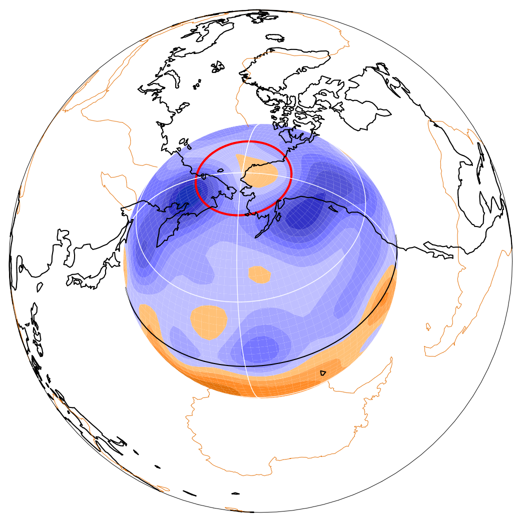
LEOPACK



continent_full_sphere_plot

Continents and full sphere plot

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1 continent_full_sphere_plot

Source code is in

LEOPACK_DIR/GPROGRAMS/continent_full_sphere_plot.f

although subprograms from LEOPACK_DIR/GSUBS, LEOPACK_DIR/SUBS and LEOPACK_DIR/LINALG are also required.

This program is not given a full section as it is in principle identical to the program full_sphere_plot: differing only in that it adds the outline of the continents on the surface of the sphere. For this to work, you need to include the file coast.dat in the directory of execution. A copy of this file is in the directory

LEOPACK_DIR/GTEST

A valid input file to the program full_sphere_plot is a valid input file to the program continent_full_sphere_plot.

1.1 Sample runs of continent_full_sphere_plot

The directory

$LEOPACK_DIR/SAMPLERUNS/CONTINENT_FULL_SPHERE_PLOT

contains example input files only. Do not under any circumstances edit these files. They refer to other (solution vector) files which are elsewhere in the distribution and provide a relative path to avoid unnecessary duplication of files. The outputs from the different files are displayed here rather than left in the directory.

1.1.1 Example a

```
* input file for full_sphere_plot
 85.0  -20.0    180.0                           : alpha beta gamma
example_aOUTPUT                                 : Filename stem
../../EXAMPLES/SHEARWAVE/swave_temp.ints        : integers
../../EXAMPLES/SHEARWAVE/swave_temp.vecs        : vectorfile
../../EXAMPLES/SHEARWAVE/swave_temp.xarr        : radialfile
 120.0   0.0  0.0   0.80                        : huepos, hueneg, csat, scal
 12   6   3   8.0     7                         : nlev idev nnds papwidth  icomp
 80  160   1.50                                 : NTHE NPHI RADV2
```

The solution vector in this input file is a temperature function which is set up to be proportional at the outer boundary to the lateral variation of shear waves in the lowermost mantle. Using the Euler angle γ, we centre the plot in the Pacific and show the large anomalously low shear-wave velocity region. Since we set csat to zero, we have chosen a monochrome plot and thus the minimum value of the function is in white: darker regions correspond to faster seismic wave speeds. This is an example of an instance where it is helpful to set scal to a lower value than 1.0. With contrast at its highest, it is difficult to see where the continents are.

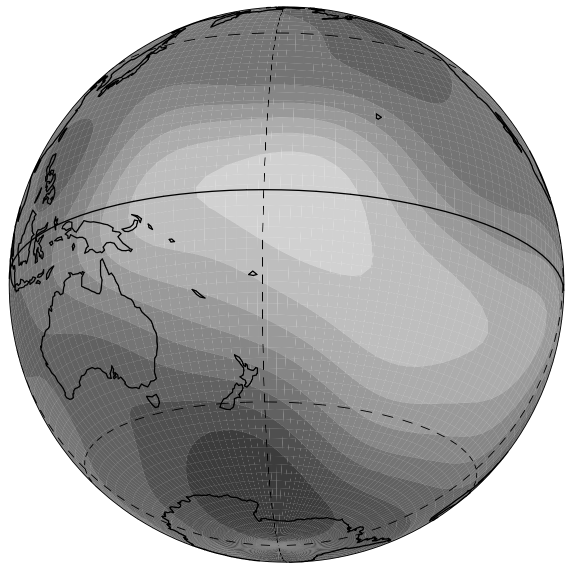

Figure 1: Output from continent_full_sphere_plot with example_a.input (Section 1.1.1).

