ISO impact on stellar models and viceversa

L. Decin[1], C. Waelkens[1], K. Eriksson[2], B. Gustafsson[2]. B. Plez[3], A.J. Sauval[4], W. Van Assche[5] and B. Vandenbussche[1]

[1]*Instituut voor Sterrenkunde, KULeuven, Celestijnenlaan 200B, B-3001 Leuven, Belgium*
[2]*Astronomiska Observatoriet, Box 515, S-75120 Uppsala, Sweden*
[3]*GRAAL - CC72, Université de Montpellier II, 34095 Montpellier Cedex 5, France*
[4]*Observatoire Royal de Belgique, Avenue Circulaire 3, B-1180 Bruxelles, Belgium*
[5]*Instituut voor Wiskunde, KULeuven, Celestijnenlaan 200B, B-3001 Leuven, Belgium*

We present a detailed spectroscopic study of a sample of standard stars based on ISO-SWS data, which enables the accurate determination of their atmospheric parameteres, but also serves as a critical review of the ISO-SWS calibration.

This study is situated in a broader context of an iterative process in which both accurate observations of stellar templates and cool star atmosphere models are involved to improve the ISO-SWS calibration process as well as the theoretical modeling of stellar atmospheres. Therefore a sample of stars, covering the whole A0-M8 spectral classification, has been observed in order to disentangle calibration problems and problems in generating the theoretical models and corresponding synthetic spectrum.

By using stellar parameters found in the literature large discrepancies were seen between the ISO-SWS data and the generated synthetic spectrum of these standard stars. A study of the influence of various stellar parameters on the theoretical models and synthetic spectra, in conjunction with the Kolmogorov-Smirnov test to evaluate objectively the goodness-of-fit, enables us to pin down the stellar parameters with a high accuracy for stars cooler than the sun (*cool* stars). Problems with the oscillator strenght of atomic transitions in the infrared make it impossible to determine accurately the stellar parameters from the ISO-SWS data for stars with an effective temperature > 5770 K (*hot* stars).

Precisely because this research involves a cyclic process, one has to be extremely careful not to introduce 'cyclic' errors. To counteract this 'cyclic' danger, three precautions are taken. First of all, all the parameters were only changed within the uncertainty of their initial values. Secondly, the spectral range from A0-M2 was highly necessary, since the different stellar structures of the various selected stars made it possible to disentangle calibration problems and problems in constructing the model or generating the synthetic spectrum. The third way to avoid that kind of problems, was by including a high-resolution observation of both a *warm* and a *cool* star in the project.

The discrepancies between the observed ISO-SWS and synthetic spectra are subjected to a careful scrutiny in order to determine their cause. At this point, a distinction can be made between discrepancies typically for *hot* stars and those typically for *cool* stars. Stellar objects belonging to the *cool* stars display molecular features in their spectrum, while those belonging to the *hot* stars do not. Therefore a description on the general trends in the discrepancies for *hot* and *cool* stars will be made first, after which some stars will be discussed individually.

Afterwards some contiguous results are depicted and we will end with a discussion on the implication on the next calibration files of the ISO-SWS off-line pipeline version.