How to use the CIRA class

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This example shows various ways to use the CIRA class.

Section 1 Setting Up

CIRA uses the Matlab class system and must be set up specifically the way Matlab is designed for. The class must be in the @ folders.

mypath/OEIS.m

mypath/CODATA2006.m

mypath/@CIRA/CIRA.m

mypath/@CIRA/GTD7.m

...

Caution, these download links may break in the future but the procedure remains the same. The files can be downloaded and unzipped manually as well.

```
outputdir = 'mypath';
fexFiles = {'45604-cira-atmosphere','45544-oeis','45590-codata-2006'};

website = 'http://www.mathworks.com';
for i=1:length(fexFiles)
  url = sprintf('%s/matlabcentral/fileexchange/%s',website,fexFiles{i});
  entry=urlread(url);
  ptr1=strfind(entry,'"btn download"');
  ptr2=strfind(entry,'" itemprop="downloadUrl"');
  link = sprintf('%s%s',website,entry(ptr1+24:ptr2-1));
  unzip(link,outputdir);
end
addpath(outputdir);
```

Section 2 Running the Tests

This example shows how to run all of the tests. This will take a long time as they are exhaustive. The tests are as follows:

1. Test low altitude

2. Test medium altitude

3. Test high altitude
4. Test southern latitude
5. Test eastern longitude
6. Test earlier in day
7. Test plotting the variation in time of the pressure at a specific location

```
atm=CIRA();
atm.run
```

Section 3 Calculating Pressure

This is a simple example with no data overrides for New Year's Eve.

```
xlat = 40; % degrees
xlon = -104; % degrees
hxx = 0.0; % km
tjd = 2451545.0; % Julian day for 2000 Jan 1.5
[ iyd, sec, stl ] = CIRA.year_dayofyear( tjd, xlon );
f107a = 152.0; % Jansky
f107 = 154.0; % Jansky
ap = zeros(CIRA.maxAP,1); % magnetic index
ap(CIRA.DAILY_AP) = 4.1;
ap(CIRA.CURRENT_AP) = 4.2;
ap(CIRA.CURRENT_M_3_AP) = 4.3;
ap(CIRA.CURRENT_M_6_AP) = 4.4;
ap(CIRA.CURRENT_M_9_AP) = 4.5;
ap(CIRA.CURRENT_M_12_33_AP) = 4.6;
ap(CIRA.CURRENT_M_36_57_AP) = 4.7;
atm = CIRA();
mass = atm.MT(CIRA.ALL_MASS); % calculate all constituents
sw = CIRA.allSwitchesOn;
sw(CIRA.TURBO_SCALE_SW) = 0; % turn off turbo scale option
atm = atm.TSELEC(sw);
[ D,T,atm ] = atm.GTD7(iyd,sec,hxx,xlat,xlon,stl,f107a,f107,ap,mass);
press = atm.totalPressure(D,T);
disp(T(CIRA.TemperatureIndex(CIRA.Der0))-273.15); % 12.3561 C
disp(press); %  1.0173e+03 hPa
```

Section 4 Calculate Lapse Rate

This is a simple example with data overrides for Spring Equinox.

```
xlat = 40; % degrees
xlon = -104; % degrees
hxx = 10.0; % km
YEAR = 2012;
DOY = 32; % Feb 1
sec = 43200.0; % noon
iyd = YEAR*CIRA.YRDSHIFT + DOY;
stl = sec/3600.0 + xlon/15.0;
```

```
f107a = 152.0; % Jansky
f107 = 154.0; % Jansky
ap = zeros(CIRA.maxAP,1); % magnetic index
ap(CIRA.DAILY_AP) = 4.1;
ap(CIRA.CURRENT_AP) = 4.2;
ap(CIRA.CURRENT_M_3_AP) = 4.3;
ap(CIRA.CURRENT_M_6_AP) = 4.4;
ap(CIRA.CURRENT_M_9_AP) = 4.5;
ap(CIRA.CURRENT_M_12_33_AP) = 4.6;
ap(CIRA.CURRENT_M_36_57_AP) = 4.7;
atm = CIRA();
mass = atm.MT(CIRA.ALL_MASS); % calculate all constituents
sw = CIRA.allSwitchesOn;
atm = atm.TSELEC(sw);
[ D,T,atm ] = atm.GTD7(iyd,sec,hxx,xlat,xlon,stl,f107a,f107,ap,mass);
dpress = atm.totalPressureGradient(D,T);
disp(T(CIRA.TemperatureIndex(CIRA.DerAlt))); % -4.0992 C/km
disp(D(CIRA.DensityIndex(CIRA.DerAlt,CIRA.ALL_MASS))); % -5.4971e-05 g/cm^3/km
disp(dpress); %  -40.1322 hPa/km
```

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