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## Determination of non-LTE barium abundances in solar-type stars: A technique for non-LTE calculations

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### Abstract

Detailed statistical-equilibrium calculations are performed for the Ba II ion to elucidate the influence of non-LTE effects on barium abundances in the atmospheres of stars with  $T_{\text{eff}} = 5500\text{-}6500$  K,  $\log g = 4.0$  and  $4.5$ , and  $[\text{Fe}/\text{H}]$  from  $-2$  to  $0$ . The computed non-LTE abundance corrections depend on the initial barium abundance  $\epsilon_{\text{Ba}}$ . They reverse sign as  $[\text{Ba}/\text{H}]$  changes from  $0$  to  $-2$ . The corrections are at a minimum for the  $\lambda 5853$  line (from  $-0.07$  to  $+0.016$  dex) and at a maximum for the  $\lambda 6141$  and  $6496$  lines (from  $-0.20$  to  $+0.14$  dex). In addition, the uncertainties in  $\epsilon_{\text{Ba}}$  resulting from errors in  $T_{\text{eff}}$ ,  $\log g$ , and microturbulence  $\xi_t$ , as well as from the use of different model atmospheres and inaccuracies in the line-broadening parameters, are estimated.

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