S_N Method

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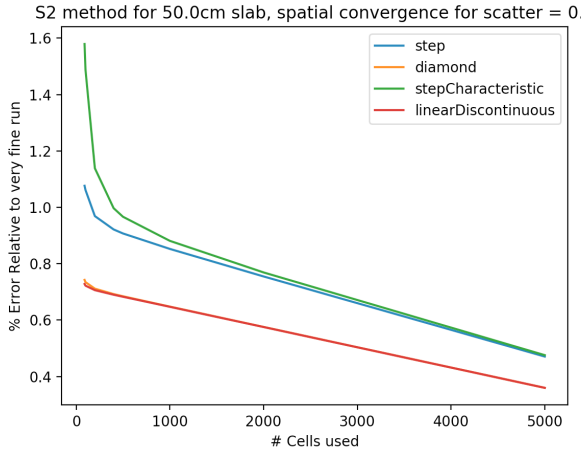
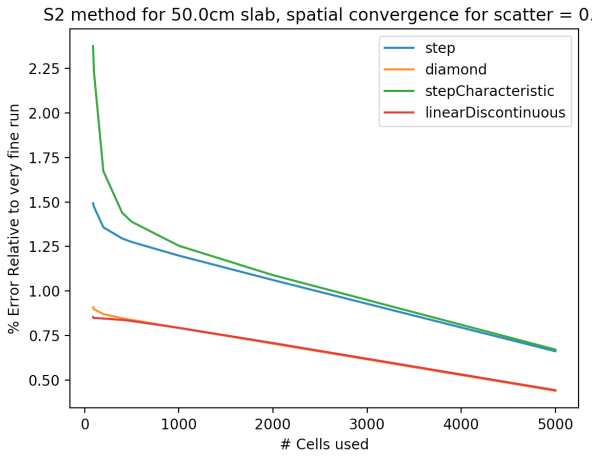
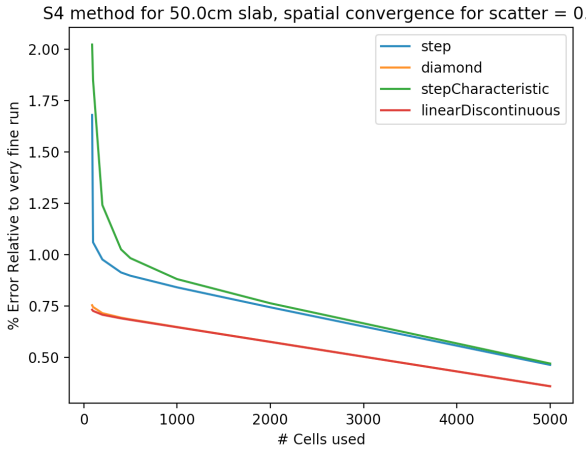
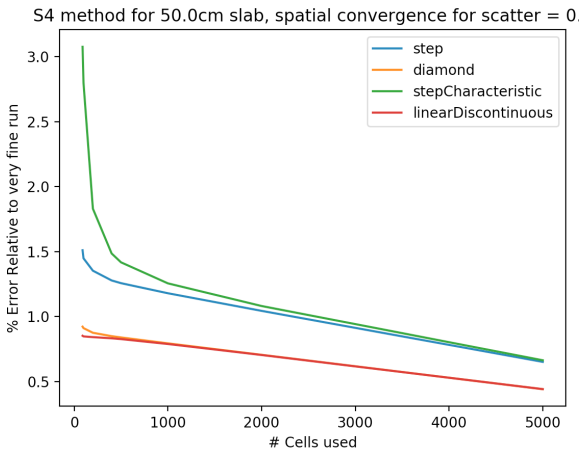
Homogenous Slab

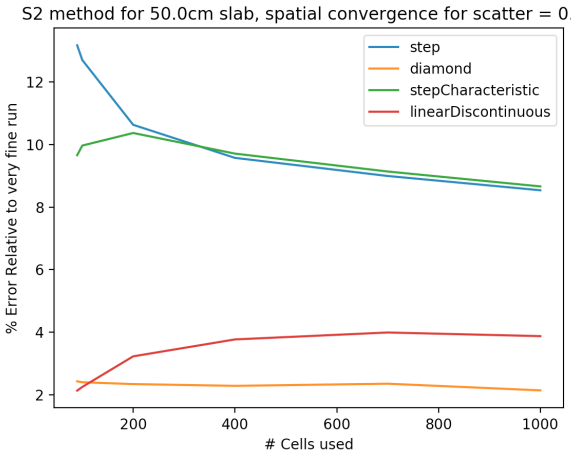
Here are the convergence plots for a 50 cm slab homogeneous slab, using 10,000 cells to be the "good" answer with which to judge my errors on.

