# Time cont. tallies

- To get time averaged moments

$$\bar{\psi}_j = \frac{1}{\Delta t}\int_{t^n}^{t^{n+1}}\int_{V} b_j(x,\mu)\, I(x,\mu) = \frac{1}{\Delta t^n}\frac{1}{N_{hist}}\sum_{i=1}^{N} \frac{S_i}{V_i} b_j(x,\mu) w_i$$

- essentially the same tallies, just a $\frac{1}{\Delta t}$ factor.

- To get first moment in time just add an extra tally

$$\psi_t^i = \frac{6}{\Delta t}\int \left(\frac{t - t^{n+1/2}}{\Delta t}\right) I(x,\mu,t) = \frac{6}{\Delta t^n}\frac{1}{N_{hist}}\sum_{i=1}^{N} \frac{S_i}{V_i}\left(\frac{t - t^{n+1/2}}{\Delta t}\right) w_i$$

- This tally happens for all tallying events so probably just need to add it to the general tallying procedure

- To get census tallies, we use essentially the pointwise shuene estimator, $I(x,\mu,t) \approx N(x,\mu,t)\, c$, but $N$ is replaced by weight, thus:

$$V_i \psi_j^{n+1} = \int_{V_i} b_j(x,\mu)\, I(x,\mu,t_c) = \frac{1}{N_{hist}}\sum_{i=1}^{N_c} \frac{w_i(t_c)\, b_j(x,\mu)\, c}{V_i}$$

$N_c$ ← N that reach $t_c$

- No need to integrate along a path, so space mom's are easier, e.g.,

$$\psi_x^{n+1} = \frac{6}{h_x^2}\int_{V_i}(x - x_i)\, I(x,\mu,t^{n+1}) = \frac{1}{N_{hists}}\frac{6}{h_x^2}\sum_{m=1}^{N_c}(x_m - x_i)\, w\, c$$