L-band spectroscopy of Galactic OB-stars

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Context. Mass-loss, occurring through radiation driven supersonic winds, is a key issue throughout the evolution of massive stars. Two outstanding problems are currently challenging the theory of radiation-driven winds: wind clumping and the weak-wind problem. Aims. We seek to obtain accurate mass-loss rates of OB stars at different evolutionary stages to constrain the impact of both problems in our current understanding of massive star winds. Methods. We perform a multi-wavelength quantitative analysis of a sample of ten Galactic OB-stars by means of the atmospheric code CMFGEN, with special emphasis on the L-band window. A detailed investigation is carried out on the potential of Bralpha and Pfgamma as mass-loss and clumping diagnostics. Results. For objects with dense winds, Bralpha samples the intermediate wind while Pfgamma maps the inner one. In combination with other indicators (UV, Halpha, Brgamma) these lines enable us to constrain the wind clumping structure and to obtain "true" mass-loss rates. For objects with weak winds, Bralpha emerges as a reliable diagnostic tool to constrain the mass-loss rates. The emission component at the line Doppler-core superimposed on the rather shallow Stark absorption wings reacts very sensitively to mass loss already at very low mass-loss values. On the other hand, the line wings display similar sensitivity to mass loss as Halpha, the classical optical mass loss diagnostics. Conclusions. Our investigation reveals the great diagnostic potential of L-band spectroscopy to derive clumping properties and mass-loss rates of hot star winds. We are confident that Bralpha will become the primary diagnostic tool to measure very low mass-loss rates with unprecedented accuracy

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