

## N29b      Modeling angular momentum transport in 3D MHD simulation of core-collapse progenitor

Ryota Shimada(Kyoto U.), Lucy McNeill(Kyoto U.), Vishnu Varma(Keele U.), Keiichi Maeda(Kyoto U.), Takaaki Yokoyama(Kyoto U.), Bernhard Müller(Monash U.)

Rotation and magnetic fields in the core of evolved massive stars in their final phase are thought to play an important role in the subsequent supernova explosion and the formation of a compact object, through their effects on the angular momentum(AM) transport. However, the interplay between rotation, magnetic fields, and convection is a nonlinear, multidimensional effect that is difficult to capture with previous 1D stellar evolution models. In this poster, we quantify the magnetic AM transport in the oxygen-shell burning phase in a core-collapse progenitor, based on our analysis of the first such simulation by Varma & Müller 2023. Our analysis shows that: (1) The direction of magnetic AM transport is clearly related to the Rossby number of the convective oxygen shell. (2) The ratio of magnetic to kinetic energy follows the scaling law suggested by Augustson et al. (2019) for interpreting rotational dependence of convective dynamos in low mass stars. (3) Convective velocity is scaled by the above ratio and the nuclear energy generation rate. Based on these results, we construct a one-dimensional model of magnetic AM transport that is applicable to stellar evolution modeling. We demonstrate that our model successfully reproduces AM transport during the saturation phase of the convective dynamo. Notably, our prescription for the AM transport for the first time accounts for inward AM flux driven by magnetic fields-physics observed in this simulation.