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A new grid of 3D non-LTE Barium abundance corrections

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We present a new grid of 3D non-LTE – 1D LTE Barium abundance corrections developed in the framework of the EU-funded ChETEC-INFRA project. The grid covers dwarfs, subgiant, and giant stars of spectral type F, G, K from solar to metal-poor metalicities for five commonly used Ba II lines. Based on a total of about 100 CO5BOLD 3D hydrodynamical stellar atmosphere models and associated 1D MARCS models, the non-LTE level population departure coefficients of an updated barium model atom (Gallagher 2020) were computed with the state-of-the-art 1D statistical equilibrium code Multi (Carlsson 1986) for a set of Ba abundances covering the observed range. In a second step, 3D non-LTE synthetic spectra were computed with the Linfor3D code. Comparison with the 1D LTE equivalent widths allows us to derive the desired abundance corrections, providing a simple means of improving the accuracy of the barium abundance obtained from standard 1D LTE analyses of stellar spectra.

We discuss the relevance of the corrections across the Hertzsprung-Russell diagram, depending on the spectral line and Ba abundance, and demonstrate that the 3D non-LTE corrections for Ba II are significantly different from the more commonly used 1D NLTE —1D LTE abundance corrections.

Web page: https://www.chetec-infra.eu/3dnlte/

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