

PREFACE

Earth's primordial conditions at the beginning of geologic history (Hadean Eon) witnessed several fundamental processes, including cooling and crystallization of a magma ocean, the Moon-formation impact event, the faint young sun paradox, the late heavy bombardment (LHB), origin of pre-biotic molecules and probably life itself, as well as the transition from reduced to oxidized outer Earth's layers, all of which have not been fully explained because of the scarce or absence of geological record preserved to support the evolutionary models throughout this time. However, these conditions stabilized somewhat during the Early Archean (3.9-3.5 Ga), creating a propitious environment for the definite origin and evolution of life. Although, currently the prevailing view favors a moderately neutral atmosphere during that time, the model does not explain many processes that occurred under highly reducing conditions and several questions remained unresolved. The LHB and its role in the appearance, destruction or preservation of life also constitute a major unresolved problem because these processes are surprisingly coincident in time.

This chapter assesses and analyses the latest and hopefully most relevant information about the primitive Earth's environments in the Hadean to Archean transition (4.5-3.5 Ga), including the faint young sun paradox, possible reservoirs of pre-biotic molecules, early carbon cycle, and the most favorable niches for the emergence of life.