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The importance of lateral variations in the crustal thickness for the existence of partial melt zones on Mars

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New images by the HRSC on Mars Express have shown clear evidence for recent volcanism in the regions of Tharsis and Elysium. The explanation most often used for this ongoing volcanic activity on Mars is the existence of mantle plumes which can cause pressure released melting underneath these regions. However, on Mars the development of plumes and even more their continued sustainment is difficult to reconcile with what we know from the Martian interior dynamics. To explain the occurrence of recent volcanism, it is important to look at the temperature distribution in the crust and the upper mantle. As the basaltic crust varies considerably on Mars - with values of a few kilometers below the impact basins and possibly more than 100 km in the large volcanic regions - and exhibits a low thermal conductivity of approximately 2 W/(mK), its influence on the temperature distribution can not be neglected. Underneath Tharsis, where a significant topography and a deep root lead to the highest crustal thickness of the planet, the heat transfer is less efficient than in the surrounding area and causes a positive temperature anomaly in the upper mantle. The increased temperatures may cause the mantle material to melt below this region and may be responsible for the recent volcanism. In 2-D mantle convection simulations, we examine the occurrence of probable partial melt zones due to lateral variations in the crustal thickness.