

Subject: 5/6 Notes
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To: Ed Waddington <edw@uw.edu>

Hi Ed,

Here is my summary for today:

Today we looked at matlab codes demonstrating some of the concept we've talked about so far.

First, we modelled the diffusion of a block under implicit and explicit schemes and saw that the implicit scheme diffuses a small amount to the boundaries instantly. On the other hand, the explicit scheme could only diffuse out one volume at a time, and thus took many time steps before the points near the boundaries were affected.

Next, we looked at a 2D transient model with a sinusoidally varying boundary and saw how a simple transient diffusion problem could create waves that propagate through the solution.

Then, we looked at a transient 1D model and compared explicit and implicit solutions under different governing parameters. After some issue with the code we saw a similar pattern where the explicit scheme affected the boundaries (albeit very slightly) instantly and the implicit scheme took time to get there. Then we saw what happens for $\beta \leq 1$ (stable) and $\beta > 1$ (unstable) conditions.

Next, we looked an advective diffusion model to look at the difference between centered difference and upwind schemes, as well as how Peclet number influences the result. Most importantly we saw that the unwinding scheme was more stable for high Peclet numbers, but also even just Peclet numbers only slightly higher than 1.

Then we looked at Ed's notes on transfer functions for advective diffusion in 2D. And we finished by looking at some answers to the homework problems.

Best,

Erich