Orbital Forcing Timescales and Cyclostratigraphy

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Orbital Forcing Timescales and Cyclostratigraphy

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Preface

The discovery in the 1970s that Pleistocene climates and especially ice-age development were controlled by identifiable orbital parameters in the Milankovitch Band, confirming the views of Milutin Milankovitch in the 1920s, is probably the greatest single advance in palaeoclimatology this century. Changes in temperature recorded by isotopes in calcite of deep-sea foraminifer tests provided a detailed record of ice-sheet advance and decay moderated by precession, obliquity and eccentricity cycles (19–400 ka). As a consequence of this work, the reality of orbital forcing of climate was established as a fact. An added bonus of this discovery is that the identification of individual Milankovitch frequencies allows construction of an orbital forcing timescale graduated by these frequencies. Earlier palaeontological research which gave evidence of the number of days in the year, and days in the lunar month in the past, contributed to calculations on how the precession and obliquity cycles may have differed in geological time.

The possibility that Milankovitch cyclicity could form the basis for orbital timescales throughout the geological column was soon recognized, although G. K. Gilbert had seen the same possibilities in the Cretaceous of the Western Interior Basin of North America a century ago. The geological record contains abundant bedding cycles, the duration of many of which fall within the Milankovitch Band. The question as to which of these diverse bedding features record climatic cycles, the processes by which they were generated, and the identification of individual cycle frequencies is a lively and exciting area of research and discussion. The holy grail of this work is the construction of a pre-Pleistocene orbital timescale graduated in Milankovitch units. Bundling of precession cycles within short eccentricity cycles is a readily identifiable feature which is particularly valuable in the development of timescales.

This volume is a product of a meeting on orbital timescales and cyclostratigraphy that we organized at the Geological Society of London apartments on 25 and 26 March 1993, and its diverse papers reflect the wide range of sedimentological, palaeontological, geochemical and stratigraphical research presented at that meeting and of the discussions generated also during a field excursion to the Dorset coast which followed that London meeting.

M. R. House and A. S. Gale