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The effects of localized heating in the crust of a neutron star

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In neutron stars, the magnetic field is believed to be mostly confined into the crust. Its topology strongly influences the surface temperature distribution, and hence the star observational properties. In this contribution, I will present some of the first simulations of the coupled crustal magneto-thermal evolution in three dimensions. In particular, I will discuss how the crust reacts to episodes of localised energy injection. This directly bears to the evolution of outbursts in magnetars, as well as to the surface temperature map of rotation powered pulsars. Simulations show that the surface temperature distribution exhibits a variety of patterns, as a consequence of non-trivial transport properties driven by the magnetic field. A remarkable result is that the hottest region on the star surface may drift while cooling.

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