3. USING THE IMAGE TOOLBAR BUTTONS TO EXAMINE IMAGES AND INTERPRETING THE STATUS BAR

Aim: To introduce you to using the image toolbar selection buttons and to interpreting the information provided in the status bar panels.

Objectives: You will learn to interpret the panels of the Status Bar for an image document, the distinction between underlying and display data values, use of point selection, line selection (transect) and box selection buttons, use of **Go To** function from the **Edit** menu, and how to select a sub-area of an image and save this as a new image.

Pre-requisites: To do this tutorial you need to have completed the tutorial on **opening, viewing and saving images** and in particular have created the image file *AVHRR_ID2497481 #02.dat*.

Activity: Open the image *AVHRR_ID2497481 #02.dat* using the default settings but make a note of the minimum and maximum values of the image data in the **Image Data Range** part of the **Redisplay Image** dialog box. Once the image is open, look at the bottom right hand corner of the **UNESCO BILKO** workspace Status Bar and note the five grey panels. The first panel shows the zoom on the image, which is currently 100%. The next two panels show the column and row coordinates of the cursor, which should be at the top left (coordinates 0, 0) of the image. The last two panels show firstly, the underlying value of the pixel where the cursor is and secondly, the display value (on a scale of 0 [black] to 255 [white]).

In this 16-bit integer image, the actual values of pixels can range from 0 to 66535 but a computer monitor can generally only display 256 grey levels so the *Bilko* program has to map the image data range to the monitor (screen) data range. The default settings map the lowest image pixel value, which you should have noted as 48, to 0 and the highest pixel value, which you should have noted as 762, to 255, with intermediate value pixels taking values in between. This mapping is discussed in more detail in a later section.

Activity: Make the image cursor a "point selection" by clicking on the point selection button ⊞. Now move the mouse pointer over the middle of Spain and click the left hand button. The white arrow places a flashing cursor in the form of a cross (+) on the image where it is clicked. The last four grey panels will now contain the *x*-coordinate (column), *y*-coordinate (row) and both underlying and display brightness values of the pixel that the cursor is on. If the cursor was on a pixel 300 from the left and 295 rows down the panels would look as follows, showing that the pixel has an underlying data value (DN) of 226 and is displayed as a grey level of 64. Being able to find out the value of an individual pixel at a given location using the image cursor can be very useful.
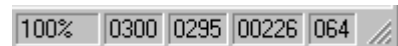
To practice your use of the cursor we will find out typical values of sea and land pixels in the clear part of the AVHRR band #2 image. This is recorded at wavelengths of 0.72-1.10 μm in the near infra-red part of the spectrum. Near infra-red is strongly absorbed by water and strongly reflected by vegetation and thus infra-red images can be useful for determining land-sea boundaries. To focus in on the non-cloudy part of the image you will select a sub-area from the main image and make this into a new image before examining land and sea pixel values using the status bar.

Activity: Make the image cursor a "box selection" by clicking on the box selection button ▢. Select **Edit, Go To** and set the position (top left coordinates) to an **X:** of 185 and **Y:** of 290 and selection size to a **DX:** of 245 [columns] and **DY:** of 230 [rows]. Once this is done click ▭ OK ▭. The specified sub-area is now delimited by a box.

> *Note:* You can also delimit boxes interactively by clicking on the top left of the area you want and then, holding the left mouse-button depressed, dragging the bottom right of the box to where you want. Now that you know the area you want, practice doing this. At any time you can click on **Edit, Go To** in order to check precisely what sub-area you have selected and modify this using the position and selection size coordinate boxes.
>
> When happy with this, leave a cloud-free sub-area, similar to that suggested above, selected. Then select **File, New** from the menu and in the **New** dialog box select **IMAGE Document** and click . This creates a new image of the clear sub-area you want to focus on.
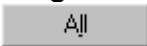
You can move the cursor around the new image using the arrow keys ($\uparrow \downarrow \rightarrow \leftarrow$) on the keyboard. By default, each press of an arrow moves the cursor 10 pixels in the direction indicated until it is within 10 pixels of the edge of the image. To move the cursor one pixel at a time hold down the <*Ctrl*> key and then press the appropriate arrow key. You can also use **Edit, Go To** to alter increments moved by the image cursor (with or without the <*Ctrl*> key depressed) or to go to a specific column and row coordinate on the image, e.g. 90, 135. The latter function is particularly useful on images with geographical coordinates.

Activity: Experiment with using the cursor and then use it and the status bar to find answers to the following questions. [*Hint:* zooming in may help in positioning the image cursor around the coastline].

Question 1: Concentrating on the coastline but trying to avoid "mixels" (i.e. pixels which overlap both land and sea), what are the maximum underlying pixel brightnesses (DN values) in areas that are clearly sea?

Question 2: Concentrating on the coastline but trying to avoid "mixels" (i.e. pixels which overlap both land and sea), what are the minimum underlying pixel brightnesses (DN values) in areas that are clearly land?

Question 3: Why are the sea pixels much darker (i.e. have lower DN values) than the land pixels?

Activity: When you have finished close the sub-image and close the ***AVHRR_ID2497481 #02.dat*** image. Now open a colour composite image (***AVHRR_ID2497481_composite.set***) that has been saved as a set of three images (bands #1, #2 and #4 of the AVHRR_ID2497481 image). In the **Redisplay Image** dialog box select **Auto linear stretch** for the stretch setting to use and click the **A‖** button to apply this stretch to all three bands of the composite (see **tutorial 5** for details of stretches). Click the point selection button and select **Edit, Go To** dialog box from the menu bar. Use this to place the cursor on the pixel at column (**X:**) 258 and row (**Y:**) 329. The fourth and fifth panels of the Status Bar should now each contain three values separated by commas (see right).

