

# BILKO

By Larry Atkinson

THIS IS THE FIRST of what I hope are many columns on useful tools for the oceanographer. By tools I mean software, hardware, or data that we use to do our job. I will try to focus on tools that are of general utility to all oceanographers and that may have educational value.

This first edition of *The Oceanographer's Toolkit* features the BILKO software of UNESCO's Training and Education in the Marine Science Program (TREDMAR). So what is BILKO?

BILKO is a simple image analysis tool that comes with digital image files. The files are referred to in lesson sets so a neophyte user can learn both how to process data and learn image processing techniques. BILKO is used in over 70 countries by users at over 500 institutions. BILKO runs on PC's.

The key image processing functions of BILKO are

Load image	Save image
Load LUT	Save LUT
Load palette	Save palette
Display image	Cursor
Histogram	Filters
Modify LUT	Multi Image
Modify image	Transect
Modify palette	Misc

"Modify LUT" has the look up table functions histogram equalization, linear stretch and manual stretch options. "Modify image" has subimage and zoom options. "Multi-image" has six options: radiometric masking, two-band ratioing, scattergram, image arithmetic, toggle and normalized difference vegetation index. While this menu of functions may not be complete it covers all the normal processing tricks we need.

The real power of BILKO is the wealth of lessons that come with it. The lessons give examples of how to work with various types of data. Again I'll resort to a list of examples. These lessons are all from the paper referenced later in this column. You will be surprised to

note that the applications are not limited to satellite derived imagery.

"Imaging *in situ* bio-optical and physical parameters—analyze time series velocity, chlorophyll and temperature data from Biowatt II." (Contributed by Ocean Physics Group, Department of Geological Sciences, University of Southern California.)

"Spatio-temporal evolution of the coastal upwelling in the Senegalese and Mauritanian littoral—show upwelling dynamics using Meteosat 4 infrared images." (Contributed by CRODT/ ORSTOM/UTIS, Dakar, Senegal.)

"Variation of AVHRR-derived sea surface temperature with satellite zenith angles—understand the scale and sense of the error induced by the satellite zenith angle on the calculation of SST" (Contributed by OSTROM/Station SEAS, La Reunion, France.)

"Seasonal and yearly variation of surface temperature distributions in the North Sea—understand the thermal structure of the North Sea by showing the seasonal course and the annual variability of the sea surface temperatures, as measured by NOAA satellites." (Contributed by the Royal Netherlands Meteorological Institute, De Bilt, The Netherlands.)

"Analysis of the turbid plume of the Gironde estuary (France) using SPOT data—understand how to monitor estuarine discharge in oceans using SPOT data." (Contributed by the Department of Geology and Oceanography, University of Bordeaux.)

"Detection of sea surface life with an airborne synthetic aperture radar—gain familiarity with digital images of fishing events as recorded by an airborne SAR." (Contributed by Centre ORSTOM-UF Hydrobiologie-Océanographie, Centre ORSTOM-Surveillance de l'Environnement Assistée par Satellite, Centre IFREMER and GDTA. All in France.)

And finally if that variety is not enough:

"Bathymetry prediction from satellite altimeter data—predict bathymetry from gridded radar altimetry measured by earth-orbiting spacecraft over remote oceans where conventional ship-borne depth soundings are sparse [but] satellite altimetric measurements

are dense and evenly space[d]." (Contributed by the Naval Research Laboratory, Washington, DC.)

Each of these lessons includes clearly stated objectives, necessary background information including theory, and a lesson with questions and answers. I've found that I can try any one of the lessons and quickly learn about both processing techniques and new observational techniques such as SAR or altimetry since the lessons include excellent simple explanations. Key references are also included with each lesson. There are 20 more lessons in the first three training modules produced by TREDMAR.

I have found BILKO to be very useful and have recommended it to many students who have asked about image processing. The combination of software, lessons and imagery is powerful. An additional advantage of the system is the growing user group that is cultivated by TREDMAR scientists. In fact one of the two requirements made by TREDMAR is that you return an information card so they can build the user list. The other is that you not sell BILKO.

The information presented in this column was obtained from the following publication.

Robinson, I. S., Matthews, A. and Blackburn, D. A. eds., 1993: *Applications of Marine and Coastal Image Data from Satellite, Airborne, and In Situ Sensors—Fourth Computer-Based Learning Module*. Marine Sciences Training and Education Program, UNESCO, Paris, 1993, 102 pp. + 5 discs.

A Windows version is in the making. For a copy and more information write to:

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In the next issue of *The Oceanographer's Toolkit*—Atlas and OceanAtlas.