

National Aeronautics and Space Administration



New Architecture to Use Mesoscale Atmospheric Models for Mars EDL Simulations

Nelson Yanes

California Institute of Technology

David Way & Soumyo Dutta

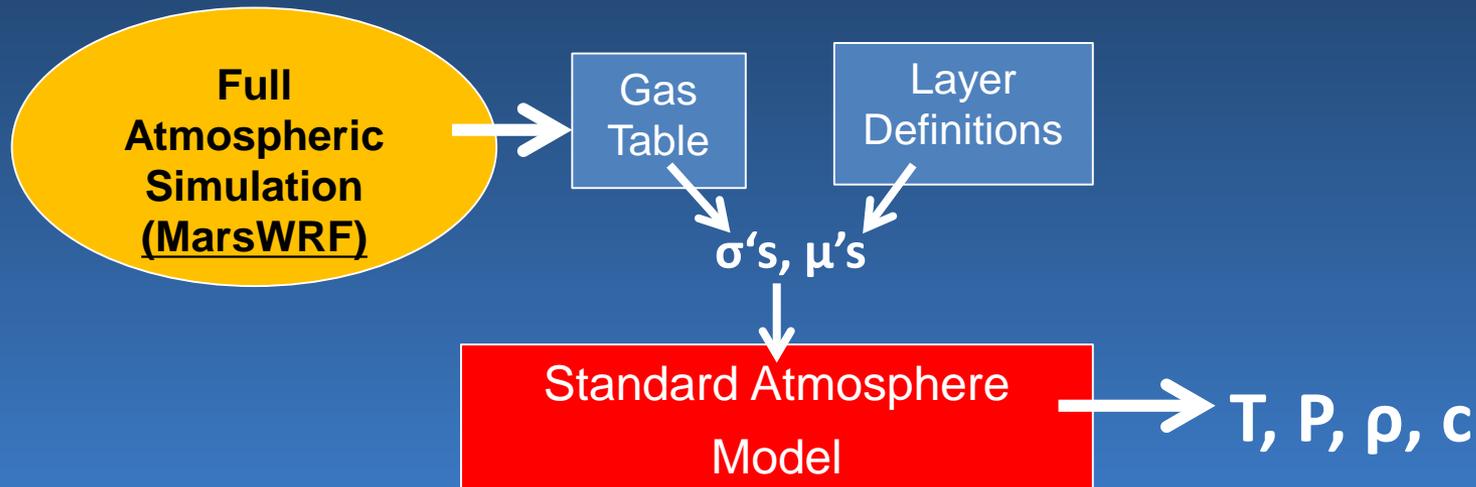
2015 IPPW Conference



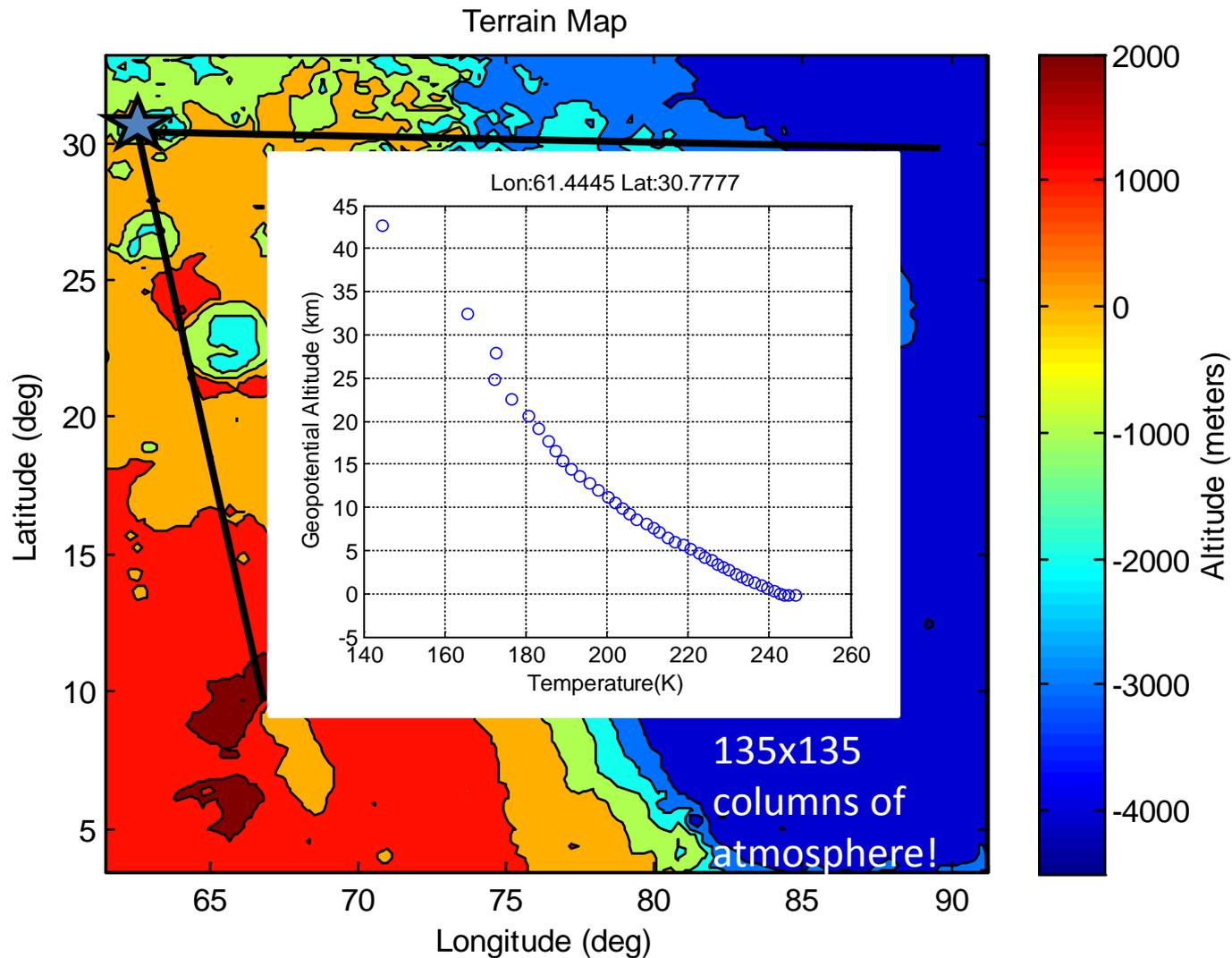
Motivation



- For 2012 Mars Science Laboratory (MSL), MRAMS and MMM5 mesoscale models were used.
- Integration of mesoscale models into the flight simulation through MarsGRAM could not maintain important physical properties.
- Objective: Develop an improved architecture for using mesoscale models in Monte Carlo flight simulations **that can** better represent the physics described by the standard atmospheric model.



