The Mars Climate Database (MCD Version 5.2)


What is the Mars Climate Database?

The Mars Climate Database (MCD) is a database of meteorological fields derived from General Circulation Model (GCM) numerical simulations of the Martian atmosphere and validated using available observational data. The MCD provides a new and updated source of data to support atmospheric science investigations. The database consists of climate boundary conditions for models and the climatology of Mars.

The MCD includes: high-resolution meteorological fields, a variety of atmospheric properties such as temperature, pressure, wind, dust concentration, CO₂ ice, etc., and the climatology of Mars.

Using the Mars Climate Database

For download and access, visit the MCD website: http://www.mars-lmd.jussieu.fr/

Overview of MCD contents

- The MCD includes a range of datasets, including the climatology of Mars, high-resolution meteorological fields, and atmospheric properties such as temperature, pressure, wind, dust concentration, CO₂ ice, etc.
- The MCD is designed to support atmospheric science investigations.

Validation of the Mars Climate Database climatology

The MCD has been validated using observational data from many available sources, including Global Survey (TES, Pia02), local measurements (MGa, MGb), and forecasts from the MCD itself. The validation process includes comparison with observational data, including measurements from the European Space Agency (ESA) and the Center National d’Études Spatiales (CNES, France).

Example n°1: Surface pressure at Viking Lander 2 site

The Viking landers reached Mars in Mars Year 3 and collected data for a few Martian years (3 for VR1 and 1.5 for VL2).

- Surface pressure during a Martian year, as retrieved by the MCD climatology scenarios at Viking Lander 2 (2, with an envelope of ±200 mb at standard deviation, compared to the recorded values.

Example n°2: MSL surface pressure

The REMS station on board Curiosity (1907-24) and MAVEN measure surface pressure since the rover’s arrival on Mars (Mars Year 2), a set of real-time data that is currently still collecting data.

Example n°3: TES atmospheric temperatures

The Thermal Emission Spectrometer (TES) onboard Mars Global Surveyor has nearly continuously monitored the Martian Atmosphere for almost 20 Mars years (from early in Mars Year 24 to the beginning of Mars Year 27), yielding information on the local and seasonal evolution of atmospheric conditions on Mars.

Example n°4: MCS atmospheric temperatures

The Mars Climate Simulator (MCS) onboard Mars Reconnaissance Orbiter has been monitoring the Martian Atmosphere in the last few years and is still collecting data, which is currently still collecting data.

Illustrative examples:

- Comparison between Opportunity entry (Mars Year 24, sol 62), solar longitude (MLAT) 52°, and Monte40 entry (Mars Year 24, sol 62), solar longitude (MLAT) 176°, as retrieved using the Opportunity and Monte40 entry, respectively.
- Illustration of the climatology scenario (Opportunity entry) temperature profiles observed with the three possible Solar UV inputs (minimum, average, maximum).

Atmospheric variability in the MCD

To represent the wide range of conditions over which meteorological variables vary, the MCD includes:

- 2-year to year variability and dust content variations.
- Simulated climate with variations in the different climatic parameters.
- 12 seasonal cycles in the MCD are stored 12 "typical" days (average over 30° of latitude) at 30 days.
- The MCD is 12 cycles, and the average data are stored 12 times per day, used to evaluate the variability of the climatology of Mars.

The high resolution mode

- The MCD horizontal: latitude-longitude, latitude : 0.075°-1.75°, longitude: 0.075°-1.75°.
- The MCD high-resolution meteorological fields, which provide a detailed view of the Martian atmosphere.

- High-resolution meteorological fields can be used to reconstruct the vertical atmospheric pressure distribution and, within the restriction of the procedure, yield high-resolution values of atmospheric variables.