Posting type	Informational
Subject	Change in definition of flowrate native flags
Module/Species	A, B, C/ All species
Sites	entire network
Period	Starting 1/1/05
Submitter	C.E. McDade, mcdade@crocker.ucdavis.edu

Supporting information

During summer 2006, Jay Turner characterized the IMPROVE cyclone and found that the equations relating cutpoint to flowrate developed at UCD are invalid. Therefore, the native validation flags based on flowrate have been revised. The IMPROVE cyclone is based on the AIHL cyclone specifications. Dr. Turner's characterization work was consistent with the characterization performed by John and Reischl (1980), and we have therefore decided to use the original John and Reischl (1980) equation for the IMPROVE cyclones used in the A, B, and C sampler modules. Figure 1 shows the old equation from the IMPROVE SOP, the equation for the AIHL cyclone and a few of the data points collected in Dr. Turner's study. There are two important features to note in Figure 1: 1) the John and Reischl (1980) equation is much less sensitive to flow rate than the equation we have used in the past, and 2) at the IMPROVE nominal flowrate of 22.8 LPM, the cutpoint is 2.4 μm, not 2.5 μm.

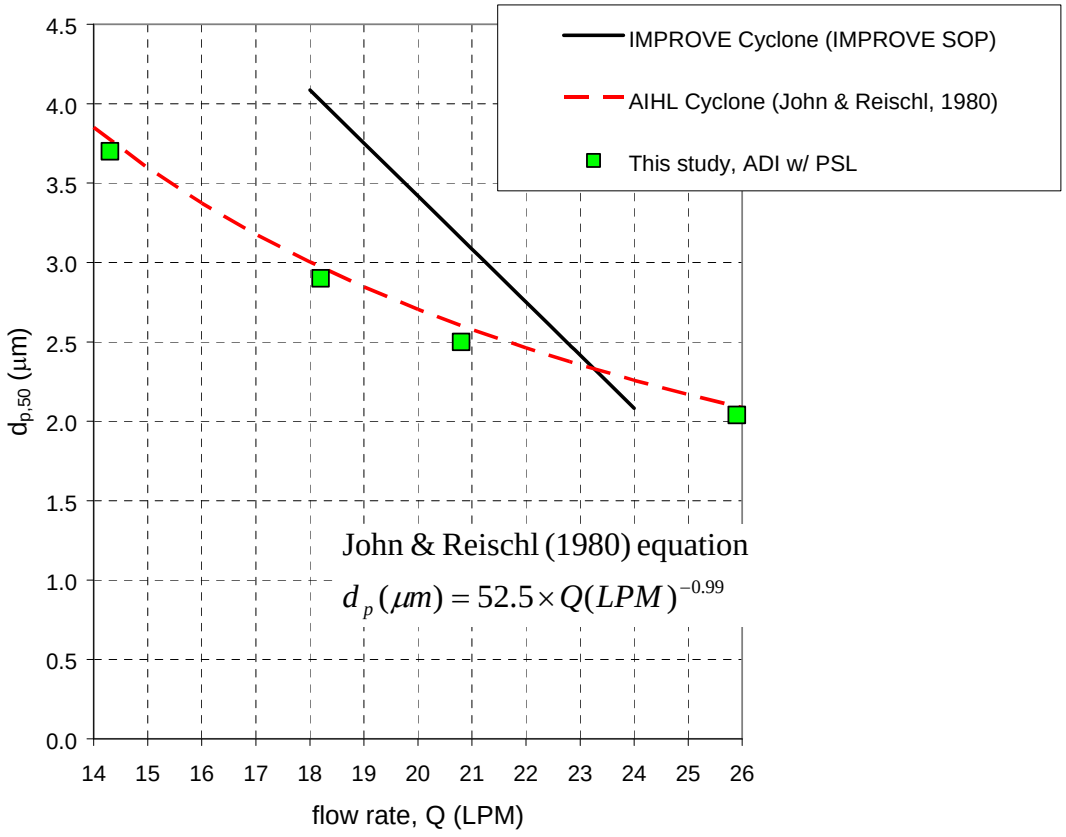

Figure 1. Diameter at which 50% of the particles are collected by the cyclone ($d_{p,50}$, also known as cutpoint) as a function of flow rate.

We have decided to maintain the existing criteria for the CL, CG, and RF native flags. Table 1 lists the criteria and their meanings based on the John and Reischl (1980) equation. The CL flag is based on the accuracy of the flowrate equation and is therefore not affected by this new information. The CG and RF flag criteria are now stricter in terms of cutpoint because the equation is less sensitive to cutpoint. We have decided to change the numerical flowrate criterion for the LF flag because the prior criterion is not centered on 2.5 um as a result of the shift in the equation. The updated criteria have been applied to data starting in January 2005. The native flags LF and RF translate to a V5 status flag in the IMPROVE VIEWS database, and the native flags CG and CL translate to an M3 status flag.

Table 1. Updated flowrate-related validation flag definitions and application criteria.

Validation Flag	Definition	Concentration Reported?	Old Criteria: applied to Jan 2000 thru Dec 2004 samples	Updated criteria: applied to samples collected in Jan 2005 and onward
CL	Clogged Filter	No	Flowrate less than 15 L/min for more than 1 hour	Same criterion - based on the flow rate calculation inaccuracy not cutpoint
CG	Clogging Filter	Yes	Flowrate less than 18 L/min for more than 1 hour	Same criterion, corresponds to a cutpoint of 3 μm
LF	Low/high flowrate	Yes	Average flowrate results in cutpoint outside 2 to 3 μm (corresponds to flowrates of 21.3 L/min and 24.3 L/min).	Average flowrate results in cutpoint outside 2.25 to 2.75 μm (corresponds to flowrates of 19.7 and 24.1 L/min)
RF	Really high flowrate	Yes	Average flow rate greater than 27 L/min	Same criterion, corresponds to a cutpoint of 2 μm

Reference: John, W. and Reischl, G.P. (1980) A Cyclone for Size-Selective Sampling of Ambient Air, *J. Air Pollut. Control Assoc., 30* (8), 872-876.