VARVE MEASUREMENT AND ANALYSIS PROGRAMS – INSTALLATION

UTHSCSA Image Tool 3.0
Varve300.itm – script file for varve measurement.
Varveprofile100.itm – script file for gray-scale profile analysis.

PRE-INSTALLATION INFORMATION

The varve measurement and gray-scale analysis programs (Varve300.itm and Varveprofile100.itm) are script files that are run in UTHSCSA (Univ. of Texas Health Sciences Center at San Antonio) Image Tool 3.0 (Wilcox and others, 2002), and take advantage of its image analysis utilities. Computer and operating system requirements are listed on the Image Tool web page at: http://compdent.uthscsa.edu/dig/itdesc.html or search for "Image Tool 3.0". Image Tool operates in Microsoft Windows and at present there is no Mac version. Although the web site does not list Image Tool 3.0 as operating with versions of Windows higher than Windows 98, we are not aware of, and have not experienced, any difficulties using the program with Windows 2000 or XP. We have not tried the program with Microsoft Vista.

For reasons discussed below it is optimal to have a large screen monitor and to have the monitor set to a high resolution with 1280 x 1040 or higher being sufficient. Higher screen resolutions will allow you to use images of higher pixel dimensions. Your screen resolution can be set in Control Panel under Display – Settings on your computer. If you measure a lot of varves, staring at the computer screen while using the measurement program can be tedious on your eyes. Flat-panel LCD monitors are much easier on your eyes and do not have any noticeable distortion as sometimes may occur on older CRT monitors.

SOFTWARE INSTALLATION

Step 1. Download Image Tool 3.0 from the Image Tool web site at:
http://compdent.uthscsa.edu/dig/itdesc.html or search for "Image Tool 3.0". An IT3.zip folder should load right to your desk top. Open the IT3.zip folder and run (click on) setup.exe to install the program. It is recommended that you install Image Tool in the Program Files folder on the C:\ drive (or master hard drive) of your computer. Once the program is installed an Image Tool 3.0 short cut icon can be sent to your desktop. To do this right-click on the "***it.exe***" file in the ***C:\Program Files\UTHSCSA\ImageTool*** folder and select: **send to - desktop**.

Step 2. Download the script files: Varve300.itm & Varveprofile100.itm on our varve web site or here if you are reading this document on your computer. You can save the files to your desk top or directly to the folder indicated in Step 3 below.

Download: LINK to Varve300.itm

Download: LINK to Varveprofile100.itm

Step 3. Place the script files in the following folder:

C:\Program Files\UTHSCSA\ImageTool\Scripts and **NOT** in the Plug-Ins folder.

If you did not set up Image Tool with the standard choices your UTHSCSA or Image Tool folders may be in a different drive and in a different location than the regular Program Files folder.

FILE SETUP FOR IMAGE TOOL

After installing Image Tool 3.0 you will need to set up some files on your computer to house images and data files by doing the following:

Step 1. On the C:\ drive of your computer, create a folder called IMAGES. The measurement and gray-scale analysis script programs will look for this folder as C:\IMAGES. If you are reading this on your computer you can alternatively download and place the IMAGES folder below with its contents on your C:\ drive as C:\IMAGES. Download: LINK to IMAGES folder
We recommend that you download the folder here because you will also get the sub-folders of IMAGES as well as digital images for learning how to use the programs.

NOTE: If you want to put the IMAGES folder somewhere else instead of the C:\ drive you will have to go into the script programs (Varve300.itm and Varveprofile100.itm) with an ASCII text editor such as WordPad to change the destination drive name for IMAGES and all of its sub-folders wherever they appear in the script programs. See the Modifying Script Programs section below.

Step 2. If you did not download the IMAGES folder from this web site, create the following folders in the IMAGES folder: ANALVRV, RAWVRV, PROCESSED, and RESULT. Exact spelling is critical.

Images to be analyzed will be placed in the RAWVRV sub-folder. If you download the IMAGES folder and its sub-folders in Step 1 above the RAWVRV folder will contain practice images. All output from the measurement programs will be in the other folders. ANALVRV will be the destination for images with annotations and posted lines showing image measurements. Intermediate image treatment steps such as image rotation and translation (jpeg to bitmap, RGB to gray-scale, etc.) will be stored in the folder PROCESSED and are frequently discarded by the user when analysis is complete. All numerical data files will be placed in RESULT.

