USING MULTIPROCESSORS IN METEOROLOGICAL MODELS

INTRODUCTION

The problem presented by weather forecasting is made particularly difficult by two factors, namely:

1. the system is non-linear, consequently small-scale errors can produce large-scale effects and the longer the term of the forecast, the more serious the effect of such errors.

2. The initial state can never be perfectly known. Since numerical weather prediction depends upon the application of laws governing the behaviour of various physical phenomena and processes, the initial state needs to be accurately described and the model must represent the atmosphere accurately.

The physical limits beyond which computing speeds cannot be increased with current technology will soon be reached. Since extended forecasts and increasing accuracy depend upon ever increasing quantities of calculations, other methods of gaining speed must be sought and hence the Centre's present interest in multiprocessors and the way in which their facilities can best be exploited for meteorological applications. Moreoever, although the limits of deterministic weather forecasting remain at 2-3 weeks, vastly increased computing capabilities would allow the production of general climatic (average) forecasts for considerably longer periods.

According to the estimates of scientists working at the Centre, meteorology could potentially make use of machines fifty times faster than those now available. It was noted that at present the purity of the physics used in forecasting is compromised by a reduction in the complexity of the algorithms used, in order to facilitate and accelerate machine application. As descriptions of models and initial states become more accurate, so ever greater volumes of data will be involved and, therefore, CPU speed requirements will be accompanied by a need for considerably greater core memory capacity.