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INVOLVEMENT OF HYPERLEDA IN A WIDE FIELD IR IMAGER AT CONCORDIA

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Abstract. French and Australian members of the ARENA consortium propose a 2 meter-class telescope at Dôme C, called PLT, dedicated to wide field infra-red imaging and driven by major astrophysical key projects. We present the foreseen contribution of the Observatoire de Lyon to handling, processing and distribution of the data products.

1 A large telescope at Concordia

The numerous results of site testing campains at Concordia, Dôme C, over the past years have convinced that the outstanding seeing conditions, transparency, background level and stability of this site represent an unique opportunity for ground-based astronomy. The most important gain is in K_{dark} (2.4 μm) and L-band (3.8 μm) but still very interesting in M and N-bands. To take the best advantage of this opportunity, we propose to place there a wide-field, high angular resolution 2.5 m telescope optimized for the near-infrared, called PLT (Polar Large Telescope, see Epchtein, N., this conference). It's the result of two projects: WHITE, a french project proposed by Burgarella et al. 2008, and PILOT, australian project leaded by Storey (Storey et al. 2007). The first light of PLT is planned for the Antarctic winter 2017.
In such a project, to guarantee an optimal scientific return and the widest visibility, processing, archiving and distributing the data play a major role. The team of the Observatoire de Lyon proposes to use its expertise in this field (HyperLeda database, DENIS survey, Virtual Observatory) to contribute to the design and deployment of the data processing. Our team developed the HyperLeda database, widely used for extragalactic physics. It can be found at the adress: http://leda.univ-lyon1.fr.
It contains compilations of measurements published in the litterature and in the large surveys. These data are used to produce an uniform and homogeneous catalogue with multi-wavelength informations on galaxies (Paturel et al. 2005).
The main scientific interest of our team is to trace the cosmic history of the star formation and of the metal enrichment of dwarf galaxies in order to improve the interpretation of stellar content and mass assembly at low and intermediate redshifts.

2 Data processing and distribution of the data products

Our goal is to provide homogeneous and high quality data in the shortest delay to the users community.
Several astronomical experiments produce large flux of data, from Terabytes to Petabytes each year (SDSS, VISTA, GAIA). Because it combines a high angular resolution with a large field of view and a fine time resolution, PLT will be one of the great data producers (around 0.5 to 1TB/day). For a robust data handling system, these figures require a storage and processing on the telescope site, at Concordia. Because of the restrictions in the data transfert volume, only the derived data-products, catalogues of extracted sources and light curves, will be transferred immediately to the remote operation center in Lyon for release to the astronomers.

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2.1 Data processing

The data processing has to be performed on the site and in quasi-real time. Each individual frame has to be corrected for instrumental effects and all the frames of a given observing block are combined to form a data-cube whose first two axes are position (or wavelength in case of spectroscopy) and third axis is the time.

The raw and reduced data are stored in the telescope database and transferred off-line to the remote operation center. This transfers will be possible during summer season. The meta-data of each observation are transferred on-the-fly to the remote operation center.

The sources' detection and extraction will proceed as usual (determination of the precise astrometry and of the PSF). The choice of algorithm for source detection will depend on the astrophysical programs. The standard processing pipeline will use classical source extraction method.

For some observations, and in particular for the legacy surveys, we will produce added-value data-products. All the observations of deep fields or multi-epoch programs will be co-added to achieve the deepest detection. The catalogues will be cross-identified with the HyperLeda database in order to construct multi-wavelength spectral energy distributions, and the results will be distributed through HyperLeda.

2.2 Distribution of the data-products

The catalogues of extracted sources and the meta-data of the observations will be immediately available to the astronomers from the remote operation center in Lyon, through HyperLeda. The access during the proprietary period will be made through a secured web site. The data access will then be publicly released after this delay, through the Virtual Observatory.

3 Instrument simulator

In order to test and validate the complete observational process, including the data-processing and analysis, we will simulate astrophysical fields, observe them with a virtual telescope and process them as real observations. The two steps of (i) simulating astrophysical fields and (ii) constructing the virtual telescope are needed in an early stage of the instrument design to assess to performances and to prepare the observations and their exploitation.

3.1 simulations of fields

Realistic fields, including source confusion (crowded fields), will be provided using various physical hypotheses. For the extragalactic sources, we will use cosmological simulations (like, for example, GalICS). The Galactic foreground will be added using the Modèle de Besançon. The simulated 2D images will be observed with a virtual telescope. That is, we will simulate the effects of the atmosphere, of the telescope and of the detectors in order to produce mock individual frames that will be processed exactly as real observations.

3.2 performance assessment and observation preparation

The simulations and the virtual telescope will be made available at an early phase of the instrument design in order to assess the performance. Because of the constraint on the simulations and construction of the virtual telescope, successive versions of these elements will be made during the development phase of the project. They will integrate the updated knowledge of the instrument model and the best available astrophysical models.

References

Burgarella, D., Le Roux, B., Langlois, M., et al. 2008, Proceedings of the SPIE, SPIE.7012E..82B

Paturel, G., Vauglin, I., Petit, C., Borsenberger, J., Epchtein, N., Fouqué, P; Mamon, G, 2005, A&A, 430, 751

Paturel, G., Petit, C., Rousseau, J., Vauglin, I., 2003, A&A, 405, 1

Storey, J., Ashley, M., Burton, M., Lawrence, J., 2007, EAS Publications Series, Volume 25, 255