MODIFYING SCRIPT PROGRAMS

Before using the script files in Image Tool you may want to modify them as indicated below. To change the script programs open them in an ASCII text editor such as WordPad to make edits. If you have suggestions for changing the script programs please contact us at our web site's contact box.

1. Changing the Drive Location of the IMAGES Folder

If the IMAGES folder you created (or downloaded above) is in a location other than on the C:\ drive of your computer you will have to modify the script programs by replacing "C:\" in all program statements with the location you have chosen.

2. Project or Institution Name on Images

The varve measurement script files will post a label on the bottom right corner of processed images. Part of this label is the core image name while the other part says "Tufts University". You will likely

want to change this in your script files. Open the script file in an ASCII text editor such as WordPad to change "Tufts University" to your own institution's name. Don't make it too long or it will run off the image. The critical line that you want to change is a write statement near the end of each script file:

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write('Tufts University');
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Do not remove any punctuation such as the single quotes, parentheses, or the semi-colon because a syntax error will occur when running the program.

If you do not want to post an institution name on your analyzed images we suggest that you enclose the statement above in brackets { }, which will turn the statement into a comment statement. This will preserve the position of the statement and its content if you should want to include it or change it later by removing the brackets.

COLLECTING DIGITAL IMAGES

Listed below are some instructions, suggestions, and hints for collecting images. An example image is shown below on Figure 1.

1. All digital images should be collected at a high resolution as either bitmap (*.bmp) or joint photographic experts group (*.jpg) images and must include a scale (Figure 1). As explained below, copied sets of digital images can be changed to lower pixel resolution in a program like Photoshop if this becomes necessary for a program to function. We usually collect images at a resolution of 3008 x 2000 pixels.

2. Cores should be partially and evenly dried to accentuate the contrast between layers of different grain size (see LINK Core Preparation).

3. We recommend that full spectrum bulbs be used to illuminate the core when images are collected. For more information on how this is done at Tufts, please see the web site section: (see LINK Collecting Digital Images).

4. Images should be collected with the long axis of the core parallel (perpendicular to bedding) to the long (usually horizontal) dimension of the images and with the bottom of the core on the left side of the image in landscape view (Figure 1). The computer programs will automatically rotate the images to a vertical upright orientation on your computer screen for varve measurement or gray-scale analysis.

5. As much as is possible, bedding on the image should be lined up so that it is parallel to the sides of the image (see Figure 1). This may mean that the sides of the core or core liner will not necessarily be parallel to the bottom or top of the image. Alignment of bedding is critical because varve thicknesses and gray-scale profile lines are recorded in a vertical direction (perpendicular to bedding) when images are rotated 90° and displayed in the programs.

6. All images must have a scale because the programs have calibration routines that measure distances of known length (in any direction) on the images. The scale bar should be placed along the side of the image roughly perpendicular to bedding (Figure 1). If you are collecting images for only gray-scale profile analysis it may be convenient to have the scale parallel to bedding across the bottom of the core section.

Figure 1. High resolution image of core section from core site at Claremont Junction, New Hampshire.

7. For the varve measurement program, a marking system on the core liners should be developed that show the bottom of the first varve to be measured on an image and the top of the last varve to be measured on the image (Figure 1). The mark for the top of the last varve will appear as the bottom of the first varve to be measured on the next image and so on in a sequence of core images. On the image below red numbers separated by green lines are our marks used to locate measurement boundaries on the image and identify image numbers. Dots and dashes, similar to Roman numerals, are used (for example, ● = 1, ●●= 2, ▬ = 5, and so on) if the core liner is too thin for writing numbers.

8. Images must be named following the format described in the next section on Format of Images. All images of core sets that are ready for analysis must be placed in the RAWVRV sub-folder of IMAGES for the programs to access them.

