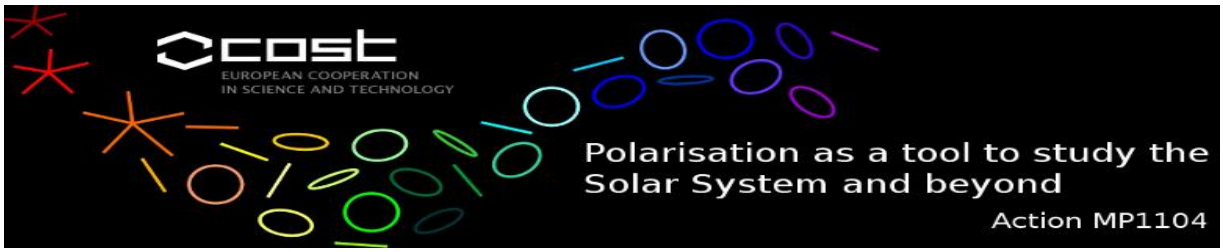

STSM Scientific Report Template

Applicant and home institution : Devogele Maxime, Université de Liège

Visited scientist and host institution : Bendjoya Philipe, Observatoire de la Côte d'Azur

Dates of STSM : 20-04-2015 to 15-05-2015

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 purpose of this STMS was to gain new expertise about the new CAPS (Calern Asteroid Polarimeter Survey) polarimeter. This polarimeter installed at the Cassegrain focus of the Omicron 1 meter telescope the Calern observatory, France. During my stay at the Calern observatory we were able, with the local team, to improve the processing pipeline of the CAPS data in order to obtain accurate data and reliable error bar estimation.

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

The whole procedure of the CAPS data processing pipeline was reviewed during this STSM. In order to improve the quality of the reduced data, a new photometric processing procedure was developed. This procedure is based on the curve of growth photometric reduction technique. This technique consists in a basic aperture photometry using multiple aperture sizes for each targets. Our approach consist to construct the curve of the flux of the target in function of the aperture size without substracting from the background flux. The flux of the target is then determined by fitting the curve with an analytical function representing the target flux (PSF + background). The originality of our procedure is to use an MCMC (Markov Chain Monte Carlo) fitting procedure which allows to obtain very accurate determination of the photometric errors.

An other part of my stay was to determine the stability and repeatability of the measurement of the CAPS polarimeter. This determination is needed for every new instrument before starting to produce scientific data. For the CAPS polarimeter this is even more important because of its peculiar configuration. The CAPS polarimeter is a “one shoot” polarimeter which allow to obtain the 3 Stokes paremeters (I, U and Q) using one single exposure. This king of polarimeter is not common and the question remains about the effectiveness of this configuration.

Using a simplified procedure of the one explained in the first paragraph (using a levenberg marquardt fitting procedure instead of a MCMC), we were able to assess that the CAPS polarimeter gives very good and repeatable results. Using 17 observations of unpolarized stars during 8 nights, we assessed that the instrumental polarisation is Q(V) = 3.82±0.018% and U(V) = 0.27±0.007 % for the V band and Q(R) = 3.61±0.011 %, U(R) = 0.30±0.017% for the R band. Using 5 observations of polarized stars during 5 nights, we assessed that the differences between previously published polarization for these stars and the polarization found by CAPS after removing the instrumental component differ by $1.7 \times 10{-}2 \pm 2.7 \times 10{-}2$ %.

The results of this work will be presented at the EPSC (European Planetary Science Congress) 2015 in Nante and will be published in a paper in preparation.