ABSTRACT

The considerable influence of climate on Earth processes and the variability of climate are the impetus for paleoenvironmental research. Much of the historical approach to paleoenvironmental research has been inductive, an emphasis on observing and deciphering geologic data and then developing comprehensive interpretations. This approach has defined much of the nature of the paleoclimatic record and has focused attention on the problems and issues of needed research.

The development of models based on the physical laws which govern the atmosphere-ocean-ice system offers even greater utility and application of the wealth of sedimentologic and paleontologic data. Past climates and causes of climate change can be investigated quantitatively by performing simulations and then the paleoenvironmental data becomes an independent opportunity to verify or challenge the results. With increasing confidence in model predictions, they can be applied to frontier areas or to regions where data interpretation is less certain.

Climate models for the atmosphere and oceans are increasingly being applied to investigate the geologic record. These applications are directed toward understanding the causes of climate change, prediction of climate for particular time slices, prediction of critical variables of significance for the distribution and character of life and sediments, and addressing some of the major debates in sedimentology and paleobiology. The model applications also enhance the contribution of the Earth sciences to understanding global change.

The short course is intended to broadly describe the characteristics and applications of climate models and to investigate the utility of predictive models. The course is divided into six sections: (1) introduction to the climate system and climate models, and their application in sedimentary geology, including the factors governing climate on geologic time scales, (2) application of climate models to investigate specific time periods in Earth history, (3) application of climate models to predict variables of specific significance to sedimentary geology, including (a) upwelling and organic carbon deposition, (b) precipitation and evaporation patterns, (c) lacustrine environments, (d) biogeography, (e) rhythmic sediments, and (f) severe storms and storm sedimentation, (4) regional paleoenvironmental studies, and (5) frontier areas, including the simultaneous examination of multiple variables, stratigraphic reconstructions from climate models, and high spatial resolution model experiments.