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EMIR DATA REDUCTION PIPELINE

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RESUMEN

Presentamos el concepto y estado actual de la cadena de reducción (DRP, Data Reduction Pipeline) que estamos desarrollando para EMIR (Espectrógrafo Multi-Objeto Infrarrojo), que es una cámara de campo amplio y espectrógrafo multiobjeto infrarrojo. Este instrumento será construído para ser usado en el telescopio de 10 m Gran Telescopio Canarias (GTC) en La Palma, España. EDRP procesará los datos adquiridos por EMIR proporcionando imágenes reducidas mediante programas robustos y algoritmos optimizados para el manejo de datos en el infrarrojo próximo.

ABSTRACT

We present the concept and current status of the Data Reduction Pipeline (DRP) for EMIR (Espectrógrafo Multi-Objeto Infrarrojo) which is a state-of-the-art near-infrared (NIR) wide field camera and multiobject spectrograph proposed for the 10-m GTC on La Palma (Spain). EDRP will process data acquired with EMIR and will deliver reduced images by means of robust software tools and algorithms optimized for handling NIR data.

Key Words: **INSTRUMENTATION: SPECTROGRAPHS — METHODS: DATA ANALYSIS**

1. INTRODUCTION

EMIR is a state-of-the-art near-infrared (NIR) wide field camera and multiobject spectrograph that is designed to work at the Nasmyth focus of the 10 m GTC. It will be built by a consortium of Spanish, British, and French institutions, led by the Instituto de Astrofísica de Canarias (IAC). See other contributions to this meeting for more information. In this peper the concept and current status of the EMIR Data Reduction Pipeline (EDRP) are described.

2. EDRP DESCRIPTION

The EDRP will process data acquired with EMIR. It will deliver reduced images by means of robust software tools and algorithms optimized for handling NIR data. It will be devised to handle wide field frames in imaging mode, as well as multiobject observations. Frames obtained with EMIR will be reduced to scientific images and delivered to astronomers with no need for further processing. The EDRP will be fully integrated into the GTC Data Factory, which constitutes a common framework in which EMIR and other instruments can be used. It is being coded following GTC programming and software standards (ANSI-C++), under an object-oriented architecture. The Rational Unified Process (RUP), which is a software engineering process, is being used to manage and create the EDRP.

The EDRP is being designed and coded by the EMIR Universidad Complutense de Madrid (UCM) Group. It will be invoked via graphic- and command-driven interfaces, and both fully automatic and interactive reduction modes are envisaged. On-line help and documentation will be available. Other features included are image restoration and the full history of the processing of each image. Since EMIR is a multimode instrument, new solutions specific to each observing mode are being designed. A careful treatment of errors is included taking into account error propagation (see Cardiel et al., this volume, p. 75).

The EDRP is in the elaboration phase, and part of the code is being written. Some procedures have already been tested on the CAHA 3.5 m K' Omega Prime image observations (see Serrano et al., this volume, p. 318) and on Keck + NIRSPEC spectroscopic observations. The latest updates and more information can be found at the EMIR home page: http://www.ucm.es/info/emir/emir.html.

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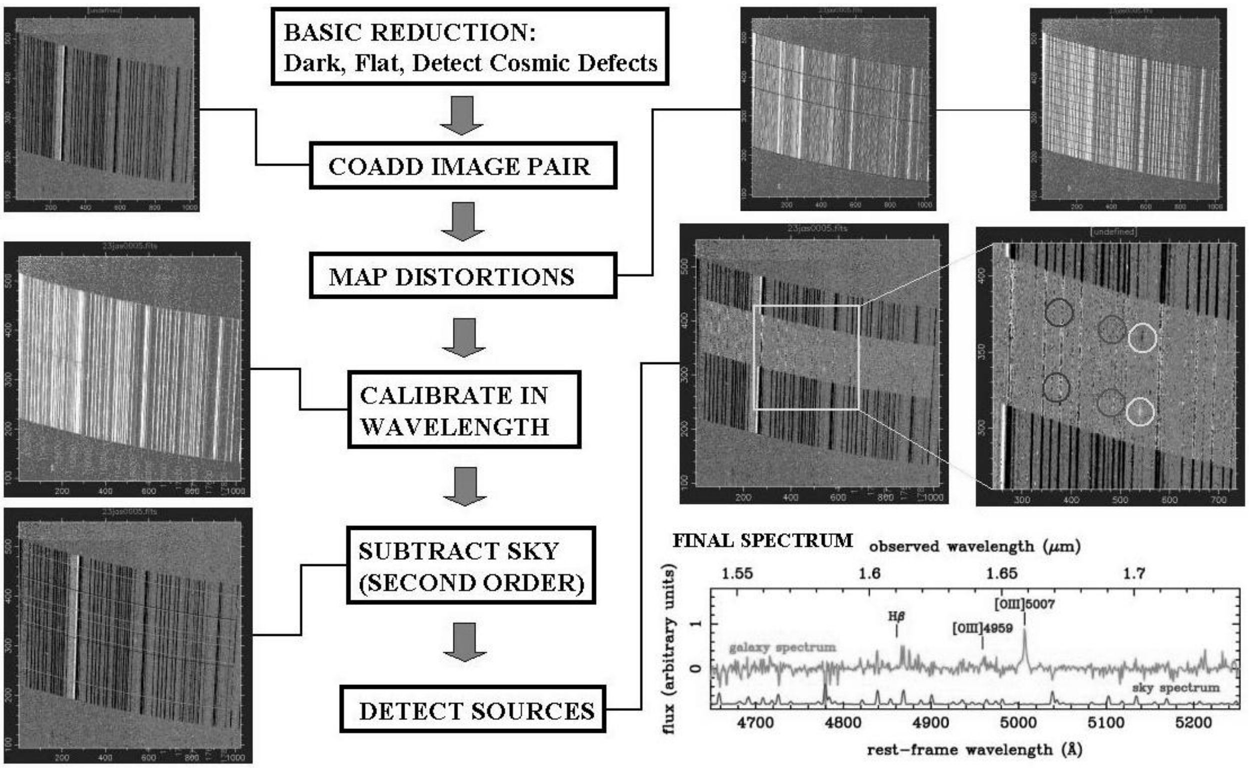

Fig. 1. Flow chart of a new method of reducing distorted NIR spectra developed for the EMIR Data Reduction Pipeline. The processed spectrum was taken with Keck + NIRSPEC.

3. PROCESSING DISTORTED SPECTRA

As an example of one of the method of reduction, we show in Figure 1 a flow chart of the steps for reducing an NIR long slit distorted spectrum.

After the basic reduction, which includes the standard procedures in the near infrared, the images containing the spectrum in two different positions on the detector are combined to obtain a sum of both observations. This procedure, which is standard for this kind of observation, allows a first-order cleaning of the sky spectrum. The next step consists in a careful mapping of the distortions.

Correcting the distortions at this stage, before wavelength calibration, is the usual method. In contrast, our procedure calibrates in wavelength using the original distorted spectrum without correcting the distortion. As we like to say: ‘we process in the distorted world’.

Although the image coadding had removed the sky background to some extent, the sky residuals are subtracted in a second step. Finally, our procedure detects the spectrum and extracts it following the lines determined by the distortion map. After exhaustive testing, we are confident that this method is considerably more reliable than the standard procedure of correcting the distortions from the beginning. Figure 1 includes the final spectrum of a Keck + NIRSPEC spectroscopic observation processed in this way.

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