1 Instructions

Please save your code for the following exercises as an m-file or Jupyter Notebook file and email the file to me (at `m3becker@ucsd.edu`). Download a file called `lab3start.m` (at `http://topex.ucsd.edu/rs/labs2019/lab3/lab3start.m`), which includes a few lines of MATLAB code to get you started. Please be sure to provide an answer for each and every component of each exercise! (Some have several!)

2 Exercises

1) Plot the spectral radiance of a blackbody as a function of wavelength for an object of temperature 300 K (e.g., ∼Earth), 1000 K, and 6000 K (e.g., ∼Sun). Calculate the wavelength of peak radiation for each temperature, and plot the curves on the same figure. (Use `hold on` in MATLAB.) The finished plot should look like Figure 2.13 from Rees. *Hint:* You may find that this exercise requires careful use of the MATLAB operators `./` or `.*`.

2) Download a La Jolla topography file from

`http://topex.ucsd.edu/rs/labs2019/lab3/lajolla_swab`.

Read the topography file into MATLAB as an array and make an image. Can you make an illuminated image by using the built-in MATLAB function `diff()`? You will need to set the limits in your `imagesc` plot to [-1000,1000] because there are some extreme slopes at the coastline.

Listing 1: Example of loading a topography file into MATLAB

```
% load the topography image
fid = fopen('lajolla_swab','r');
topo = fread(fid,[3240,1440],'int16')';
```

3) Read in a JPEG photo (a file of passive-source EM radiation at three visible bands) using the built-in MATLAB function `imread()`. (Use your own photo or the default file in `http://topex.ucsd.edu/rs/labs2019/lab3/`. An image with bright colors works best.) Look at the red, blue, and green components separately. Recombine the three bands into an RGB image. Do you get what you started with? Recombine the three bands in a different order (e.g., GBR) and look at the image. Do the results make sense to you? Are the originally red colors now green? Try another RGB combination. Save one of these recombined images as a *.jpg file using the built-in MATLAB function `imwrite()`, and send it (and the original image) along with your code.

Listing 2: Example of loading a JPEG image into MATLAB and extracting a color component

```
% load the JPEG image
z = imread('Paraglider.jpg');
% extract the red component
r = z(:,:,1);
```