Calculating Geometric Mean Diameter from EMAP Physical Habitat Data:

Here is the revised algorithm for calculating geometric mean diameter (D_{gm}) from the particle size class info from EMAP/WSA or similar Physical Habitat field data. This replaces the procedure for calculating the variable LSUB_DMM described in Section 3.2.6 (page 42) of:

Kaufmann, P. R., P. Levine, E. G. Robison, C. Seeliger, and D. V. Peck. 1999. Quantifying physical habitat in wadeable streams. EPA/620/R-99/003. United States Environmental Protection Agency, Washington, D.C.

Essentially, you assign each particle a nominal diameter equal to the geometric mean of its upper and lower bounds. (i.e., Log_{10} transform the upper and lower bounds and divide by two). Where the largest class has no upper limit (bedrock), multiply the lower limit by 2 and log transform before entering it into the calculation. If your smallest size class has no lower limit (e.g., silt, clay, muck), divide its upper limit by 4 (same as multiplying by 0.25 below) and log transform before entering it into the calculation (If you have defined lower bounds silt or clay size classes, you don't really have an undefined lower limit). In our earlier work, we took the geometric mean of the upper and lower bounds of the silt+clay size fraction . In more recent work, we have been making the assumption that most of this material is in the silt size fraction, so have taken the geometric mean of the silt fraction bounds to define the nominal diameter of the smallest size class.

The above procedure is simplified by calculating and using the frequency-weighted class-midpoints as follows:

$$D_{gm} = \text{Antilog of} \quad Sum_i \{ P_i \{[\log_{10} (D_{iu}) + Log_{10}(D_{il})]/2\} \}$$

Where: P_i = Proportion of particle count within diameter class i (i.e., Frequency within diameter class i / total number of particles in pebble count)

D_{iu} = Diameter (mm) at upper limit of diameter class i

D_{il} = Diameter (mm) at lower limit of diameter class i

Sum_i = Summation across diameter classes

If there is no upper limit of diameter in the largest size class, **multiply** the lower bound (mm) by 2 and log10 transform: $P_i \{\log_{10} (2 \times D_{il}) \}$

If there is no lower limit of diameter in the smallest size class, **multiply** the upper bound (mm) by 0.25 and log10 transform: $P_i \{\log_{10} (0.25 \times D_{iu}) \}$

Usually I just leave the values as Log10(D_{gm}), as is done in the variable "LSUB_DMM" in the Kaufmann et al (1999) document.

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