Analytical Solutions for Radiation-Driven Winds in Massive Stars. I: The Fast Regime

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Accurate mass-loss rate estimates are crucial keys in the study of wind properties of massive stars and for testing different evolutionary scenarios. From a theoretical point of view, this implies solving a complex set of differential equations in which the radiation field and the hydrodynamics are strongly coupled. The use of an analytical expression to represent the radiation force and the solution of the equation of motion has many advantages over numerical integrations. Therefore, in this work, we present an analytical expression as a solution of the equation of motion for radiation-driven winds in terms of the force multiplier parameters. This analytical expression is obtained by employing the line acceleration expression given by Villata and the methodology proposed by Müller & Vink. On the other hand, we find useful relationships to determine the parameters for the line acceleration given by Müller & Vink in terms of the force multiplier parameters.

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