

Foreword

The need for a workshop on non-local thermodynamic equilibrium (NLTE) for chemical abundance analysis in stellar photospheres emerged as a natural progression at the end of the ATLAS12 workshop, held in Trieste in July 2005. The advent of very large telescopes equipped with powerful spectrographs now routinely collect spectra from the near ultraviolet to the infrared wavelengths at an unprecedented quality, revealing spectral details that were not detected. The information on the physical state and chemical composition of stars, stellar clusters, interstellar matter and galaxies can now be extracted from new spectral diagnostics. These data would certainly revolutionize our understanding of stellar physics and that of galaxies as well. The analysis of high resolution spectra would need to include modelling techniques which include NLTE physics, certainly for specific lines and perhaps leading to more inclusive approaches. Most researchers analysing stellar spectra do so under LTE conditions. However, significant departures from LTE in stellar atmospheres may be expected if either the radiative rates dominate over collisional rates or radiation is not in equilibrium, ie. the intensity does not have a Planckian distribution. Such conditions are found in stellar atmospheres. To establish a better familiarity with NLTE spectrum analysis, a workshop was conducted in Nice, France at the beginning of August 2007. The workshop provided a gentle and progressive introduction to semi-consistent NLTE modelling of stellar atmospheres (ie. based on an underlying LTE model atmosphere) for researchers, students and post-docs normally familiar with using LTE but concerned by possible NLTE effects in the lines they study. Morning sessions were comprised of lectures that addressed radiative transfer in stellar atmospheres, the LTE and NLTE solutions to the equation of radiative transfer, statistical equilibrium for trace elements, atomic data and the construction of model atoms, NLTE analysis of observed spectra, background opacities, and mechanisms of departures from LTE in various types of stars. Practical exercises using the NLTE codes KIEL, DETAIL and SURFACE were carried out during afternoon sessions. The material for these exercises can be found at <http://cifist.obspm.fr/NLTE/onlinemat.html>. The proceedings of the workshop reflect all topics presented. Each chapter has been written and edited to be a comprehensive introduction to the subject of non-LTE analysis for abundance analysis of trace elements in stellar atmospheres. The text will therefore be of interest to a much wider community than the participants of the workshop, and it may serve as a textbook on the subject.

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