CELESTIAL CLIMATE DRIVER: A PERSPECTIVE FROM FOUR BILLION YEARS OF CARBON CYCLE — •Jan Veizer — Ottawa-Carleton Geoscience Centre, University of Ottawa, Canada & Institut für Geologie, Mineralogie und Geophysik, Ruhr-Universität Bochum

An understanding of the evolutionary history of our planet, and the impact of human activities on it, is accomplished mainly through the use of geochemical techniques. These provide a baseline against which to gauge the extent of human impact on the planet's environment and climate (global warming).

Such studies show that the carbon cycle, and life, had acquired their basic functions already in the nascent stages of Earth history, some 4 billion years ago. The subsequent evolution of the carbon cycle is mostly a succession of boom and bust episodes, superimposed on this basic design. Model calculations, based on such an oscillating pattern, suggest that atmospheric pressures of carbon dioxide (pCO_2) during most of the geological past do not show any clear-cut relationship with ancient climates. On the other hand, the correlation of climate with the oxygen isotope data (a reflection of the past hydrologic cycle) and cosmic ray flux is convincing, suggesting that, as today, water vapour may have been the most important greenhouse gas and that cosmic ray flux may be the principal climate driver on geological time scales.

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