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# New calibrations for abundance determinations in HII regions

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## Abstract

© 2016 The Authors. Published by Oxford University Press on behalf of the Royal Astronomical Society.Simple relations for deriving the oxygen abundance in HII regions with intensities of the three strong emission lines R2, R3, and N2 (R calibration) or S2, R3, and N2 (S calibration) in their spectra are suggested. A sample of 313 reference HII regions of the counterpart method (C method) is used as calibrating data points. Relations for the determination of nitrogen abundances, the R calibration, are also constructed. We find that the oxygen and nitrogen abundances in high-metallicity HII regions can be estimated using the intensities of the two strong lines R2 and N2 (or S2 and N2 for oxygen) only. The corresponding two-dimensional relations are provfided. There are considerable advantages of the suggested calibration relations as compared to the existing ones. First, the oxygen and nitrogen abundances estimated through the suggested calibrations agree with the Te-based abundances within ~0.1 dex over the whole metallicity range, i.e. the relative accuracy of the calibration-based abundances is 0.1 dex. Although we constructed distinct relations for high- and low-metallicity objects, the separation between these two can be simply obtained from the intensity of the N2 line. Moreover, the applicability ranges of the high- and low-metallicity relations overlap for adjacent metallicities, i.e. the transition zone disappears. Secondly, the oxygen abundances produced by the two suggested calibrations are in remarkable agreement with each other. In fact, the R-based and S-based oxygen abundances agree within ~0.05 dex in the majority of cases for more than three thousand HII region spectra.

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## Keywords

Galaxies: abundances, HII regions, ISM: abundances