NON-CONSERVATIVE EVOLUTION OF MASSIVE O-TYPE CLOSE BINARIES WITH GALACTIC AND WITH MAGELLANIC CLOUD CHEMICAL ABUNDANCES

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The general evolutionary pattern of massive O type close binaries evolving according to a case B mode of mass transfer, including mass loss by stellar wind prior to Roche lobe overflow (RLOF) at rates appropriate for O type stars, only marginally depends on the choice of the initial chemical composition whether the galactic or the MC abundances are used (the difference never exceeds 10%). The theoretical results are compared to the observations, O type binaries describing the evolutionary phase prior to RLOF, WR type binaries describing the helium burning phase after RLOF. The large mass loss by stellar wind in WR stars considerably affects the evolution during the latter phase. The comparison yields the following conclusions:
a) from the ZAMS up to the WR stage, 50%-60% of the initial primary mass is leaving the system corresponding to at least 70%-80% of the total mass lost by the primary due to stellar wind and RLOF;
b) during the WR phase the star is losing approximately half of its mass;
c) the average mass ratio for binaries prior to the supernova explosion equals 3, i.e. the exploding star is 3 times less massive than its companion.

DISCUSSION

Tutukov: Selection effects lead to an overestimation of the relative number of massive close binaries with low mass ratios. The reason is that most low mass-ratio binaries are single-line stars. The minimal semi-amplitude K_{min} of discoverable single-line binaries is several times lower than that for double-line binaries, according to an analysis of the observations. Did you take this selection effect into account when determining the distribution of unevolved binaries as a function of mass ratio?
Vanbeveren: We did not include this selection effect. If the number of O type binaries with mass ratio close to unity is really increased when the selection effect is taken into account, then in order to match observations of WR stars the amount of mass lost from the system during Roche lobe overflow has to be even larger than the 80% proposed in my talk.

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