



## **Scenarios for the formation of Chasma Borealis, Mars**

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An intriguing feature of the Martian polar caps is the presence of large chasms and smaller scarps/troughs which have no counterpart in terrestrial ice sheets. In this study, the focus is on Chasma Borealis, which cuts about 500 km into the western part of the north-polar cap. A possible explanation for its origin is a temporary heat source under the ice due to a tectono-thermal event or a volcanic eruption [see the discussions by Fishbaugh and Head (2002; *J. Geophys. Res.* 107, 5013) and Greve et al. (2004; *Planet. Space Sci.* 52, 775-787)]. This possibility will be explored by assuming a locally increased geothermal heat flux in the region of Chasma Borealis for a limited period of time in the past, and simulating the dynamic/thermodynamic response of the ice cap with the model SICOPOLIS (Simulation COde for POLythermal Ice Sheets). The questions to be investigated are (i) how much geothermal heat over which amount of time is required to form the chasm, (ii) how much water is discharged by a process of that kind (catastrophic flooding?), (iii) what are the local ice-flow velocities at the slopes of the chasm, and (iv) which processes can keep the chasm open after the end of the heating event.