

Figure 3: Wavelet transform of the SUSI image of NGC 4261.



Figure 4: Wavelet transform of the PC image of NGC 4261 (level 4).

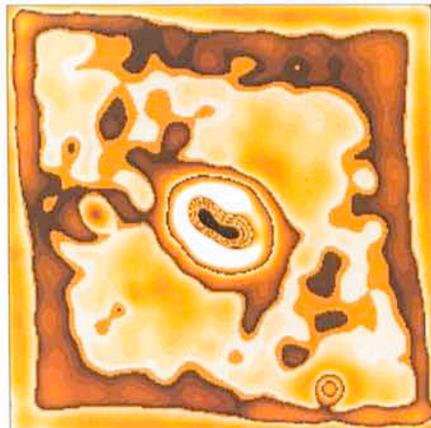


Figure 5: Wavelet transform of the PC image of NGC 4261 (level 3).

er the morphological characteristics of infalling matter in the central region of the galaxy. The original images provided no direct clues. Availability of a pair of images from different instruments with very different resolutions and signal levels affords a very good framework for validating the faint structures uncovered by the wavelet transform, as will be seen. (See also p. 28 of this issue.)

To lessen the impact of different effects due to image borders and image resolution, the SUSI image was re-binned to the scale of, and rotated to be aligned with, the PC image. Both images are shown in Zeilinger et al. (1993). The SUSI image was sharpened, and the PC image was restored, using 40 iterations of the de-noising RL method referenced in Section 1 above.

Figure 3 shows a wavelet transform image (level 4) of the de-noised and sharpened SUSI image. Figures 4 and 5 show two wavelet transform images (levels 3 and 4) of the de-noised and

restored PC image. A rather severe intensity transfer function has been used to emphasize the faint features external to, and closely adjacent to, the central dust lane of the galaxy. In the ground-based and level 3 space-born images one notices a clear protrusion to the right-hand side (which is far less pronounced in the level 4 PC image). Similarly, much of the detail in the upper left-hand side is common to these images. These features may be interpreted in terms of a warp related to the central disk. Emphasized features in the background, and towards the image borders, are artifacts which are of course uninteresting.

5. Conclusion

The wavelet transform provides a powerful exploratory tool for the analysis of faint features associated with processes which are superimposed and/or not easily distinguished. It is undemand-

ing in terms of image pre-preparation or modelling. If faint and complex features are present, then it offers an excellent way of heuristically demarcating them.

References

- A'Hearn, M.F.S., Hoban, S., Birch, P.V., Bowers, C., Martin, R. and Klinglesmith III, D.A., 1990, *Nature*, **324**, 649.
- Boehnhardt, H. and Kohoutek, L., 1992, *Icarus*, **99**, 106.
- Larson, S.M. and Sekanina, Z., 1984 *Astron. J.*, **89**, 571.
- Schulz, R., 1990, PhD thesis, University of Bochum.
- Starck, J.-L., 1993, "The wavelet transform", MIDAS Manual, Version N093.
- Starck, J.-L. and Murtagh, F., 1993, "Image restoration or sharpening with noise suppression using the wavelet transform", submitted.
- Zeilinger, W.W., Moller, P. and Stiavelli, M., 1993, *The Messenger*, this issue.

StarGates and StarWords

AN ON-LINE YELLOW PAGES DIRECTORY FOR ASTRONOMY

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1. General

Two new databases have been made available at ESO under Starcat (Pirenne et al., 1993). They are products of the Star's Family encompassing databases, data sets, dictionaries, directories, mailing labels, and so on, compiled by the second author (see Heck, 1991c). They offer a comprehensive *yellow pages* service of astronomical institutions world-wide as well as a lookup data-

base of acronyms and abbreviations used in astronomy and related sciences.

2. StarGates

StarGates is an on-line database of astronomy, space sciences, and related organizations in the world. It offers essentially the information listed in directories on paper published previously under the acronyms IDAAS (Heck,

1989a), IDPAI (Heck, 1989b) and ASpScROW (Heck, 1991 a&b), and currently available under the homogenized name of *StarGuides* (Heck, 1993 a&b). *StarGates* has however the advantage of being permanently updated. To date, more than 6,000 entries from about 100 countries are accessible.

