W05a Magnetohydrodynamic simulations of outflows from white dwarf merger remnants

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As the most common outcome of star evolution, it is estimated to be $\sim 10^{10}$ white dwarfs (WDs) in our Milky Way Galaxy, among which around 2% of them reside in close binary system will eventually merge. Such double degenerate mergers are potentially the most plausible channel for forming massive white dwarf ($\sim$ chandrasekhar mass) with fast spin and strong magnetic field. However, though some candidates have been recently discovered thanks to high-cadence photometric surveys, their post merger evolution is fairly uncertain mainly due to the lack of understanding of the outflow from the merger remnant. In this study, we numerically construct a series of axisymmetric rotating magnetic wind solutions for massive white dwarf merger products. Primarily focusing on the magnetospheric structure and the resultant spin down torque exerted to the merger remnant, we find: (i) quasi-periodic mass eruption triggered by magnetic reconnection along with the equatorial plane (ii) a novel scaling relation for the spin down torque with respect to the magnetic field strength, the spin frequency, and the mass loss rate. We apply our results to study the spin down evolution of known systems such as WD J005311 that resides in a mid-infra nebula WS35 (assoc. Cassiopeia).