The Galactic WN stars: line-blanketed analyses versus evolutionary models

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Context. Very massive stars pass through the Wolf-Rayet (WR) stage before they finally explode. Details of their evolution have not yet been safely established, and their physics are not well understood. Their spectral analysis requires adequate model atmospheres, which have been developed step by step during the past decades and account in their recent version for line blanketing by the millions of lines from iron and iron-group elements. However, only very few WN stars have been re-analyzed by means of line-blanketed models yet.

Aims.The quantitative spectral analysis of a large sample of Galactic WN stars with the most advanced generation of model atmospheres should provide an empirical basis for various studies about the origin, evolution, and physics of the Wolf-Rayet stars and their powerful winds.

Methods. We analyze a large sample of Galactic WN stars by means of the Potsdam Wolf-Rayet (PoWR) model atmospheres, which account for iron line blanketing and clumping. The results are compared with a synthetic population, generated from the Geneva tracks for massive star evolution.

Results. We obtain a homogeneous set of stellar and atmospheric parameters for the Galactic WN stars, partly revising earlier results.

Conclusions. Comparing the results of our spectral analyses of the Galactic WN stars with the predictions of the Geneva evolutionary calculations, we conclude that there is rough qualitative agreement. However, the quantitative discrepancies are still severe, and there is no preference for the tracks that account for the effects of rotation. It seems that the evolution of massive stars is still not satisfactorily understood.

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