Note on "Fixed-Flux" vs. "Periodic" radial B.C."

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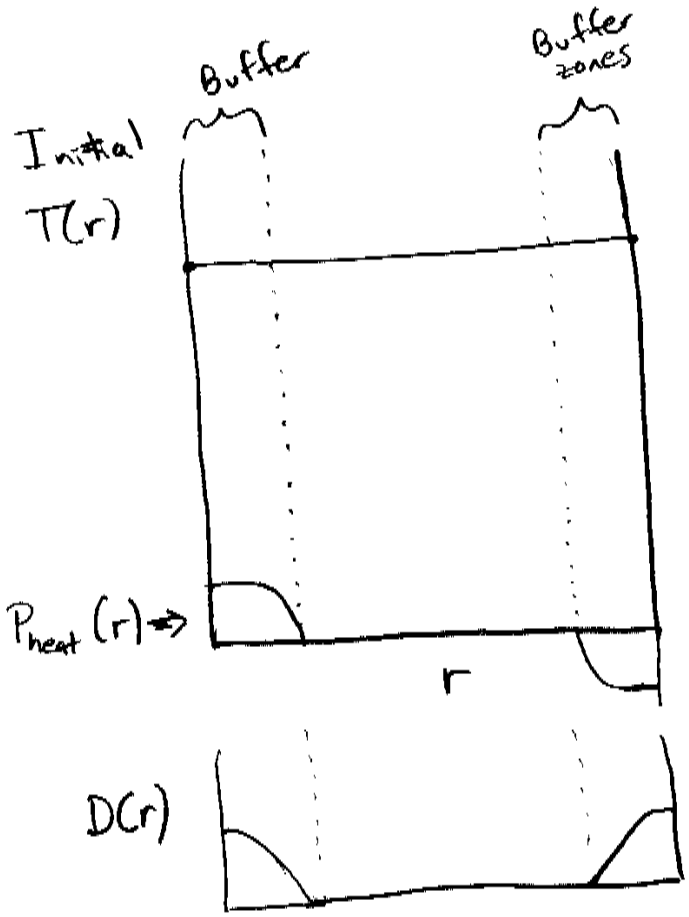
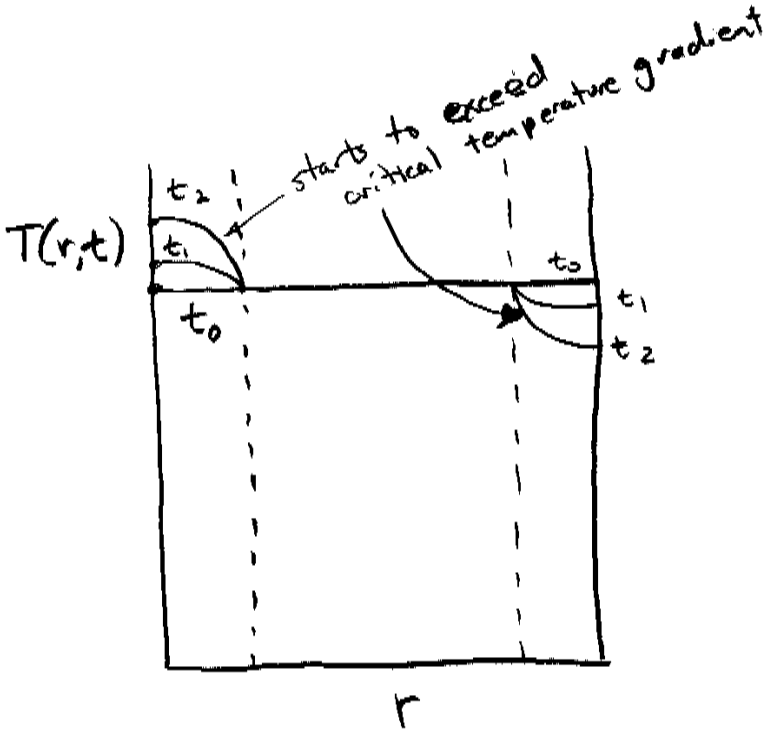
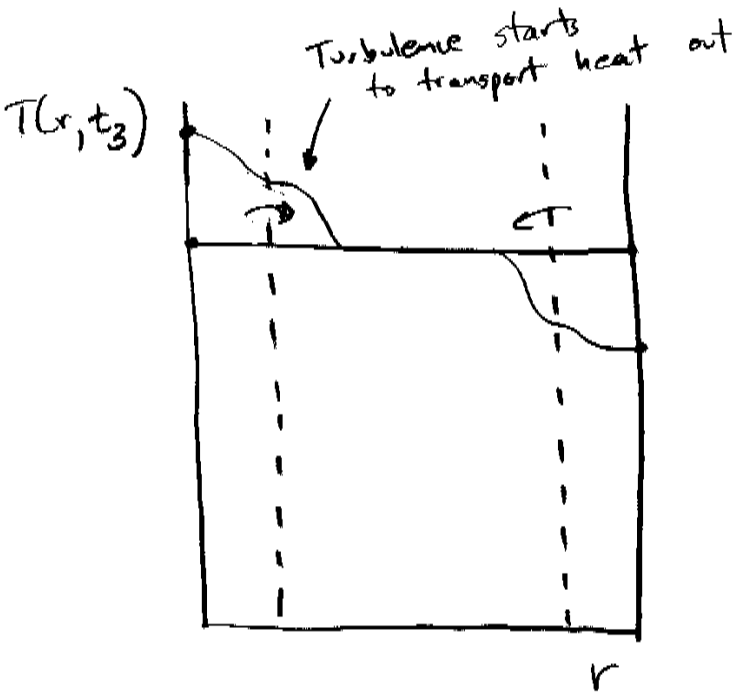
March 5, 2002

