論文内容の要旨

True Polar Wander Due to Surface Mass Loading on Mars
(火星における表層質量荷重による真の極移動)

Yuji Harada
原田　雄司

Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo
東京大学大学院理学系研究科地球惑星科学専攻

Abstract

Time variation of a pole location is calculated regarding a case of large-scale true polar wander due to surface mass loading on Mars. In this calculation, both cases with and without effect of pole tide are investigated. Through comparison between them, the effect of the pole tide on the time variation of the pole location is discussed. As a conclusion, this calculation quantitatively indicates that the pole tide stabilizes the pole location over much longer time scale than that of relaxation. On the other hand, it also implies that the effect of the pole tide is negligibly small in a case of longer term variation than the delay by this stabilization.

Also, in this study, long-term variation of a pole location driven by evolution of a volcanic province on a terrestrial planet is investigated. The present modeling comprehends large-scale variation. Also, this study considers an elastic lithosphere as a fossil bulge. For this purpose, this study tries to expand the previous formulation for the final state of TPW to that for long-term variation. Remarkable variations are those on a TPW angle for the following situations. The parameter $Q'_{\max}$ (a normalized magnitude of a surface mass load) is larger than or equal to 1, and also is slightly smaller than 1. In addition, the initial load co-latitude is less than

about 10°. Under the situations of such Q'_{max} and initial load co-latitude, the results are as follows. If the initial load co-latitude is close to zero, extremely large and rapid variation like as inertial interchange true polar wander is possible. If not close to zero, variation is relatively large but is much more gradual. These results would give us a possibility of reconstruction of volcanic history, such as the evolution of Tharsis on Mars.

Key Words

Geophysics, Mars, interior, Planetary dynamics, Rotational dynamics, Volcanism