

Volatile Exchange on Mars

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Abstract

The movement of CO₂ from the atmosphere of Mars to the polar caps on a seasonal basis and the subsequent sublimation of the material back into the atmosphere is the long-term dominating atmospheric processes on Mars. This process is observable in the orbits of Mars spacecraft determined from tracking data and the quantity of material can be estimated from changes in the gravity field. These observations of the motion of volatiles is not necessarily restricted to the exchange of CO₂ between the atmosphere and polar caps but, like Earth, to any movement of mass on or in the planet, including the possible flow of ground water, and the escape of volatiles from the regolith. The measurement of these motions is largely dependent on the quality of the orbit determination and hence the tracking data. Laser tracking of spacecraft around other planets is potentially the most accurate source of data for observing and monitoring these changes.