Besides astronomy and space sciences, related fields, such as aeronautics, aeronomy, astronautics, atmo-

spheric sciences, chemistry, communications, computer sciences, data processing, education, electronics, energetics, engineering, environment, geodesy, geophysics, information handling, management, mathematics, meteorology, optics, physics, remote sensing, and so on, are also covered when appropriate.

StarGates gathers all practical data available on associations, societies, scientific committees, agencies, companies, institutions, universities, etc., and more generally organizations involved in astronomy and space sciences.

Many other related types of entries have also been included, such as academies, bibliographical services, data centres, and also distributors, funding organizations, IAU-adhering organizations, journals, manufacturers, meteorological services, national norms and standards institutes, parent associations and societies, publishers, software producers, and so on.

The information is given in an uncoded way for easy and direct use. For each entry, all practical data returned by the organizations are available: city, postal and electronic-mail addresses; telephone, telex and telefax numbers; foundation years; numbers of members or staff; main activities; titles, frequencies, ISS-Numbers and circulations of periodicals produced; names and geographical coordinates of observing sites; names of planetariums; awards, prizes or distinctions granted; and so on.

StarGates points to the various entries not only by their different designations and acronyms, but also by locations and major terms in names. Selection criteria are also available, such as the geographical coordinates of a location around which one would like to list the entries (with available coordinates)

within a given radius. Any string of characters can also be searched in any field. It is also possible to search by keywords such as places, etc.

3. StarWords

StarWords is an on-line database of abbreviations, acronyms, contractions, and symbols in astronomy, space sciences, and related fields. It offers essentially the updated information listed in the dictionary *StarBriefs* (Heck, 1993 c&d). To date, about 60,000 entries are accessible.

The field coverage is the same as for *StarGates*. Abbreviations, acronyms, contractions and symbols in common use and/or of general interest have also been included when appropriate. The travelling scientist has not been forgotten either (codes of airlines, locations, currencies, and so on).

4. How to Access It?

Access to *StarGates* and *StarWords* is included in Starcat which can be run from any computer within ESO or through the standard Starcat account reachable

- • through Internet: \$ telnet
stesis.hq.eso.org (134.171.8.100),
- • through SPAN: \$ set host stesis

From the top level menu, select the ESO option. The successive menus are then self-explanatory. On-line help and documentation is also available, as well as a dedicated user report system.

More details on Starcat can be obtained by contacting S. Hill at ESO or archeso@eso.org (Internet) or ESO::ARCHESO (SPAN).

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ous ways to compile and update the information presented in *StarGates* and *StarWords*.

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Feedback from users on possible modifications and/or additions to the data provided in *StarGates* and *StarWords* would be highly appreciated in order to ensure endured accuracy of the master files.

References

1. Heck, A. 1989a, International Directory of Astronomical Associations and Societies together with related items of interest. IDAAS 1990, *CDS Special Publ.* **13**, vi+716 pp. (ISSN 0764-9614 – ISBN 2-908064-11-1).
2. Heck, A. 1989b, International Directory of Professional Astronomical Institutions together with related items of interest. IDPAI 1990, *CDS Special Publ.* **14**, vi+658 pp. (ISSN 0764-9614 – ISBN 2-908064-12-X).
3. Heck, A. 1991a, Astronomy, space sciences and related organizations of the world – ASpScROW 1991, *CDS Special Publ.* **16**, x + 1182 pp. (ISSN 0764-9614 – ISBN 2-908064-14-6) (two volumes).
4. Heck, A. 1991b, *Astron. Astrophys. Suppl.* **90**, 103–104.
5. Heck, A. 1991c, *CDS Inform. Bull.* **40**, 139–141.
6. Heck, A. 1993a, StarGuides, a directory of astronomy, space sciences, and related organizations of the world, *CDS Special Publ.* **20**, x + 1174 pp. (ISSN 0764-9614 – ISBN 2-908064-18-9) (two volumes).
7. Heck, A. 1993b, *CDS Inform. Bull.* **42**, 71–72.
8. Heck, A. 1993c, StarBriefs, a dictionary of abbreviations, acronyms, and symbols in astronomy, space sciences, and related fields *CDS Special Publ.* **21**, xxxiv + 778 pp. (ISSN 0764-9614 – ISBN 2-908064-19-7).
9. Heck, A. 1993 d, *CDS Inform. Bull.* **42**, 73–74.
10. Pirenne, B. and Albrecht, M.A. 1993, *ECF Newsletter* **19**, 16–17.

