

## Re: a simple(?) probability question...

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- *From:* James Waldby <[j-waldby@xxxxxxxx](mailto:j-waldby@xxxxxxxx)>
  - *Date:* Sun, 21 Jan 2007 14:16:18 -0700
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Joe wrote:

[...] By definition, a 100 Years Storm is a storm that will occur at least once in 100 years. That means certainty within 100 years, i.e. probability equals 1 in the elapsed time of 100 years.

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That doesn't agree with common terminology as stated, for example, in <http://bcn.boulder.co.us/basin/watershed/flood.html> and [http://en.wikipedia.org/wiki/100-year\\_flood](http://en.wikipedia.org/wiki/100-year_flood). From the former: The terms "10 year", "50 year", "100 year" and "500 year" floods are used to describe the estimated probability of a flood event happening in any given year. [...] A 10 year flood has a 10 percent probability of occurring in any given year, a 50 year event a 2% probability, a 100 year event a 1% probability, and a 500 year event a .2% probability. While unlikely, it is possible to have two 100 or even 500 year floods within years or months of each other.

Given the likelihood of 1% for a 100-year event to occur in a given year, one could figure  $1 - (1-0.01)^{50}$  or  $\sim .395$  likelihood for it to occur at least once in any given 50-year period, or  $1 - (1-0.01)^{100}$  or  $\sim .634$  likelihood for any 100-year period.

A Poisson process ([http://en.wikipedia.org/wiki/Poisson\\_process](http://en.wikipedia.org/wiki/Poisson_process)) with  $\lambda = 0.01$  per year has probability  $\sim .632$  of 1 or more events occurring in any 100-year period, which is about the same as for the Bernoulli process mentioned in the preceding paragraph, just as one would expect for a small probability and many years.

-jiw

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