I. Goals:

- Explore, download and manipulate energy and water flux data from the CZO database

II. Objectives:

- Explore and download data in the CZO database
- Demonstrate a basic knowledge of EEMT and related conversions
- Use Excel to visualize energy and water fluxes

III. References:

- CZO National Database, <criticalzone.org/national/data/>

IV. Reading:

- Rasmussen, et.al, 2011, An open system framework for integrating critical zone structure and function, Biogeochem, 102:15-29.

V. Energy Fluxes

Write out the basic energy balance equation, defining all variables. (2 pts)

1.

List four ways that radiation affects vegetation or vegetation affects radiative fluxes (2 pts)

2.
3.
4.
5.

Show how 1 year equals 3.154 x10^{7} sec from the basic definitions of time, showing all units (1 pt)

6.

Show how annual rainfall amount (mm yr^{-1}) can be expressed as a mass flux having units of kg m^{-2} s^{-1}. Show all steps in the conversion – do not "Google" it! Assume the density of water is 1 g cm^{-3}. (2 pts)

7.

Show how to convert MJ m^{-2} yr^{-1} to W m^{-2}. Show all steps in the conversion – do not "Google" it! (2 pt)

8.

VI. Calculations of EEMT

Write out the two component equations for Effective energy and Mass transfer (EEMT), defining all variables and showing all units and constant values: (4 pts):

9.

Eppt =

10.

Ebio =

VII. Accessing Flux Data from the CZO database

First we will access a common data record and learn something about it. Then you can look for data anywhere in the system and do your own analysis.

Often times, meteorological data from field experiment networks comes in one of two typical suites:

- Micromet station data – typically contains such things as:
  - incoming solar, air temp @ 2 m, rel.humidity, wind speed, …
- Flux tower data or Eddy Covariance site data
  - This data set is typically much more extensive and can include fluxes of water, carbon and heat, some of which might come from various heights within a canopy,

Working with Excel hint - Remember that the easy way to select the full column of data is to place the cursor over the first data value and type, End, Shift down-arrow.

Steps to access the common data set:

a) goto: http://criticalzone.org/catalina-jemez/data/datasets/

Downloadthe Daily data set (90 kB):

b) follow the link for: Jemez 2013 Burned ZOB - Meteorology - South-East, (2010-2014)
c) click on the dataset link**:** Jemez 2013 Burned ZOB – Daily Meteorological Data

Return to the previous page. Download the 30 minute data set (1,955 kB):

c) follow the link for: Jemez River Basin – Flux Tower – Mixed Conifer (2007-2012)
d) click on the dataset link**:** Jemez River Basin – Mixed Conifer Flux Tower data Gap-Filled 2010

e) save this data to your hard-drive (typically under "downloads" on a PC)
f) open this file (called "data_daily_met1.csv" or "Tower_Vcm_2010_gapfilled.csv") in Excel. It should automatically parse the comma delimited fields into separate columns. If not, the "Text Import Wizard" will help you do this.
g) scan the "Metadata" file next to the link in "step d"

Fill in the following table with the "header" parameter definition and corresponding units (2 pts)

#	col	Header Parameter Definition	Units
1	A		
2	B		
3	C		
4	D		
5	E		
6	F		
7	G		
8	H		
9	I		
10	J		
11	K		
12	L		
13	M		
14	N		
15	O		
16	P		
17	Q		
18	R		
19	S		
20	T		

VIII. Homework – Data Visualization (to be done individually; 15 pts)

- Look for a different data set and make 2 plots with at least 2 variable/plot of Meteorological variables (such as TA or VPD) and Energy Flux variables such as (Rn, H or LE) verses Julian date. Once you have the basic plot, make sure you make it readable (titles, etc). Create two versions (by editing the x-axis), one set showing the full annual cycle and one set focused in on a 10 day period (ie. DOY 170-180). Turn in the in-class worksheet responses and graphs at the beginning of the next class