Deep blank field catalogue for medium- and large-size telescopes

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Abstract

Taking advantage of the Virtual Observatory, we have searched for *deep blank fields* (DBFs) throughout the whole sky, with a minimum size of 10' diameter and an increasing threshold magnitude from 15 to 18 in USNO-B *R* band. The result is **the catalogue with the deepest blank fields known** so far. Some of them have been tested with the 10.4m GTC, demonstrating to be extremely useful for medium- and large-size telescopes. This catalogue is accessible through the tool TESELA.

Introduction

In observational Astrophysics, and in particular focusing in imaging acquisition through the optical window, the observation of blank fields (BFs), regions of the sky devoid of stars down to a given threshold magnitude, constitutes one of the most relevant calibration procedures required for the proper reduction of astronomical data. An inadequate flatfielding or sky subtraction easily leads to the introduction of systematic uncertainties in the data.

Recently, a systematic all sky catalogue of optical BFs up to 11 magnitude was published (Cardiel et al. 2011, MNRAS, 417, 3061). Together with the catalogue, a new VO tool TESELA[1] was created to facilitate the user to retrieve the BFs available near a given position in the sky (see Fig. 1). Another commonly used resource is the collection by Marco Azzaro[2], consisting in a short list of 38 BFs from 10 to 16 magnitude. However, even Azzaro's BFs has demonstrated to be shallow for large class telescopes. In particular, the GTC equipped with the OSIRIS camera ideally needs BFs free of stars down to 17.5 magnitude. This requirement will be even more demanding in the case of the future E-ELT.

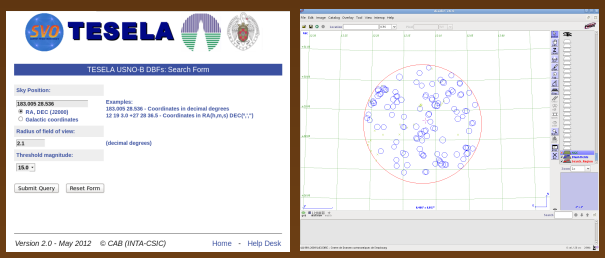

Fig. 1 *Left:* TESELA's search form. Through it the user defines the value of several parameters used for the cone-search. *Right:* Results of the cone-search shown with Aladin.

Acknowledgment

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[1] *http://sdc.cab.inta-csic.es/tesela*
[2] *http://www.ing.iac.es/~meteodat/blanks.htm*

The catalogue and TESELA

The final result of our search is the deepest so far catalogue of regions void of stars. We found 74, 332, ~6000, and more than 77000 DBFs free of stars down to 18, 17, 16, and 15 USNO-B *R* band magnitudes, respectively. This new catalogue of DBFs is also accessible through the TESELA tool (see Fig. 1). The spatial distribution of the DBFs is shown in Fig. 2.

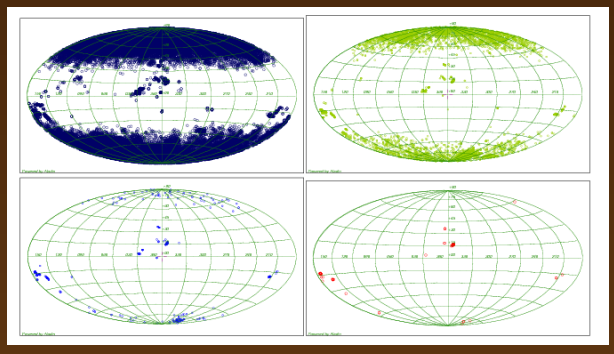

Fig. 2: Galactic position of the DBFs void of stars down to 15, 16, 17 and 18 magnitude in the upper-left, upper-right, lower-left and lower-right panel, respectively.

Some of these DBFs located at the northern hemisphere have been validated with the GTC and are regularly used in the nightly operation of the telescope. The advantage of using the new DBFs with respect to those from the Azzaro's collection is really evident (see Fig. 3 for a comparison).

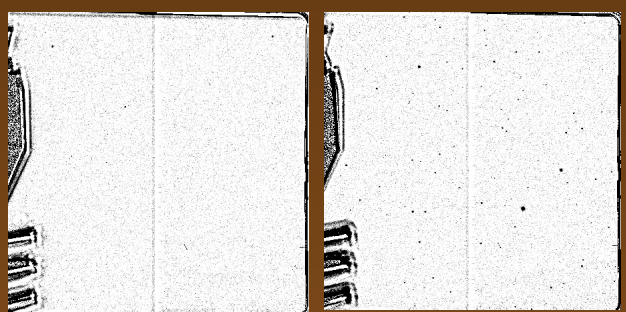

Fig. 3: Comparison of two BFs images taken with OSIRIS. They are 2 second exposure images at the Sloan r filter, with a background level of ~30,000 ADUs, of a DBF *(Left)* and a BF from Azzaro's catalogue *(Right)* at the same region of the sky.