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Magnesium abundances in mildly metal-poor stars from different indicators

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Abstract

We present Mg abundances derived from high-resolution spectra using several MgI and two high-excitation Mg II lines for 19 metal-poor stars with [Fe/H] values between -1.1 and +0.2. The main goal is to search for systematic differences in the derived abundances between the two ionization state lines. Our analysis shows that the one-dimensional local thermodynamic equilibrium (LTE) and non-LTE (N-LTE) study finds a very good agreement between these features. The [Mg/Fe] versus [Fe/H] relationship derived, despite the small sample of stars, is also in agreement with the classical figure of increasing [Mg/Fe] with decreasing metallicity. We find a significant scatter however, in the [Mg/Fe] ratio at [Fe/H] ~ -0.6 which is currently explained as a consequence of the overlap at this metallicity of thick- and thin-disc stars, which were probably formed from material with different nucleosynthesis histories. We speculate on the possible consequences of the agreement found between Mg I and Mg II lines on the very well-known O problem in metal-poor stars. We also study the [O/Mg] ratio in the sample stars using O abundances from the literature and find that the current observations and nucleosynthetic predictions from Type II supernovae disagree. We briefly discuss some alternatives to solve this discrepancy.

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Keywords

Galaxy: evolution, Stars: abundances, Stars: atmospheres