1.1.2 Example b

```
* input file for full_sphere_plot
 85.0   10.0      0.0                       : alpha beta gamma
example_bOUTPUT                             : Filename stem
../../EXAMPLES/SHEARWAVE/swave_temp.ints    : integers
../../EXAMPLES/SHEARWAVE/swave_temp.vecs    : vectorfile
../../EXAMPLES/SHEARWAVE/swave_temp.xarr    : radialfile
 0.0   120.0  1.0   1.00                    : huepos, hueneg, csat, scal
 16   6   3   8.0     7                     : nlev idev nnds papwidth  icomp
 40   80   1.50                             : NTHE NPHI RADV2
```

Another view of the same solution in Figure (2); note that we have set positive values to blue and negative values to red. In this way, our function is now coloured more appropriately for the temperature interpretation.

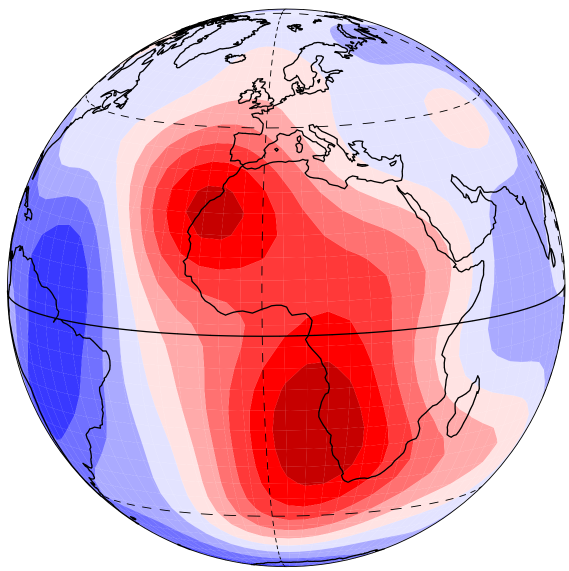

Figure 2: Output from continent_full_sphere_plot with example_b.input (Section 1.1.2).

2 The HLS colour scheme

When plotting using the PGPLOT software, a colour is specified by either one of the two calls

```
CALL PGSHLS( IND, CH, CL, CS )
```

or

```
CALL PGSCR( IND, CR, CG, CB )
```

The integer `IND` is the index of the colour being applied. `CR`, `CG` and `CB` are respectively the red, green and blue values in the ranges $[0, 1]$.

Figure 3: Colours as described by the integer HUE in the HLS (Hue, Light and Saturation) colour scheme.

The alternative HLS (Hue, Light and Saturation) system takes three real values

- `CH`. Hue. This is an angle between zero and 360 degrees which specifies the colour. Red is 120, Green is 240 and Blue is 0 (or 360). The full spectrum, in intervals of 5 degrees, is displayed in Figure (3).

- `CL`. Light. Ranges from 0.0 to 1.0 with black at lightness 0.0 and white at lightness 1.0.

- `CS`. Saturation. Ranges from 0.0 (grey) to 1.0 (pure colour). Hue is irrelevant when saturation is 0.0

I opted for the HLS system for the general graphics system - not because I thought the results were better - but because it is simply much easier to apply. I generally set one hue value for positive values and one for negative values and then vary the lightness as a function of the numbers being plotted.

Other users may find this colour scheme unappealing and so are welcome to devise a better way of assigning colours to contour levels! I did a job for Andy Jackson last year, for which he gave me a set of 16 red, green and blue (RGB) coefficients. This scheme is very nice and so I have implemented it in the majority of the codes as a special value of `NLEV` (the number of contour levels). Setting `NLEV = -1` should implement this colour scheme, resulting in 16 contour levels. I never got round to implementing any more general RGB scheme.

References