`100%  0258  0329  00123,00234,00513  021,066,041`

In the fourth panel are the image data values (123, 234 and 513) for the pixel at column and row coordinate (258, 329); in the fifth panel are their display brightness values (21, 66, 41 if **Stretch, Options Min %** is 0 and **Max %** is 100; 20, 85, 18 if **Stretch, Options Min %** is 5 and **Max %** is 95). The first number refers to the image displayed through the red gun, the second to that displayed through the green gun, and the third to that displayed through the blue gun (*Hint:* Remember RGB). You can check what these images are by dragging down the top of the image window.

Activity: To do this, click on the grey edge above the image (indicated by the arrow) but below the title bar and holding down the left mouse-button drag the image "window pane" downwards (it works a bit like a roller-blind). [*Note:* When the mouse pointer is positioned correctly over the top of the window pane it will change into a pair of parallel lines with up and down
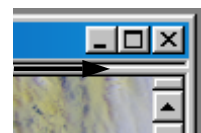
arrows.] Under the composite image you should see: **False Colour Composite AVHRR_ID2497481 #01+#02+#04.** This tells you that the top (Red gun) image is band #1, the second (Green gun) image is band #2 and the third (Blue gun) image is band #4 of the AVHRR_ID2497481 image. This type of information on image history is automatically stored by *Bilko* and can be very useful at times. Use **Window, Close All** to close all the images making up the set.

Finally, in this section we will look at the transect button on the menu bar. The Transect option allows you to view a graph of pixel brightness values along a transect drawn between any two points on an image. This is shown as a graph of pixel values on the *y*-axis versus number of pixels along the line between the points. Transects can be used to study how pixel values change between different areas of the image. To find information about the transect button, click on it and while holding the left mouse button down, press the F1 key.

Figure 3.1. Map showing the area covered by the *AVHRR_Mulls#04.bmp* image.

For this you will look at an AVHRR image taken in band #4 which senses emitted thermal infra-red electromagnetic radiation in the wavelengths 10.50–11.50 μm. This image has been processed and re-scaled to 8-bits. By convention darker areas are warmer on this type of AVHRR thermal image. Colder parts of the image will thus appear brighter (high pixel values) and warm parts dark (low pixel values).

Activity: Open the image *AVHRR_Mulls#04.bmp*, click on the Transect button, or select the **Selection, Line** option from the **Edit** menu. Start the transect north of Malin Head (Figure 3.1) near coordinates (5, 120) and drag the mouse pointer to the middle of Islay island (Figure 3.1). This draws a transect which passes through the oceanic front off Northern Ireland and ends on land. Now click on **File, New**
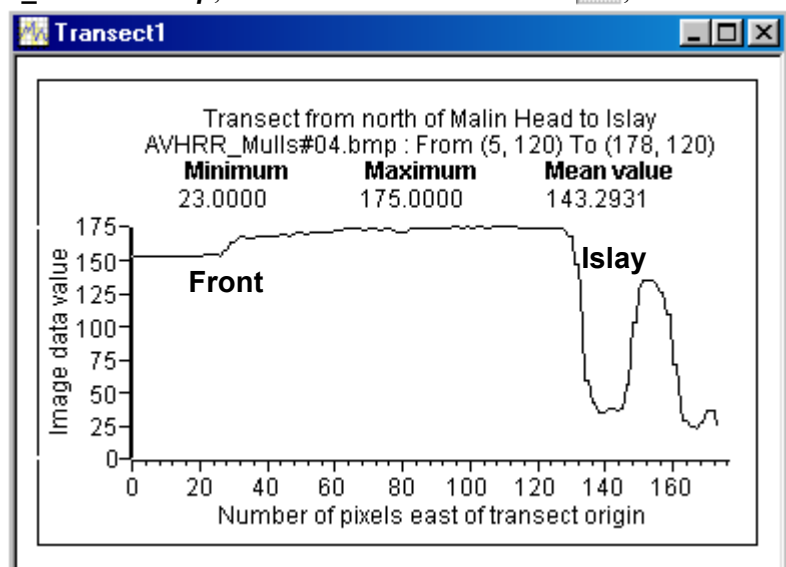
and select a TRANSECT Document (the default) from the **New** dialog box.

The front shows up as a sudden increase in pixel values whilst the warm land (whose pixel values are very low) is where pixel DN values suddenly plummet to around 30.

Activity: Note that if you needed the transect information for reference purposes, you could save the transect document (extension *.tsc*). You may wish to experiment with this, saving and re-opening the transect document. When you have finished with the transect, close it. If you are **not** going onto the next tutorial, you can also close the *AVHRR_Mulls#04.bmp* image.

In this section you have learnt how to use the image cursor and panels of the Status Bar to interpret an image, the distinction between underlying image data and display data values, use of point selection, line selection (transect) and box selection buttons, use of **Go To** function from the **Edit** menu, and how to select a sub-area of an image and save this as a new image. You have also learnt how to find out more about an image by dragging down the top of the image window. These skills are all routinely used in image interpretation and image processing and will come in useful later.

At this point you can either go on to further **examine images using Histograms** or you may wish to take a break.