Abstract for “A new magnetar formation scenario in a proton-neutron star spun-up by fallback”

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Magnetars are isolated young neutron stars characterized by the most intense magnetic fields known in the Universe, which power a wide diversity of high-energy emissions. The origin of their magnetic field is still a challenging question. In situ magnetic field amplification by dynamo action is a promising process to generate ultra-strong magnetic fields in fast-rotating progenitors. It is, however, unclear whether the fraction of progenitors harboring fast core rotation is sufficient to explain the entire magnetar population. To address this point, we investigate a new scenario for magnetar formation from a slow rotating progenitor, in which a slow-rotating proto-neutron star is spun-up by the supernova fallback. We argue that this can trigger the development of the Tayler-Spruit dynamo while other dynamo processes are disfavored. I will present the results arising from an analytical model of our scenario and from numerical simulations of the Tayler-Spruit dynamo. These results show that the generated magnetic fields have strengths close to those expected in magnetars and our simulations demonstrate the existence of the Tayler-Spruit dynamo in the frame of this scenario. Thus, our scenario provides a new promising approach to form magnetars from slow-rotating progenitors.