Unified equation of state for describing the outer and inner crust of magnetars

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Abstract. A specific class of neutron stars characterised by extreme magnetic fields of order $10^{14} - 10^{15}$ G at their surface are called magnetars. According to numerical simulations the magnetic fields in their interior are potentially much stronger. This has prompted the investigation of their equilibrium properties for a wide range of magnetic field strengths. The equation of state and the composition of the outer and inner crusts are calculated in a unified and consistent way within the nuclear-energy density functional theory and taking into account Landau-Rabi quantization of electron motion.