



STSM Scientific Report Template

Applicant and home institution : Ernest Alsina , IAC (Instituto de Astrofísica de Canarias)

Visited scientist and host institution : Dr. Luca Belluzzi, IRSOL (Istituto Ricerche Solari Locarno)

Dates of STSM : 15/09/2014 – 4/10/2014

Explain briefly below how your STSM matched one of these key-points :

1. strengthen current collaborative projects
2. establish new collaborations
3. obtain necessary knowledge for the application of new techniques
4. use host infrastructures that are not available at the home institute.

The main goal of this STSM was to work closely with Dr. Luca Belluzzi, who is the co-director of my thesis together with Prof. Javier Trujillo Bueno.

Lately, my work has been focused on the development of a non-LTE radiative transfer code for polarized radiation, accounting for partial frequency redistribution (PRD) effects in a two-level atom, in the presence of a weak deterministic magnetic field. Careful tests of the code have been carried out as well as first applications to spectral lines of interest.

During my stay at IRSOL, I have also been able to perform spectropolarimetric observations using the ZIMPOL polarimeter, which is permanently installed on the IRSOL telescope.

Describe below the activities carried out during the STSM and the main results obtained.

Before I arrived at IRSOL, the previously mentioned code was already under development, in the limit of CRD. At IRSOL, several tests were carried out, and theoretical details were discussed with Dr. Belluzzi about its generalization to the case of PRD.

The more general PRD equations have been implemented and now, after the STSM, new tests are being performed, with and without magnetic field. The next step will be to apply the code for the investigation of lines whose scattering polarization signals are known to be affected by PRD effects, namely the BaII line at 4554A and the SrII line at 4077A.

Moreover, I have become more familiarized with the "RH" radiative transfer code for unpolarized radiation written by Dr. Han Uitenbroek, which provides several quantities that are used as inputs in my code. In particular, due to the foreseen application of my code to the SrII line at 4077A, I built a detailed atomic model for ionized strontium, to be used as input in Uitenbroek's RH code.

During my stay at IRSOL we have been able to perform high quality spectropolarimetric observations of the SrII line at 4077A and of the BaII D2 line at 4554A. The observations were performed thanks to the invaluable guidance of Dr. Michele Bianda, and will allow for highly interesting comparisons with the results of my code. Moreover, Dr. Bianda also supplied me with both routines and a tutorial for performing the data reduction of the observations performed with ZIMPOL, a technique which shall be highly useful in my future work.