Abstract

The Observatorio Astrofísico de Javalambre (OAJ, Teruel) will be the location of a large étendue 255cm telescope (JST/T250) that will carry out a multiband (57 filters) 8000 deg² sky survey. The Javalambre PAU-Astrophysical Survey (J-PAS) is designed to map the sky efficiently using a dedicated survey telescope with the same area of the sky covered in 12 filters. In addition, atmospheric extinction will be measured with a dedicated extinction monitor (EXCALIBUR). This paper outlines the procedure designed to calibrate the exposures of J-PAS to achieve the required photometric accuracy (~2%) needed to obtain precise photometric redshifts of millions of galaxies with the scientific goal of measuring the Acoustic Baryonic Oscillations.

Introduction

The Javalambre PAU-Astrophysical Survey (J-PAS, j-pas.org) will be an 8000 deg² sky survey in 54 narrow + 2 medium + 1 broad band filters. The main scientific goal is to measure the Baryonic Acoustic Oscillations measuring positions and photometric redshifts of several millions of galaxies with a precision better than 0.005 (1+z). The survey will be carried out with a large étendue 2.5m telescope (T250/JST), a panoramic camera with 14 CCDs (JPCam) and a special set of 57 filters designed to optimize the determination of photometric redshifts. The photometric calibration of the images will be done using an auxiliary 83cm telescope (JAST/T80), a wide field camera (T80Cam) and a set of 12 filters. The JAST/T80 will observe the same area of the sky beforehand in the Javalambre Photometric Local Universe Survey (J-PLUS), whose data will be used to calibrate the images taken with the JPCam@T250/JST as well as to carry out analysis of the local universe. To maximize the time on target of both telescopes, the computation of the atmospheric extinction will be done using an on-purpose extinction monitor called EXCALIBUR. The goal of the photometric calibration is to achieve a photometric accuracy better than 2%.

Exposure time for the J-PAS survey will be computed using an extinction monitor called EXCALIBUR. EXCALIBUR is a 25cm telescope that will observe stars at different airmasses during every night in 10 different filters. This will allow us to compute the atmospheric extinction coefficients in 10 wavelengths which will be fitted to a model of atmospheric extinction of 3 components: Rayleigh scattering, ozone absorption and aerosol scattering.

The photometric zero point of the J-PLUS system will be computed observing standard photometric stars every night. After correcting for atmospheric extinction with the data from EXCALIBUR and comparing with synthetic magnitudes in the J-PLUS filter system, we will be able to measure the photometric zero points in the 12 filters of the J-PLUS system.

Given the uniqueness of J-PLUS filters, we need to compute synthetically the magnitudes of the secondary standard stars in that system. To do so, first of all, the J-PLUS photometry of these stars is fitted with stellar spectral models. It has been shown with simulations, using high resolution flux calibrated synthetic star templates from the library by Coelho et al. (2005, A&A, 443,735), that for stars with SNR>50 in the 12 J-PLUS filters it is possible to recover the stellar parameters with enough accuracy in >90% of the cases. Finally, the best stellar spectral model found for each star will be convolved with the J-PLUS filters+CCDs transmission curves to obtain the synthetic magnitudes in the J-PAS bands. These synthetic magnitudes will be used to calibrate the J-PAS exposures.

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