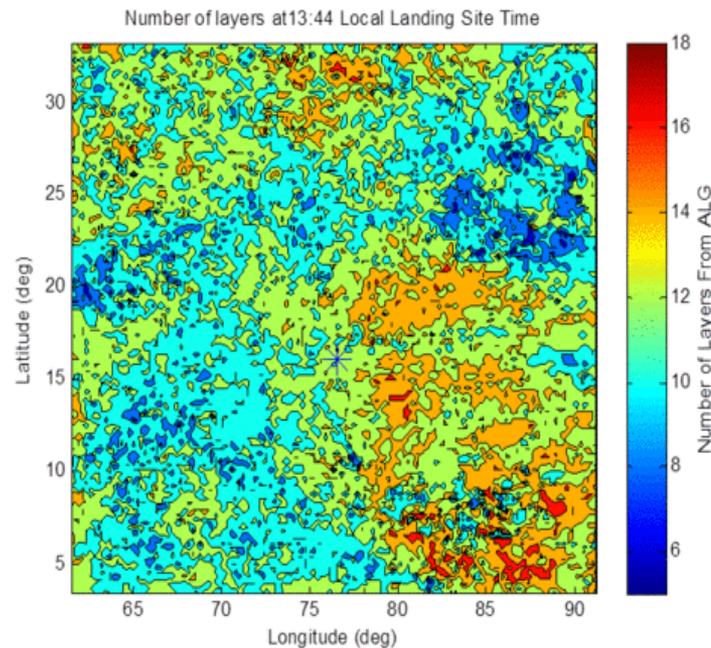
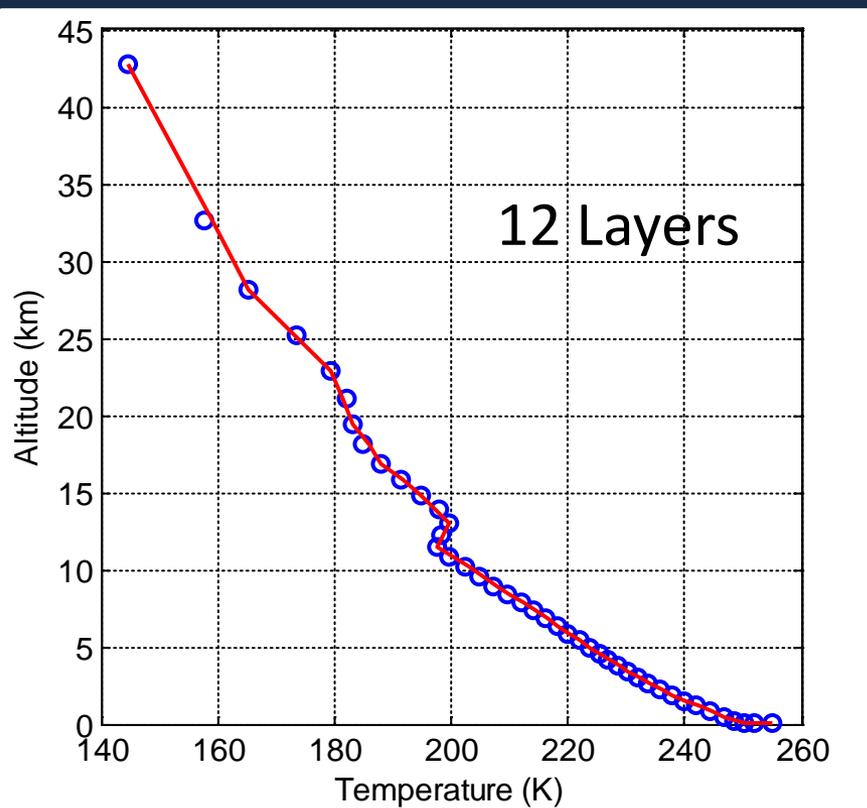
North East Syrtis



Automatic Layer Generator (ALG)



