Comparative analysis of obliquity-driven changes in the Martian atmosphere A.Wofford[1], S. Guzewich[2],K. Tsigaridis[3], J. Perlwitz[4], M.Way[5], P.Ginoux[6],B.Demoz[7],and S.Smith[8] [1]Howard University (2400 6th St NW, Washington, DC 20059) [1]alia.wofford@bison.howard.edu, [2]NASA Goddard Space Flight Center(8800 Greenbelt Rd, Greenbelt, MD 20771), [2]scott.d.guzewich@nasa.gov.

Introduction: For years Mars' climate has been a subject of curiosity and discussion due to its close distance to Earth and as one of the four terrestrial planets within our solar system. In comparison to Earth, Mars has a relatively thin atmosphere that is primarily composed of carbon dioxide and a surface pressure that is approximately 610 Pa [1]. Mars' surface temperatures are much cooler than Earth which is mostly attributed to its very thin atmosphere [1] and lack of other prominent greenhouse gases in its atmosphere that are present on Earth. Studies suggest that atmospheric dust has a significant impact on Mars' weather and climate by way of dust lifting process. Moreover, an observation of the variable impact on Mars' dust cycle throughout its recent geological history due to the planet's wide obliquity swings [2] has not been well documented. In Mars' dust cycle, particles can be lifted from the surface by surface wind stress and dust devils and can radiatively interact with the atmosphere and trigger changes in the atmospheric circulation and form regional to planet encircling dust storms [3],[4].Additionally, the microphysics processes leading to the formation of the dust storms are not well understood in regards to the exchange of water between the atmosphere, the subsurface and the ice dust mixtures in the Martian polar caps[5][6].

Our work will examine changes to dust lifting, transport , and deposition in the polar regions with varying obliquity and its impact on cloud formation.

Methods: Resolving Orbital and Climate Keys of Earth and Extraterrestrial Environments with Dynamics (ROCKE-3D) is a three dimensional general circulation model that was developed at the NASA Goddard Institute for Space Studies. Its design is based of its predecessor, ModelE2, which is used to simulate the climate of modern Earth. ROCKE-3D is an expansion of its predecessor's capabilities that allows a broader range of atmospheric conditions, more diverse atmospheric chemical compositions, diverse ocean and land distributions, and to model other terrestrial worlds within or solar system such as Mars [5]. We present preliminary simulations using ROCKE-3D to simulate Mars' obliquity ranging 0°-60° and to analyze the changes in Martian dust cycle in the planet's recent geological history.

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