How to add benchmark into ILAMB

How ILAMB indexes and finds a certain benchmark package file path
DataDir = ILAMB_DATADIR + "/" + varID + "/" + str_upper(Source) + "/derived"

What this means is that to add a benchmark for an existing variable, one must add a new source under its variable folder in the ILAMB data directory.

To add a benchmark for a variable that ILAMB does not already use, there are additional steps noted in the ILAMB documentation.

Once the benchmark is in the data directory correctly

1. Edit table_scoring_metrics.txt to have the right varID and Source name, must be same as the folder names in the data directory.

   Append this to the list:
   gpp (Gross Primary Production), FOONET (Faux-Fluxnet [Cyrus et al. 2016]), 3, 3, 5, Yes, Yes, Yes, Yes, Yes

2. Edit retrieve_DataInfo.ncl, the first part of the file changes variables based on source so one must add a new if statement for the new benchmark source. It is important that one specifies the correct variable dimension called ‘dimens’ as this affects the behavior of the file lookup protocol. The second part of the file must be edited so that when a certain variable has a certain benchmark source selected, variables will be changed accordingly (Ex: Source Reference)

   For the first part note how fluxnet’s format was copied.

```
if (str_lower(Source).eq."fluxnet") then
          DataName  = "Fluxnet Sites"
            Dimens    = "D1s"
          TRes      = "monthly"
          StartYr   = "1996"
           EndYr     = "2005"
 end if

 if (str_lower(Source).eq."foonet") then
          DataName  = "Foonet Sites"
           Dimens    = "D1s"
           TRes      = "monthly"
           StartYr   = "1996"
          EndYr     = "2005"
 end if
```

   For the second part that changes variable settings based on varID and source

```
if (str_lower(VarName).eq."gpp") then
    LongName      = "Gross Primary Productivity"
    VarModel      = VarName
    ModelComp     = "Lmon"
    Category      = CatNames(0)
    GSMLocalRefer = "YES"
    MassWeighting = "YES"
    if (str_lower(Source).eq."fluxnet") then
      Reference  ="Lasslop et al. (2010)"
    end if
    if (str_lower(Source).eq."foonet") then
      Reference  ="Cyrus et al. (2016)"
    end if
    if (any(str_lower(Source).eq.(/"fluxnet-mte", "gbaf"/))) then
      Reference     = "Jung et al. (2009)"
      LandOnly      = "YES"
      CarbonMonthly = "YES"
      LimitFlag     = "NO"
    end if
  end if
```

3. If the new benchmark source changes the variables unit, edit retrieve_unit.ncl so that under the pertinent variables section the unit change is made.

   Here's what it looks like, but no changes were necessary for this benchmark.

```
if (any(str_lower(VarName).eq.(/"gpp", "nee", "reco"/))) then
    results           = 3600.*24.*1000.
    results@Initial    = "kgC/m2/s"
    results@FinalTable = "gC/m2/day"
    results@FinalPlots = "gC/m2/day"
    if (any(str_upper(Source).eq.(/"FLUXNET-MTE", "GBAF"/))) then
      results@FinalTable = "PgC/yr"
    end if
  end if
```

4. If the new benchmark source changes the draw settings, edit retrieve_DrawInfo.ncl so that when the pertinent varID is referenced, certain variables are changed (ex: cnlevels and lblabels) This also apparently needs to be redone for each if statement based on the passed argument 'keyword'. The possibilities are annualmean, bias and rmse.

For the annualmean section:

```
if (str_lower(varID).eq."gpp") then
    ;cnlevels = (/0.1,0.2,0.5,1,2,5,10,20,40,60,80,100/)
    ;lblabels = (/"<0.1","0.1","0.2","0.5","1","2","5","10","20","40","60","80",">=100"/)
    ;cnlevels = (/0.05,0.1,0.2,0.5,1,2,5,10,15,20/)
    ;lblabels = (/"<0.05","0.05","0.1","0.2","0.5","1","2","5","10","15",">=20"/)
    cnlevels = (/0.0,0.02,0.06,0.1,0.3,0.5,1.5,2.5,7.5,12.5,17.5,22.5/)
    lblabels = (/"<0.0","0.01","0.04","0.08","0.2","0.4","1","2","5","10","15","20",">=22.5"/)
    if (any(str_lower(Source).eq.(/"foonet","fluxnet"/))) then
      delete(cnlevels)
      delete(lblabels)
      ;cnlevels = (/0.0,0.01,0.02,0.05,0.1,0.2,0.5,1,2,3,4,5/)
      ;lblabels = (/"<0.0","0.0","0.01","0.02","0.05","0.1","0.2","0.5","1","2","3","4",">=5"/)
      cnlevels = (/0.0,0.02,0.04,0.06,0.1,0.3,0.5,1.5,2.5,3.5,4.5,5.5/)
      lblabels = (/"<0.0","0.01","0.03","0.05","0.08","0.1","0.2","0.4","1","2","3","4","5",">=5.5"/)
    end if
```

For the bias plots section:

```
if (str_lower(varID).eq."gpp") then
    ;cnlevels = (/-12.,-10.,-8.,-6.,-4.,-2.,0.,2.,4.,6.,8.,10.,12./)
    cnlevels = (/-6.5,-5.5,-4.5,-3.5,-2.5,-1.5,-0.5,0.5,1.5,2.5,3.5,4.5,5.5,6.5/)
    lblabels = (/"<-6.5","-6","-5","-4","-3","-2","-1","0","1","2","3","4","5","6",">=6.5"/)
    if (any(str_lower(Source).eq.(/"fluxnet","foonet"/))) then
      delete(cnlevels)
      delete(lblabels)
      ;cnlevels = (/-6.,-5.,-4.,-3.,-2.,-1.,0.,1.,2.,3.,4.,5.,6./)
      cnlevels = (/-6.5,-5.5,-4.5,-3.5,-2.5,-1.5,-0.5,0.5,1.5,2.5,3.5,4.5,5.5,6.5/)
      lblabels = (/"<-6.5","-6","-5","-4","-3","-2","-1","0","1","2","3","4","5","6",">=6.5"/)
    end if
  end if
```

For the rmse section:

```
if (str_lower(varID).eq."gpp") then
    ;cnlevels = (/0.1,0.2,0.5,1,2,3,4,5,6,7,8,9,10/)
    ;lblabels = (/"<0.1","0.1","0.2","0.5","1","2","3","4","5","6","7","8","9",">=10"/)
    cnlevels = (/0.0,0.1,0.3,0.5,1.5,2.5,3.5,4.5,5.5,6.5,7.5,8.5,9.5,10.5/)
    lblabels = (/"<0.0","0.05","0.2","0.4","1","2","3","4","5","6","7","8","9","10",">=10.5"/)
    if (any(str_lower(Source).eq.(/"fluxnet","foonet"/))) then
      delete(cnlevels)
      delete(lblabels)
      ;cnlevels = (/0.01,0.02,0.05,0.1,0.2,0.5,1,2,3,4,5/)
      ;lblabels = (/"<0.01","0.01","0.02","0.05","0.1","0.2","0.5","1","2","3","4",">=5"/)
      cnlevels = (/0.0,0.02,0.04,0.06,0.1,0.3,0.5,1.5,2.5,3.5,4.5,5.5/)
```

```
      lblabels = (/"<0.0","0.01","0.03","0.05","0.08","0.1","0.2","0.4","1","2","3","4","5",">=5.5"/)
    end if
  end if
```