Assignment 5
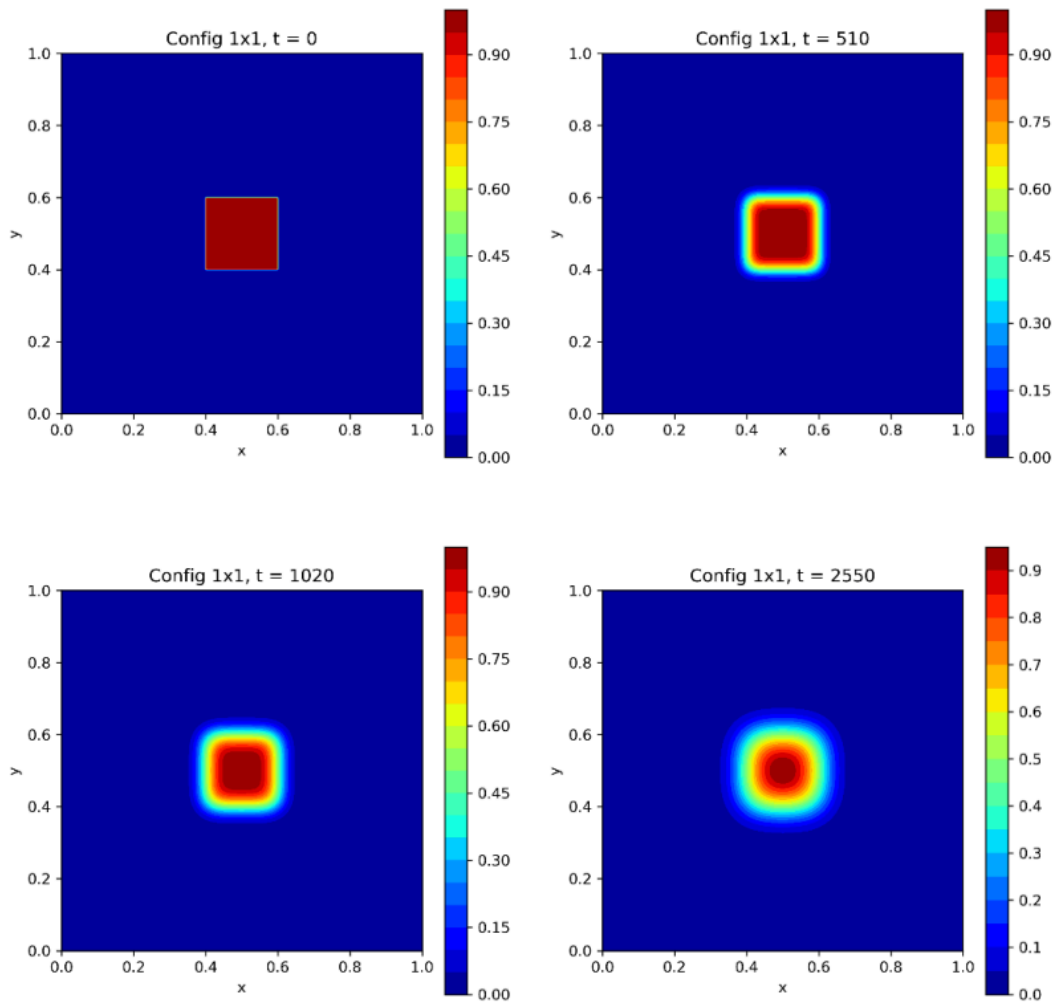## M5470 : Introduction to Parallel Scientific Computing
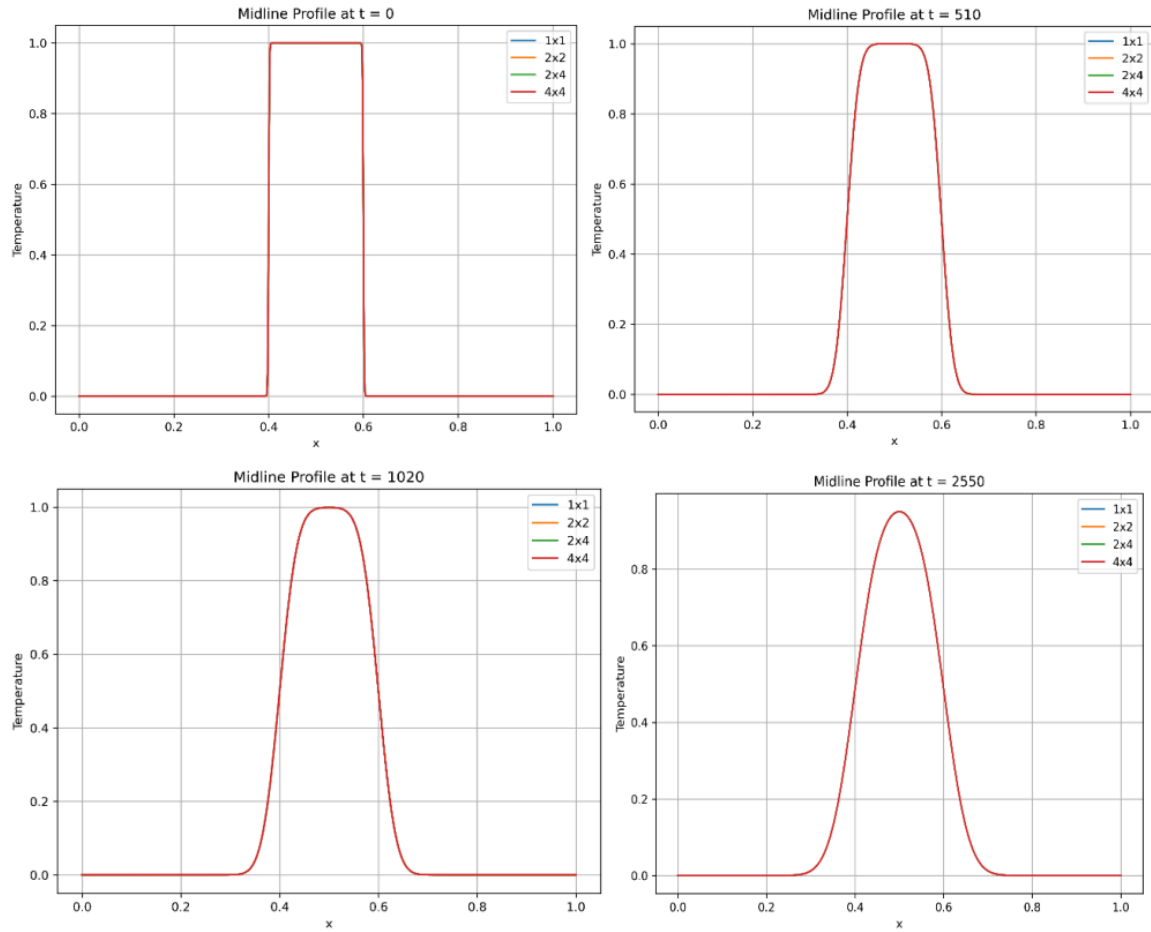### Course Instructor: Niranjan S. Ghaisas

Question 1 :

1. Plots :

For all 2 * 2, 2 *4* , 2 * 3 getting the same plots. And below is the plot for one of them.

2. Accuracy Analysis :

The maximum difference after 10-time steps: 1.234532e-15

The average difference after 10-time steps: 5.672452e-16

• The parallel and serial runs produce nearly identical results, with differences close to machine precision.

3. Performance Time conclusion :

Configuration	Time/Step (sec)	Speedup
Serial	4.3	4.3
2x2	2.1	2.1
2x4	1.3	1.3
4x4	1.2	1.2

Conclusion

- The MPI-based solver accurately matches the serial version and achieves significant speedup.

- Halo exchange is implemented and verified successfully.

- Minor differences (in machine epsilon range) validate the numerical consistency.

- Contour and line plots confirm visual and analytical accuracy.