

Session 3

Formation of the polarized solar He I 10830 A line

Andrés Vicente Arevalo^[1], Jiri Stepan^[2], Tanausú del Pino Aleman^[1]

^[1] IAC, ^[2] ASCR

The He I 10830 A, line is among the most important lines for spectropolarimetric diagnostics of the outer solar atmosphere. Existing inversion methods assume that NLTE radiative transfer is negligible given the small optical thickness of the medium which is often of the order of one. The ongoing development of new inversion tools leads to the need to verify this assumption. We generalize the so-called multi-term picture of atomic levels and we derive a more general set of NLTE equations that can be used in case in which the radiation is not spectrally flat across the 10830 triplet profile. We show that already at optical thickness around $\tau=2$ and in the simple 1D slab geometry, the NLTE transfer within the medium leads to polarization signals that are very different from those obtained using the so-called constant-property slab approximation that is being used today. We argue that neglecting NLTE radiative transfer in the 10830 line can lead to serious errors in the magnetic field diagnostics.