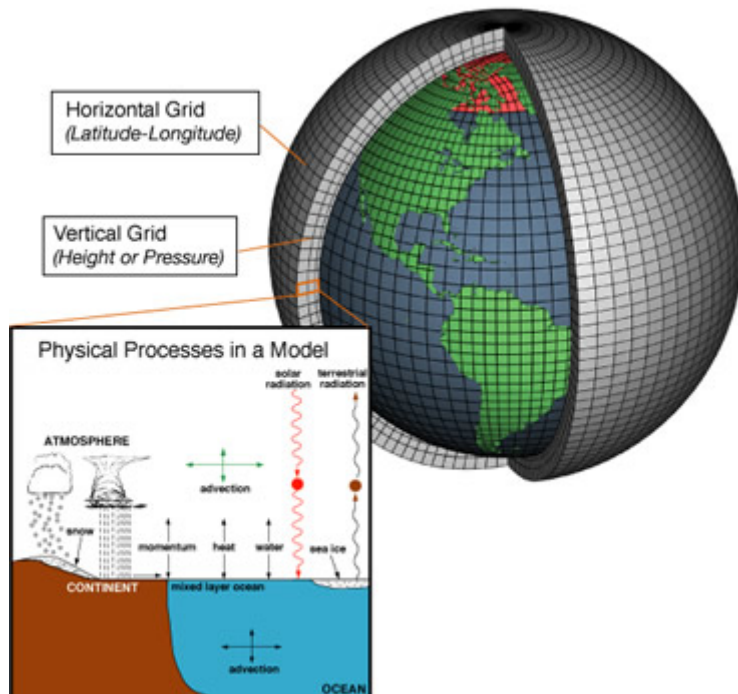


Weather Forecasting



This is the first part of a two-part article on Weather Forecasting by Professor Brian Golding OBE

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Methods of Forecasting the Weather

The desire to be able to forecast future weather has been a goal of humans since the earliest times, as captured in the story of Noah in the Bible. The approaches that have been used may be divided into three:

- **Point forecasting**

Analysis of historical time series establishes a correlation between a present observation and a future occurrence. This may be of the same variable or a completely different one. Many forecasting rules rely on animal or plant sensitivity to subtle changes in the atmosphere that presage a coming change in the weather; others use changes in cloud or wind patterns that humans can observe directly. Few of these approaches are universally applicable in time or in space, so they have largely been superseded.

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Pattern forecasting

From the time that observations could be exchanged in real-time following the invention of the electric telegraph in 1840, weather forecasting agencies were created to collect observations and create maps of them for specific times. This approach was particularly successful in middle latitudes where travelling depressions could be clearly identified in pressure observations and could be tracked from day to day. The recognition of structures within these pressure patterns, such as warm and cold fronts, further enhanced the value of forecasts produced by this means. Subsequent exploration of the upper air, and the recognition that jet streams were both highly coherent in time and provided a guide to the evolution of surface depressions, led to the full flowering of the synoptic forecasting method in the mid 20th century.

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Numerical weather prediction

The 19th century saw huge advances in understanding the behaviour of the atmosphere as a gaseous fluid behaving according to the principles of Newtonian physics. In 1904, Wilhelm Bjerknes proposed that this understanding could be used directly to predict future weather. Following an attempt at hand calculation by L.F. Richardson in the 1910s, successful progress had to await the invention of programmable computers during the Second World War. The first successful forecasts were generated in the early 1950s and the method had become a valuable contributor to the forecasting problem by the 1970s. Subsequent developments in computer power, in the use of satellite observations, and in meteorological science, have made this by far the most successful approach to weather forecasting, with useful skill to 5 days ahead on average (sometimes much more) and forecasts for the first day often accurate in their detail down to weather features of a few tens of kilometres across.

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Links

[1] <https://accsys.rmets.org/weather-and-climate/weather/numerical-weather-prediction-nwp>

[2] <https://accsys.rmets.org/weather-and-climate/weather/weather-forecasting-brian-golding/prof-brian-golding-obe>