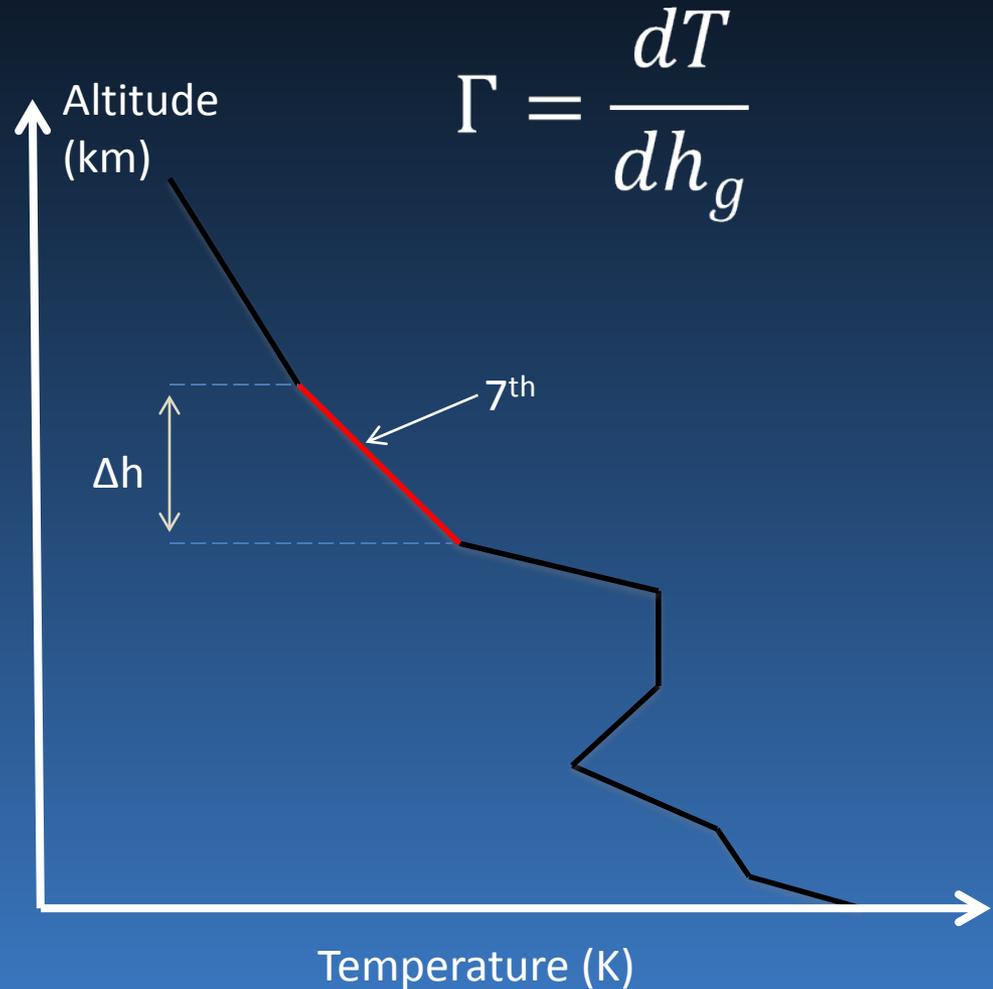
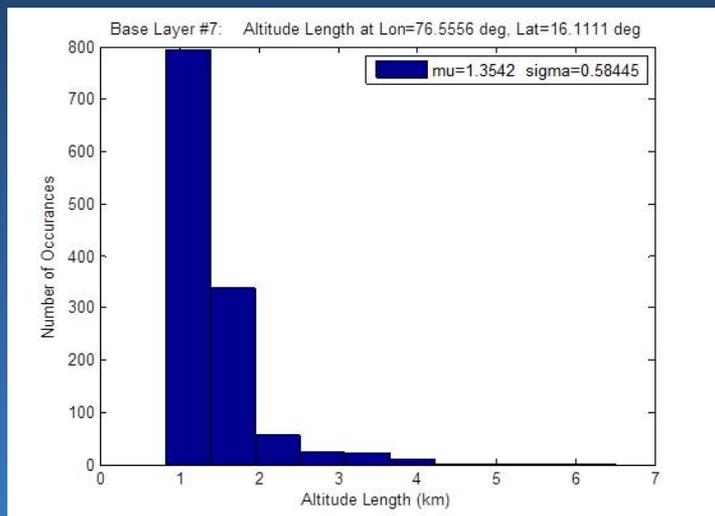
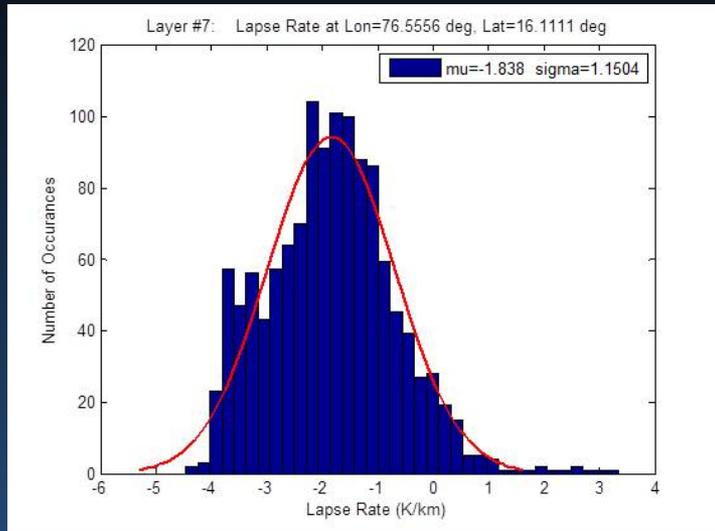
- Consists of two algorithms that analyzes the atmosphere.
- ALG allows for quick generation of standard atmospheres and helps generate statistics from the data.



Statistics and Correlations



- Create distributions of lapse rates and layer thicknesses.

