N29a A new grid of (magnetic) massive star evolutionary models

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Stellar structure and evolution models are widely used in astrophysics. Consequently, any uncertainty in such model calculations can impact various research fields, from the scale of exoplanets to galaxy and even cosmological models. We aim to study a new physical ingredient, magnetism, in evolutionary models of main-sequence massive stars. We use a well-known stellar evolution code and incorporate wind mass-loss quenching, magnetic braking, and efficient angular momentum transport. We obtain that stellar models become slow rotators, depending on the strength of the magnetic field. However, some chemical mixing may take place on a timescale shorter than that of magnetic braking. Therefore, our models might explain the anomalous nitrogen-enriched, slow-rotating stars identified in spectroscopic studies. We quantify a range of initial magnetic field strengths that allow for producing such trends. The possibility of quasi-chemically homogeneous evolution however is inhibited for strong magnetic fields. Our grid of models is fully open access and open source.