# N17a Evolutionary models for the Very Massive Stars in the R136 cluster of 30 Doradus in the LMC

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The cluster Radcliffe 136 (R136) in the Large Magellanic Cloud (LMC) contains a population of stars in excess of 100 $M_{\odot}$, including R136a1, the most massive known star in the Universe. We utilise the 1D stellar evolution code MESA to infer the evolutionary history and final fate of the three most massive stars in R136. We apply observationally constrained mass-loss rates and new Wolf-Rayet type rates. We consider three scenarios for internal angular momentum transport, defining the strength of rotational core-envelope coupling. We find that strong mass loss at LMC metallicity leads to pre-supernova objects with high effective temperatures and masses in the range of 10 – 40 $M_{\odot}$. The CO core masses are too low to produce pair-instability. Gamma-Ray Bursts are only expected if the rotational coupling is weak throughout the evolution. We confront our models with spectroscopic observables of the three WNh stars, R136a1, a2, and a3, and find solutions within the single-star channel. We infer higher initial masses than previously claimed. This is due to a ”down-stream” evolution in our models, causing a rapid decline in mass and luminosity when Wolf-Rayet type mass-loss rates are applied. The formation of stars in excess of 100 $M_{\odot}$ urgently needs to be addressed to resolve the origin of these objects.