The College of Graduate Studies and the College of Science Cordially Invite You to a

Master Thesis Defense

Entitled

ESTIMATING MARS SURFACE WIND STRESS AND DUST LIFTING USING REANALYSES BASED ON EMM AND OTHER SPACECRAFT OBSERVATIONS

by

Haneen Edhar Y Abouhaligah

Faculty Advisor

Dr Roland Young, Department of Physics

College of Science

Date & Venue

4:00 pm

Friday, 3 November 2023

Room 234, F3 Building

Zoom Meeting

3:45 pm

Friday, 3 November 2023

Meeting ID: 867 6709 8492

Password: 086662

https://uaeu-ac-ae.zoom.us/j/86767098492?pwd=nbGYgmLZa5ahiMFM5X9wksezMoaYh1.1

Abstract

Dust is the primary aerosol in Mars' atmosphere and has strong interactions with visible light from the Sun and infrared emission from the surface and air. Understanding dust dynamics in the Martian atmosphere is critical for our understanding of its weather and climate. The rate at which dust is lifted from the surface at different locations is very difficult to measure yet determines the amount of dust in the atmosphere at any given time. This thesis investigates the role of near-surface wind stress (NSWS) and dust lifting rates, using six reanalysis datasets, respectively: MACDA, EMARS, OpenMARS, ACS-TIRVIM (ExoMars observations of the MY34 Global Dust storm), EMM1 and EMM2. Following the parameterization approach by Newman et al. (2002a), areas of agreement and discrepancy among datasets were identified. Time series analysis revealed consistent results where datasets overlap temporally. Notably, global dust storms during Martian years 25 and 34 resulted in increased drag velocities and vertical fluxes. Future work should adopt new methodologies incorporating variable thresholds and roughness values, enhancing dust lifting rates accuracy and reliability on Mars.

Keywords: Atmospheric sciences, data assimilation, dust, dust lifting, Mars, surface wind stress, reanalyses