



Recent Upgrades to the Global Reference Atmospheric Model (GRAM) Suite

Soumyo Dutta

Project Manager
Atmospheric Flight and Entry Systems Branch
Langley Research Center
Soumyo.Dutta@nasa.gov



Hilary L. Justh

Planetary Atmosphere Specialist
Natural Environments Branch (EV44)
NASA Marshall Space Flight Center
Hilary.L.Justh@nasa.gov

NASA Langley Research Center

Code Architect

Jim Hoffman

Analytical Mechanics Associates

Planetary Scientist

Kunio Sayanagi

Outer Planet GRAM Developer

Justin Garland

Analytical Mechanics Associates

NASA Marshall Space Flight Center

Earth-GRAM Developer

Patrick White

Data Implementation

Paul Bremner

Corey Walker

Jacobs Space Exploration Group

GRAM Developer

Lee Burns

Jacobs Space Exploration Group

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GRAM Suite Overview

Engineering-oriented atmospheric model that estimates mean values and statistical variations of atmospheric properties for numerous planetary destinations

- Currently available for Venus, Earth, Mars, Jupiter, Titan, Uranus, and Neptune
- Outputs include atmospheric density, temperature, pressure, chemical composition, radiative fluxes (for Mars-GRAM), and wind components along a user-defined path
- Includes seasonal, diurnal, geographic, and altitude variations when such data are available
- Widely used by engineering community due to ability to create realistic atmospheric dispersions
- Can be integrated into high fidelity flight dynamic simulations of launch, entry, descent and landing (EDL), aerobraking and aerocapture
- Application Program Interface (API) available for Python and soon MATLAB
- GRAM Suite Version 2.0.0 (Released November 2023) included:
 - Addition of Python API and Earth-GRAM Modern Era Retrospective Analysis for Research and Applications, Version 2 (MERRA-2) Update
- GRAM Suite Spring 2024 release will include:
 - Earth-GRAM gridded forecast upgrade, Mars-GRAM topography data upgrade, Venus-GRAM gravity data upgrade, Uranus-GRAM input model data upgrade
- Available through the NASA Software Catalog <https://software.nasa.gov/software/MFS-33888-1>