



The Science Data Management Program

Christopher J. Miller & Elizabeth Stobie

In 2002, NOAO recognized the need to ensure that data taken at NOAO facilities be made available to the community. To address the trends of increased data volumes and their archival value, the NOAO 2002–2006 Long Range Plan introduced the Data Products Program (DPP). The long-term direction of the program foresaw a shift away from core IRAF software development to archive software and applications.

In the 2003 NOAO Long Range Plan, DPP identified its major goals: build an NOAO archive; build image reduction pipelines for Mosaic and the NEWFIRM wide-field infrared imager; and build the data management infrastructure to store, protect, and serve the data from the optical/infrared (O/IR) community.

In October 2008, DPP was re-organized to become the Science Data Management (SDM) program. In this process, the broad mission to meet the software and data management needs of the O/IR astronomical community was re-scoped into a set of specific mandates for the immediate and near-term future needs of the NOAO community. So where do things stand today with respect to the original DPP major initiatives?

The NOAO Science Archive debuted in 2002 and provides public access to over 70,000 science-ready, PI-reduced images from 15 different NOAO Survey Programs and community programs.
www.archive.noao.edu/nsa

A Data Transport System (DTS) replaced the tape-based “Save The Bits” safe store. The DTS on spinning disk contains over 2.3 million files and 19 terabytes of compressed data dating back to 2004. This system now forms the backbone of the NOAO Archive.

The NOAO Archive now provides Web-based access to all NOAO raw data and pipeline-reduced Mosaic data (nearly 300,000 files as of June 2009). Besides secure access for primary investigators (PIs) to their proprietary data, thousands of public Mosaic and NEWFIRM raw data sets and ~1.5 million Virtual Observatory science-ready images are accessible. www.portal-nvo.noao.edu

The NEWFIRM Quick Reduce Pipeline (QRP) has been integrated into the NEWFIRM data acquisition system at the telescope so that observers can view their data in near real time. www.noao.edu/ets/newfirm

The new NOAO mandate to SDM is focused on the current and near-term future needs of the NOAO community. These mandates will advance the current SDM infrastructure to include the newest NOAO instrumentation: NEWFIRM and the Dark Energy Camera (DECam), both of which require a working and scalable archive, as well as science pipelines to provide on-the-fly reduced data sets to observers. This is precisely the mission DPP started in 2003. Past progress made by DPP is enabling SDM to move quickly.

SDM is working hard to create a NEWFIRM science pipeline as well as a NEWFIRM IRAF software package and guide to data reduction. Both of these efforts are nearing completion. In the 2009B observing semester, NEWFIRM observers will be provided access to their pipeline-reduced NEWFIRM images for science verification. In this *Newsletter*, we announce the availability of the first draft of the NEWFIRM guide to data reduction and an associated IRAF package.

Next on the horizon: DECam will be integrated into the current SDM infrastructure. In doing so, SDM will improve its data transport system to move the large volume of DECam raw data from CTIO to Tucson and the National Center for Supercomputing Applications (University of Illinois at Urbana-Champaign) on a nightly basis. The DECam nightly data volume will be significantly larger than all other CTIO data combined. At the same time, SDM will be integrating the DECam Community Pipeline into its infrastructure so that DECam observers will have quick access to their reduced datasets. In tandem with the pipeline integration, SDM will make enhancements to the NOAO Archive to facilitate fast and easy access to DECam raw and reduced data sets.

By the end of 2010, SDM envisions that NOAO PIs will routinely use the NOAO Archive to query and retrieve their raw NOAO data; Mosaic and NEWFIRM PIs will utilize their pipeline-reduced data products in their scientific analyses; and SDM will be ready to operate the DECam Community Pipeline.

In the meantime, we encourage everyone in the astronomical community to try the NOAO archives (www.archive.noao.edu). On your next observing run, leave your tapes and DVDs at home and use the archive to electronically transfer your data to yourself and your collaborators. Use the NOAO Archive to download and evaluate some of the publicly available Mosaic reductions. As always, we are eager to hear your comments, questions, and suggestions: email vohelp@noao.edu.

The New NOAO Archive

Christopher J. Miller & Elizabeth Stobie

The Science Data Management (SDM) program within NOAO is pleased to announce the release of the new NOAO Archive (available at www.archive.noao.edu). NOAO principal investigators (PIs) can now access their raw data taken on NOAO instruments within 24 hours of their observations.

No more tapes or DVDs. SDM protects and serves your raw data electronically.

Formerly known as the Data Products Program (see related article in this *Newsletter*), SDM has a long track record of safely storing data taken on NOAO instruments through its “Save The Bits” (iSTB) software. Behind the scenes on most NOAO instruments, iSTB moves data from the mountaintops to spinning disks in Tucson, AZ, and La Serena, Chile. A third copy of every file is placed in deep storage at the National Center for Supercomputing Applications.

