

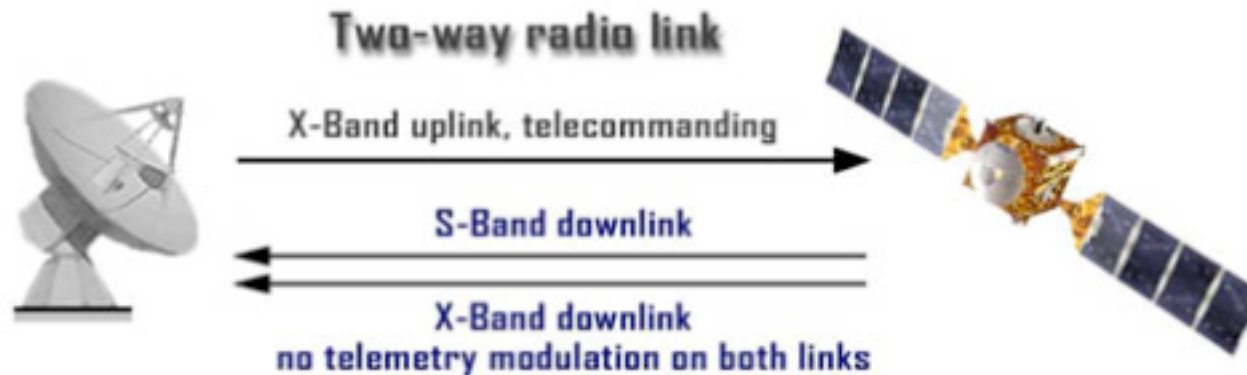
Mars Express Orbiter Radio Science MaRS

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Study how normal radio signals exchanged between Mars Express and ground station on Earth are altered by and tell us about:

1. The gravity of Mars
2. The charged particles in the atmosphere and ionosphere of Mars



Observations are recorded at the ESA ground station New Norcia (Australia) and the Deep Space Network (DSN) of NASA

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- ◆ **radio sounding of the atmosphere / ionosphere (occultation experiment)**
 - measure how density, pressure and temperature change with altitude
 - understand how density of electrons changes with altitude in the ionosphere
- ◆ **gravity experiments**
 - study how the gravity changes in certain areas due to crustal features
 - understand how seasonal mass exchange (polar caps) affects gravity field and rotation
 - determine mass and density of the moon Phobos
- ◆ **surface characteristics by a bistatic radar experiment**
 - roughness, composition of the surface

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Observations are done in different Earth/Mars/MEX configurations

- ◆ **occultation experiments from April to August 2004; December 2004**

Tell us about atmospheric conditions in early morning, late afternoon and during polar night

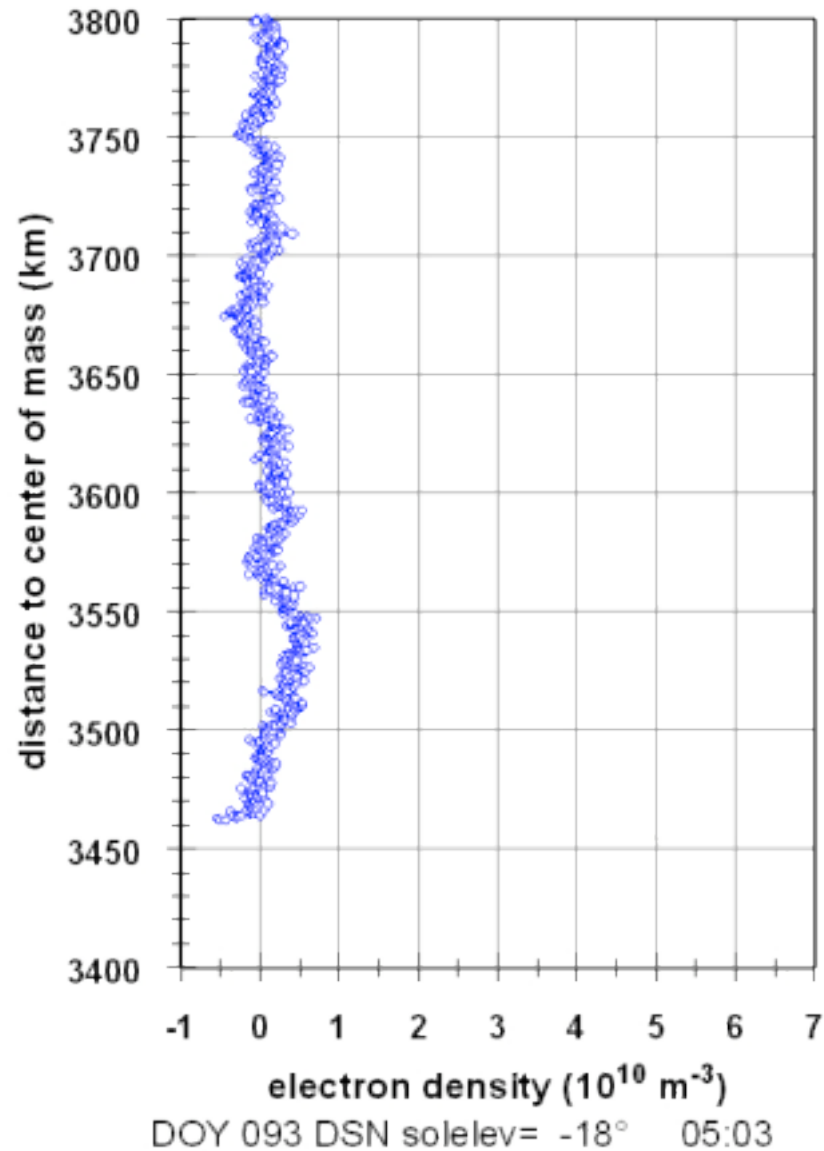
- ◆ **gravity observations from mid October 2004 to early January 2005**