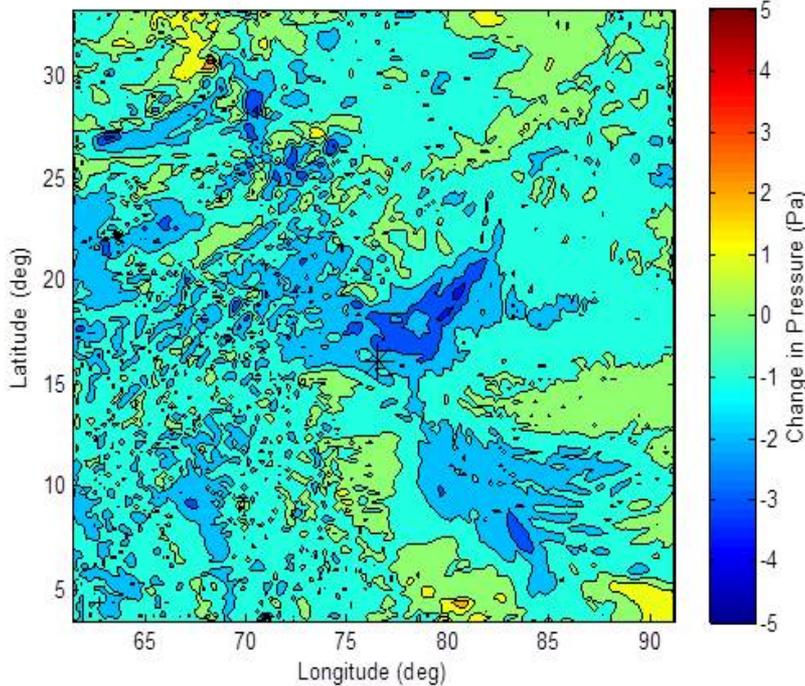


Statistics and Correlations

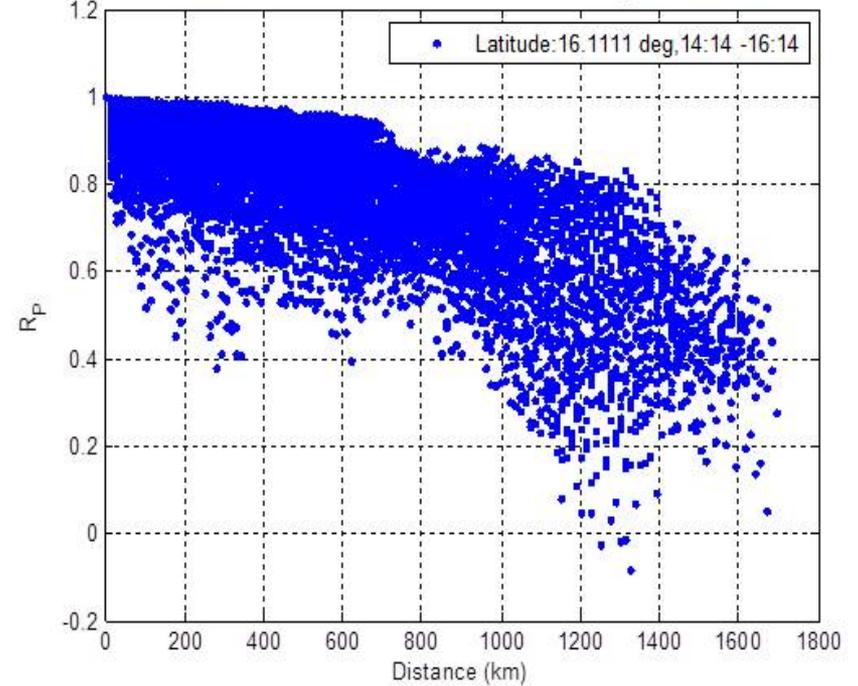


- Hypothesis: surface conditions that are geographically close are highly correlated.