SDM has completed its goal to modernize this system and provide Web-based archival access to raw data for all NOAO PIs as well as to the public. The proprietary period of all data is protected in accordance with NOAO policy (www.noao.edu/noaoprop/help/datarights.html). New users of the system will receive an email from SDM asking them to register one time with the Single-Sign-On services of the US Virtual Observatory (www.us-vo.org) to access their proprietary data. After this one-time initial registration, NOAO PIs can access any data from future observing runs as well. The NOAO Archive is accessible via a Firefox browser at: www.archive.noao.edu.

Public access to thousands of NEWFIRM and Mosaic raw images.

For non-PIs, the NOAO Archive utilizes the NOAO Virtual Observatory (VO) Portal (portal-nvo.noao.edu) to provide easy access to a variety of VO imaging archives like SDSS, HST, XMM, and Chandra.

Non-PIs can also query for thousands of NEWFIRM and Mosaic raw data taken during the scientific verification stage of the NOAO Archive project (prior to 1 January 2008). As time goes on, more and more data will become public in the NOAO Archive as the standard 18-month proprietary periods expire.

Quicker science results via automatically reduced imaging data for Mosaic.

The NOAO Archive has also integrated the Mosaic pipeline into its operations. The pipeline runs automatically on all Mosaic data taken on the Blanco and Mayall 4-meter telescopes. Once the data are pipeline-reduced, the calibrated images, stacks, masks, and master calibrations are all ingested back into the NOAO Archive. PIs can access their reduced Mosaic data within 48 hours after the end of their observing run. Anyone interested in examining the quality of the data products from the Mosaic pipeline should read the *NOAO Data Handbook* and download examples from the non-proprietary, reduced data available in the NOAO Archive.

No more media. No more worries of lost data. No more reasons to store extra copies. Analyze the reduced Mosaic data within 48 hours of the observing run.

The NOAO Archive was designed and developed to meet the needs of both the NOAO community and the astronomical community at large. It forms the basis for future SDM mandates such as the inclusion of pipeline-reduced NEWFIRM images as well as access to raw and reduced data from the Dark Energy Camera.

On future observing runs, keep an eye out for an email from NOAO announcing the availability of data for your run from the NOAO Archive. SDM is always interested in the user experience, so please send feedback to vohelp@noao.edu.

NEWFIRM Reduced Data Sets Are Now Available

Principal investigators (PIs) observing with NEWFIRM will be receiving emails from NOAO Science Data Management regarding the availability of their pipeline-reduced data products. The NEWFIRM Science Pipeline is undergoing science verification, and PIs are encouraged to download and examine their reduced images. Please send all feedback to: vohelp@noao.edu.

The NEWFIRM Guide to Data Reduction Is Now Available

Science Data Management announces the first draft version of a NEWFIRM data reduction guidebook. This guide utilizes the new near-infrared IRAF external package called NFEXTERN. Users can download publicly available NEWFIRM raw data sets using the Archive to try out the new guide and the new IRAF package.

Please send feedback to: vohelp@noao.edu

The NEWFIRM Guide to Data Reduction is at: www.noao.edu/ets/newfirm.

The NFEXTERN IRAF Package is at: iraf.noao.edu/extern.html.

NOAO Data Handbook Updated

Dick Shaw

A new version is now available of the *NOAO Data Handbook*, which describes the scientific content and structure of archived data products and the means to access them from the Archive. The content of the handbook includes:

A chapter on archived NOAO data products with:

- a summary of the data types and processing levels;
- a description of the formats;
- a description of the archive registration process; and
- detailed examples of how to query, access, and download raw or reduced data from all instruments using the NOAO VO Portal.

A chapter on the Mosaic cameras with:

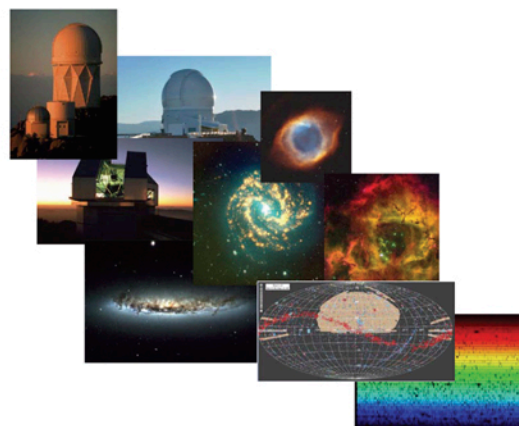
- an overview of the instruments and their most common operating modes;
- a description of the data products that are produced by the Mosaic pipeline reductions;
- a description of the pipeline processing steps, including the creation of Master Calibration files; and
- a summary of the accuracies to be expected in the reduced science products, plus instrument foibles.

A new chapter that covers data products from the NEWFIRM camera will be released soon. The Handbook provides enough detail for principal investigator teams of NOAO observing programs to make informed use of these data products and services for scientific analysis. Likewise, it will enable general Virtual Observatory users, who may not be familiar with the instruments (or who may be new to the optical/infrared wavelength regime), to make scientific use of these data products.

Access the latest version of the *NOAO Data Handbook* at: www.archive.noao.edu/help.html.

Science Data Management Group
National Optical Astronomy Observatory
950 N. Cherry Ave.
Tucson, AZ 85719

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