EVOLUTION OF CLIMATE ON VENUS: KNOWLEDGE, UNCERTAINTY AND PROSPECTS. D.H Grinspoon[1] and F.W. Taylor[2], [1] Dept. of Space Sci., Denver Museum of Nature & Science, 2001 Colorado Blvd., Denver, CO 80205 (dgrinspoon@dmns.org), [2] Univeristy of Oxford, (fwt@atm.ox.ac.uk).

Introduction: A dramatically hot and dry climate is found on Venus at the present time, probably the result of the atmosphere following a divergent evolutionary path from a more Earth-like beginning. A key question is to what extent the two planets and their early inventories of gases and volatiles were physically alike, given their common origin in the same region of the young Solar System. Venus and Earth have nearly the same size and mass, and most current models suggest they have similar chemical compositions and interior structures. However, factors such as the small discrepancy in mean density (after allowing for compressional effects, [1], and the absence of an internal dynamo [2], as well as discrepacies in the abundances of the noble gases [3] fuel a lively debate about the extent to which the two planets can be considered to be a close match due to essentially identical origins. The common assumption of identical origins is also clouded by the possibility of stochastic variations in late accretion history leading to unequal volatile inventories [4] or volatile loss and interior processing through catastrophic early impacts [5], [6], [7]. Even if we knew the answer to those questions, deriving the path and timescales of Venus' divergent evolution to its present state would still present numerous challenges, not least in terms of the climate at the surface.

In seeking to understand the formation and initial states of Earth and Venus, and how and by what stages their atmospheres progressed to the presently observed conditions, considerable use is made of the findings of each planetary mission to Venus. Many of the measurements still needed (for instance, seismic determinations of the interior structure of Venus) will require substantial investment in new technologies, while other important investigations (such as the history and present activity of volcanism) can be advanced with available techniques. We will look at the current state of understanding of the atmosphere, interior, and near-space environment of Venus, and their interactions that produce the climate at the surface and control its evolution. We will review actual and potential progress on these topics, particularly that beginning to be made in the light of new results from the European Venus Express missionand the important gaps that could be addressed by future planned projects.

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