FORMAT OF IMAGES FOR VARVE MEASUREMENT AND ANALYSIS

Images placed in the C:\IMAGES\RAWVRV folder must be named and formatted a certain way for the measurement and analysis programs to access them properly. There are some examples in the RAWVRV sub-folder of the IMAGES folder available for download above.

For BOTH varve measurement (Varve300.itm) and gray-scale analysis (Varveprofile100.itm): The images in RAWVRV must be: 1) oriented so they are horizontal (landscape) and the bottom varve of each image is to the left (see above: Collecting Digital Images), and 2) named with a standard format starting with the name of the core (core set) followed by a dash and the number of the image in the core set. We recommend limiting core set

names to 6 alpha-numeric characters. This name will be printed on the images by the program in a limited space. The first image at the bottom of the core should be numbered as 1. For example: PAS2-1, PAS2-2, PAS2-3, PAS2-4, PAS2-5, PAS2-6, PAS2-7 etc., where PAS2 is the name of the core (core set) and following the dash 1 thru 7 are successive image numbers with 1 being the image at the bottom of the core and 7 being the image at the top of the core. Single digit image numbers cannot be listed with starting zeros, such as "01" or "02", but must be given as single digits. Images should also be taken such that bedding is parallel to the left and right sides of the image when it is in landscape view (see above: Collecting Digital Images). The program will automatically rotate images so that bedding is horizontal and the image upright on you computer screen. This rotation is done because images are analyzed more easily when bedding is horizontal on a computer screen. Also, images are usually collected with the long axis of the core matching the long axis of an image (landscape view).

For varve measurement (Varve300.itm) only: Images should have a relatively low resolution so they can open completely in the measurement program's window without slide bars showing on the edge of the image. The measurement routine will not work if the images are not completely open on the computer screen. The programs open images with a 1:1 ratio of image pixels to screen pixels. Therefore, images with lots of pixels cannot be fully opened on your monitor screen unless it is of unusually large pixel dimensions. We generally collect images with a 3008 x 2000 pixel size, but the typical resolution of measurement images is 800 pixels perpendicular to bedding. This is not a very high resolution, but is plenty of pixels when measuring only a few varves per image. Typically a 2-ft core will have 4-10 images depending on the thickness of the varves and the details one wants to see during analysis. An image that spans 10-15 cm (800 pixels) will have approximately 80-50 pixels/cm or a pixel width of 0.125-0.2 mm. For very thin varves (less than 0.5 cm) many successive magnified images may have to be used for high resolution measurement. We have used images that cover only 2 cm (800 pixels @ 400 pixels/cm) with a pixel width of 0.025 mm/pixel. It once took 34 images to cover a single 2-ft (61 cm) core. Images should also be taken such that the bedding in the images is as parallel as possible to the narrower (600-pixel) sides of the image in landscape view. Bedding will be vertical on the images collected as described above (Figure 1). It is suggested that high resolution images be collected for all cores and then copied as needed for various analyses. The copied set can then be renamed and resized to 800 pixels perpendicular to bedding in a program such as Photoshop. Your computer monitor should also be set to a high resolution with a minimum of 1280 x 1024 pixels to properly display images without slide bars.

For gray-scale analysis (Varveprofile100.itm) only: The images for gray-scale profile analysis should have a very high resolution and the program will work with image slide bars, although you may have to navigate across the image with the slide bars to find such things as the scale bar. Not having parts of the image visible while trying to choose a profile location is not ideal but unavoidable unless your monitor is set to an extremely high resolution (over 2000 vertical pixels), which is not likely. You may want to collect a separate set of high resolution images for gray-scale analysis of individual varves. The images can be cropped to remove the sides of an image containing deformed bedding or the core liner. Cropping the image sides necessitates placing the scale bar at the top or bottom of the varve layers, which would be the left or right side of the images prepared in the Collecting Digital Images section above as shown on Figure 1.

References

Wilcox, C.D., Dove, S.B., McDavid, W.D., and Greer, D.B., 2002, UTHSCSA Image Tool Version 3.0: Freeware software available from the Department of Dental Diagnostic Science at the University of Texas Health Science Center at San Antonio: http://compdent.uthscsa.edu/dig/itdesc.html or search for "Image Tool 3.0"