Re: unit in size distribution

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- *From*: Mike <SulfateIon@xxxxxxxxx>
- *Date*: Wed, 12 Sep 2007 20:10:41 −0700

On Sep 13, 10:17 am, Bob <bbx107....@xxxxxxxxxxxxxx> wrote:

> On Tue, 11 Sep 2007 22:08:01 −0700, Mike87 <Sulfate...@xxxxxxxxx>
> wrote:
>
> > On Sep 12, 12:46 pm, Bob <bbx107....@xxxxxxxxxxxxxx> wrote:
> >
> > > On Tue, 11 Sep 2007 20:55:40 −0700, Mike87
> > > <Sulfate...@xxxxxxxxx>
> > > wrote:
> > >
> > > > Hi
> > >
> > > > Usually we express aerosol size distribution
> > > > in ln(natural log) scale.
> > > > Since total no. concentration is in unit of
> > > > cm−3.
> > > > So size distribution in log−scale will be in
> > > > unit of micron−1.cm−3.
> > >
> > > > It was told that "we cannot take the
> > > > logarithm of a dimensional
> > > > quantity".
> > >
> > > correct

Therefore, ln(radius) is unitless.

Well...

It is true mathematically that a log does not have units (and must be
of a unitless number).

Why?

log (a*b) = log a + log b

log (3 meters) = log 3 + log (meters)

Now what?

100 cm = 1 m

Take log of both sides...

log (100 cm) = (1 m)

That is fine, but you can't go further without dealing with those units. Obviously, just dropping them won't work. log (100) <> log (1).

For simply graphing, there is no particular problem. If you want, you can think of it as graphing data that have been normalized, by dividing by 1 meter (or 1 "whatever your unit is").

No valid meaningful equation will take the log (or exponent) of a number with units. If it appears to, there is a hidden assumption, and you really need to find out what it is.

For example... someone proposes that if two distances are equal, then the logs of the distances are (numerically) equal. The little case above with 1 m = 100 cm disproves that −− unless (hidden assumption) both measurements have the same units.

and another question...

also in logscale

N/(sqrt(2*pi)*lnSigma) * exp(−(lnr−lnr_mean)^2 / (2*ln^2 Sigma))

Let me rewrite this eq.:

dN N
(−(lnr−
lnr_mean)^2)
−−−− = −−−−−−−− * exp(−
−−)
dlnr sqrt(2*pi)*lnSigma
(2*ln Sigma *ln Sigma)

I use three (to represent big bracket.

N: no. cm−3
r, r_mean: micron
Sigma: standard deviation of r , also in micron

So all ln(parameters) are all unitless. right?
Then the unit of dN/dlnr is the same as that of N . right?

thank you for your answer

Mik

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