Still under processing and analysis

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Formation and evolution of early morning ionosphere

In the morning, when the sun is about to rise, the ionosphere of Mars is refilled by an avalanche of electrons and other charged particles caused by solar radiation

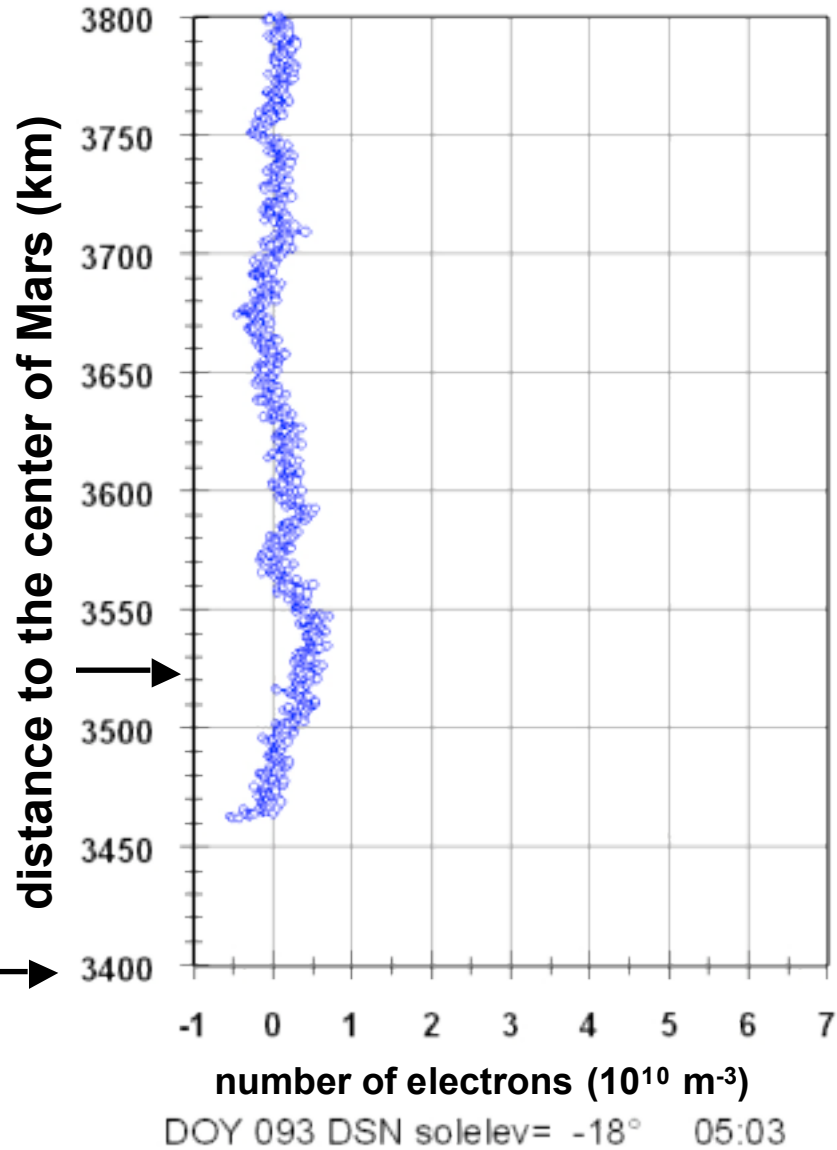


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Formation and evolution
of early morning ionosphere

altitude of layer formation —

Mars surface —



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Results

- ◆ **formation and evolution of early morning ionosphere during sunrise**
- ◆ **observations at high latitude southern winter atmosphere**
 - weather report of the southern polar night**
 - very low surface pressure (4 millibar)**
 - very cold atmosphere over the first few kilometres (-143°C to -130°C)**
 - carbon dioxide snow fall**