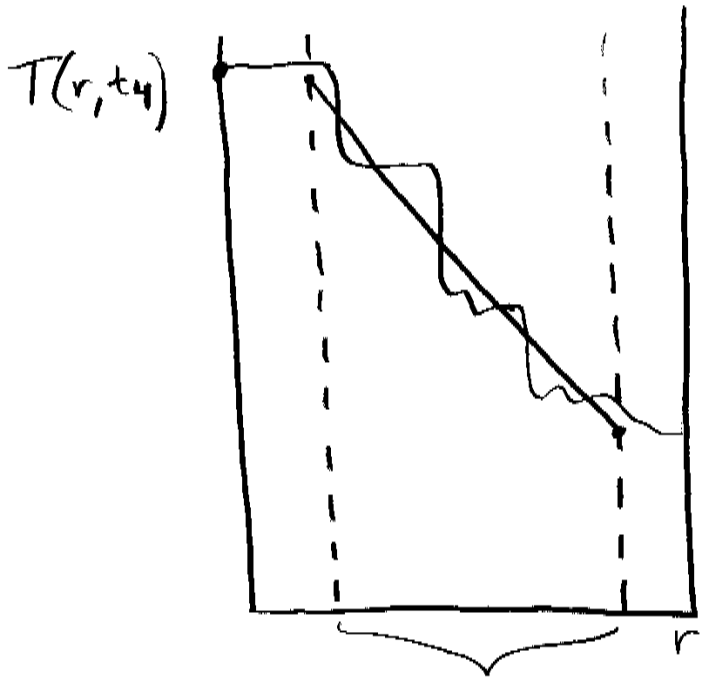


Put in buffer regions near boundaries, with $P_{heat} > 0$ in left buffer & $P_{heat} < 0$ in right buffer. These model "constant" or "fixed flux" sources & sinks from adjacent regions of plasma.

Note that the potential $\Phi = 0$ (or ρ_{banana}) is forced within several ρ_{in} of the boundaries so there is no turbulent transport across the boundaries. (All of the transport across bdy's is represented by the "fixed flux" P_{heat}). Because $\Phi = 0$ near the boundaries, one would usually also introduce some artificial diffusion near the boundaries.


starts to exceed critical temperature gradient
T(r,t)
t_2
t_1
t_0
t_0
t_1
t_2
r


Turbulence starts to transport heat out
$T(r,t_3)$
∇T
r



Snapshot of Temperature profile in a turbulent period.

In this we can write $T(r,t)$ as:

$$T(r,t) = T_0(t)\left(1 - \frac{r}{L_{T_0}(t)}\right) + \sum_{k_r} T_{k_r}(t)\cos(k_r r)$$

For large enough box size, then $T_0(t) \approx$ const. & $L_{T_0}(t) \approx$ constant, & this becomes exactly the same representation as in a periodic b.c. simulation.