Change in Pressure From 15:14 to 15:44



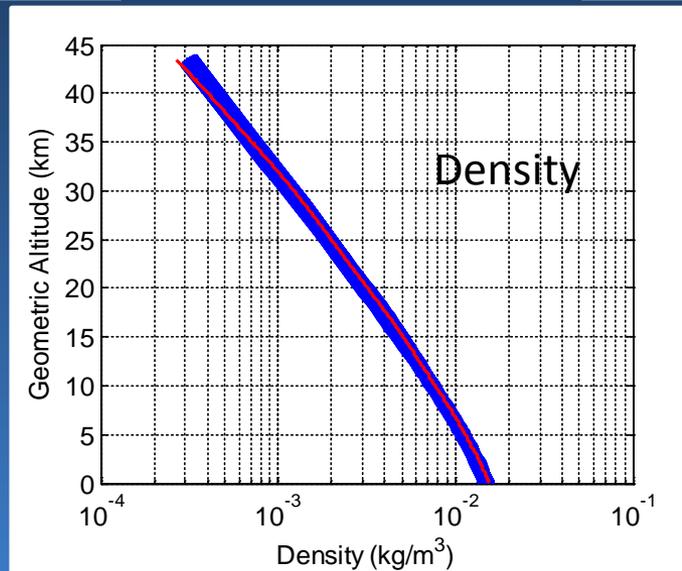
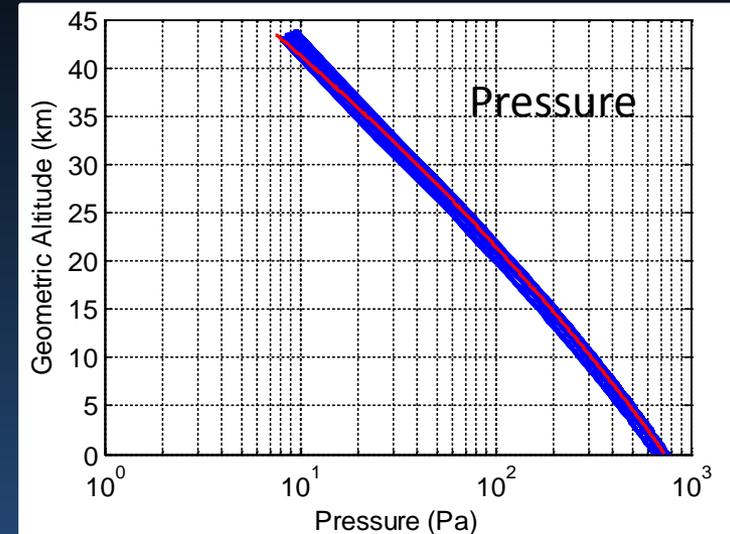
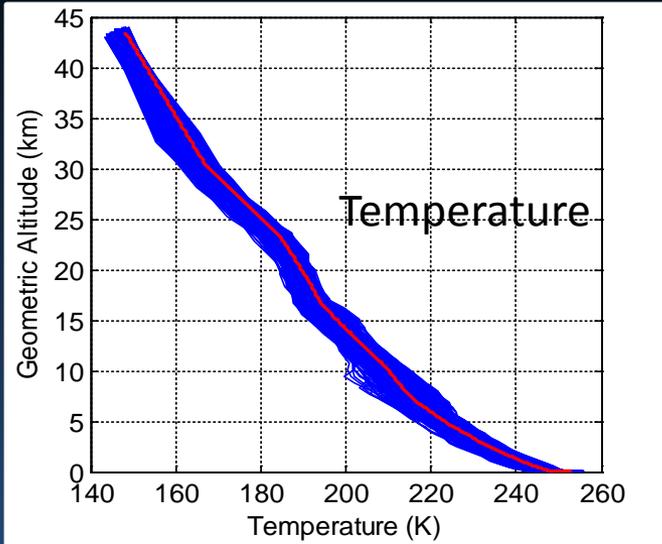
Correlation Coefficient of Surface Pressure vs. Longitude Distance



Architecture Verification



➤ Using statistics, generate a representative profile.

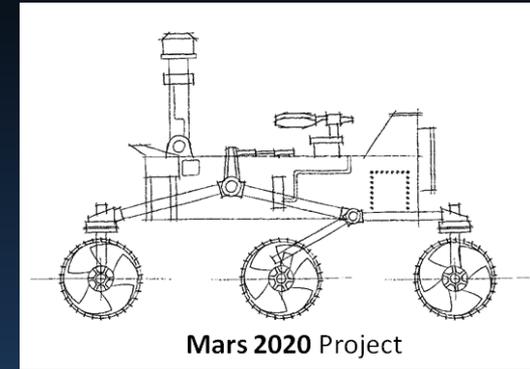


— Reconstruction
— Data Used For Statistics

Conclusions and Future Work



- Overall, there is enough evidence to show that new method can be used to generate density profiles while preserving the hydrostatic equation.
- Correlations do exist for columns of atmospheres that are spatially close (previous method did not preserve correlations).
- New architecture requires further development for software integration.



Source: NASA/JPL-Caltech