

# The influence of degree-1 mantle heterogeneity on the past dynamo of Mars

H. Amit (1), U.R. Christensen (2) and B. Langlais (1)

(1) Universite de Nantes, France, ([hagay.amit@univ-nantes.fr](mailto:hagay.amit@univ-nantes.fr)), (2) Max-Planck-Institut fur Sonnensystemforschung, 37191 Katlenburg-Lindau, Germany ([christensen@linmpi.mpg.de](mailto:christensen@linmpi.mpg.de))

## Abstract

The hemispheric dichotomy in the crustal magnetic field of Mars may indicate that the planet's past dynamo was influenced by a degree-1 heterogeneity on the outer boundary of its liquid metallic convecting core. Here we use numerical dynamos driven by purely volumetric internal heating with imposed degree-1 heat flux heterogeneities to study mantle control on the past dynamo of Mars. We quantify both south-north and east-west magnetic field dichotomies from time-average properties that are calculated according to two different end member crust formation scenarios. Our results indicate that a

moderate heat flux anomaly may have been sufficient for obtaining the observed dichotomy. Because of the excitation of a strong equatorial upwelling in the dynamo, the efficiency of a mantle heterogeneity centered at the geographical pole in producing a south-north dichotomy is much higher than that of an heterogeneity centered at the equator in producing an east-west dichotomy. These results argue against a significant True Polar Wander event with major planet re-orientation after the cessation of the dynamo.