Determining magnesium and silicon abundances from CARMENES spectra

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Abstract

The study of chemical abundances of stars that host planets is critical to our current understanding of the structure, formation, evolution of rocky planets, and to understand the evolution and assembly of the Milky Way. Here we present the abundances of magnesium (Mg) and silicon (Si) for 314 dwarf stars with spectral types in the range K7.0-M5.5 observed using the high-resolution CARMENES spectrograph. Our spectroscopic analysis employs the BT-Settl model atmospheres, the radiative transfer code Turbospectrum, and a state-of-the-art selection of atomic and molecular data. The derived chemical abundances have a line-to-line scatter at the level of 0.1 dex for all studied spectral types, which is unprecedented at the latest sub-types. Based on the comparison of the results obtained for stellar components of multiple systems, we find that the total error bar for these abundances is at the level of 0.2 dex. Our computed abundances are broadly consistent with the galactic evolution trends of earlier FGK-type stars in the solar neighbourhood. Finally, we also explore the relation of the Mg and Si abundances of stars with and without known exoplanets.

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