MATLAB
3-dimensional data

3-dimensional data
Grided satellite data for the oceans are 3-dimensional.
For a given date, you have a 2-dimensional map in x and y.

3-dimensional data
The three dimensions are the x-direction, y-direction, and with time in the 3rd dimension.

Another way to think about 3-d data
For a given location, you have a 1-dimensional data series, varying in time (time series).

Another way to think about 3-d data
In Excel, this is like taking the data from a single cell, e.g. A1 or C3, but for each of the many sheets.

Another way to think about 3-d data
In Matlab, it is finding the pixel in x- and y-space which is associated with a particular location.
...then getting the time variable data, e.g. $\text{sst1}(13,200,:)$.
### Extracting data: recall indices
You can access a particular value in the 2-D matrix using the row and column index.

```
  DIM: 2
  10  20  30  40
     110 120 130 140
     210 220 230 240
```

### Extracting a map
To get a single map out of a 3-D matrix, you need to specify the time index.

```
  >> sst1(:,:,4)
```

### Extracting a time series using `find`
To extract an SST time series for a general location, you (1) find the index in the `lon` variable containing that longitude, and (2) the index for the `lat`, call them the jth column and ith row; (3) then use the i-index in the 1st dimension in `sst1` and j in the 2nd.

```
  >> i=find(lat==26);
  >> j=find(lon==-76);
  >> sst1(i,j,:);
```

### Extracting a time series
Suppose the + corresponds to the first row and column (A) in each sheet.

```
  >> sst1(1,1,:)
```

### Review
1. Satellite data are commonly 3-dimensional surface map-time series, where the dimensions are latitude, longitude and time.
2. 2-dimensional maps, or 1-dimensional time series can be extracted, using the auxiliary `time`, `lat` and/or `lon` vectors.