NLTE in a hot hydrogen star: the Auer & Mihalas 1969 papers revisited

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We pay tribute to two landmark papers published by Auer & Mihalas in 1969. They modeled hot-star NLTE-RE hydrogen-only atmospheres, using two simplified hydrogen atoms:

- ApJ 156, 157: H I levels 1, 2 and c, Lyman α the only line
- ApJ 156, 681: H I levels 1, 2, 3 and c, Balmer α the only line

and computed LTE and NLTE models with the single line turned on and off. The results were extensively analyzed in the two papers.

Any student of stellar line formation should take these beautiful papers to heart. The final exercise in Rutten's lecture notes *"Radiative Transfer in Stellar Atmospheres"* asks the student to work through five pages of questions concerning diagrams from the first paper alone! That exercise led to the present work in which we recompute the Auer-Mihalas hot-hydrogen-star models with TLUSTY, adding results from a complete hydrogen atom for comparison.

Our motivation for this Auer-Mihalas re-visitation is twofold:

- to add diagnostic diagrams to the ones published by Auer & Mihalas, in particular B_ν, J_ν, S_ν graphs to illustrate the role of the radiation field, and radiative heating & cooling graphs to illustrate the radiative energy budget,
- to see the effect of adding the rest of the hydrogen atom.