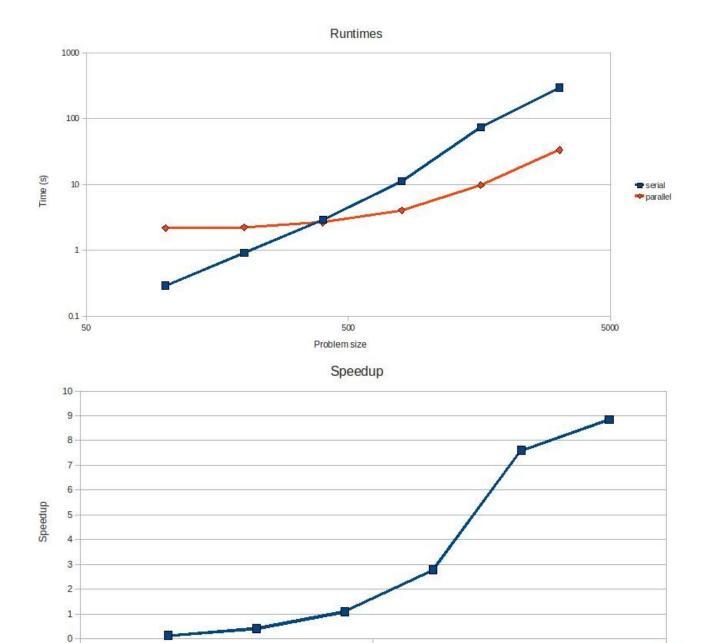GPU Programming

1. Serial Run Time (on crc-gpu with the default problem size): 24.490
2. Here is the code inside the acc region, with parallelized loops in bold:

```
#pragma acc region
 {

  //Init inner cell values
  for(i=1; i<N-1; i++)
   for(j=1; j<N-1; j++)
    u[i][j] = mean;

  //Calc the 2D heat steady state distribution via jacobi iteration
   for(iter=1; iter<maxIters; iter++)
  {

   for(i=1; i<N-1; i++)
    for(j=1; j<N-1; j++)
     //Calc cell i,j based on stencil neighbors
     w[i][j]=(u[i-1][j] + u[i+1][j] + u[i][j-1] + u[i][j+1]) / 4.0;

   for(i=1; i<N-1; i++)
    for(j=1; j<N-1; j++)
        u[i][j]=w[i][j];

  } // end for iter:maxIters

 }//end of acc region pragma
```

3. Run Time (crc-gpu, default problem size): 5.160
   So the speedup is 4.746
4. The time spent on init is about two seconds (the extra time it takes the parallel version to complete the small problems). The fraction will vary depending on the problem size.
5. Run Time (crc-gpu, default problem size, with pgcudainit): 3.220
   So the speedup is 7.6055
6. Here are plots of serial/parallel runtimes and speedups (parallel run without pgcudainit):

Runtimes

Speedup