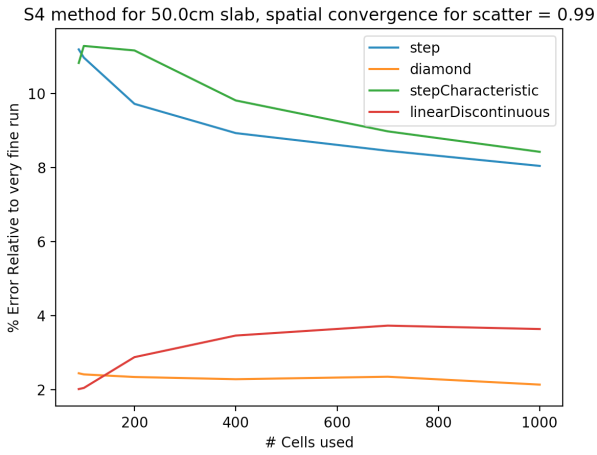












It seems that for all methods, having a SigS = 0.1 requires 6 iterations, having a SigS = 0.5 requires 18 iterations, and SigS = 0.99 requires about 700-800 iterations (depending on mesh size), except for Step Characteristic which requires as few as 200 iterations for 0.99 SigS value.

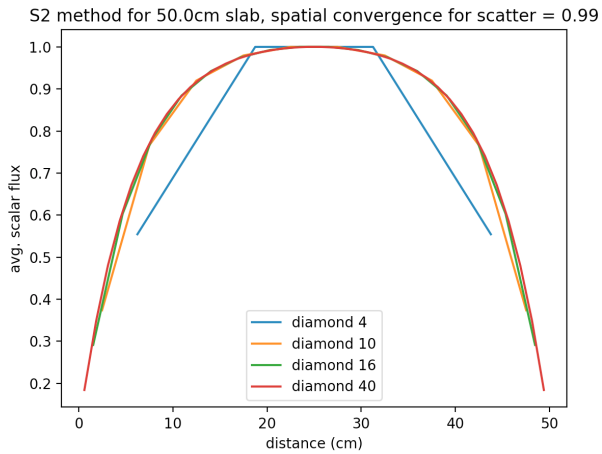
S2,S4 Step SigS = 0.1 = 6
S2,S4 Step SigS = 0.5 = 18
S2,S4 Step SigS = 0.99 = 700-800 for various numbers of cells

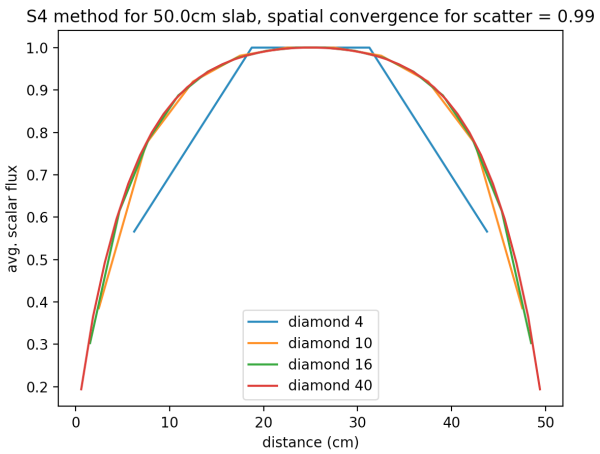
S2,S4 Diamond SigS = 0.1 = 6
S2,S4 Diamond SigS = 0.5 = 18
S2,S4 Diamond SigS = 0.99 = 700-800 for various numbers of cells

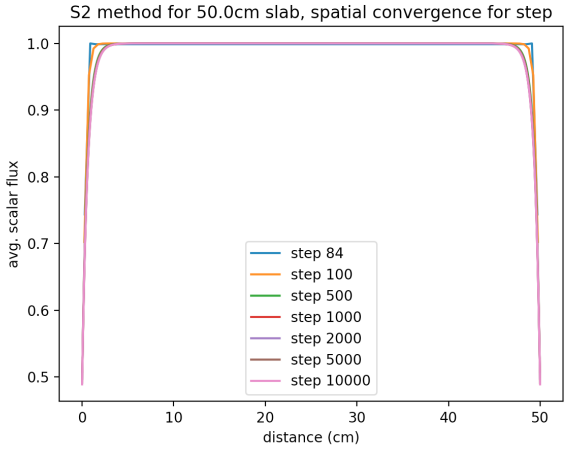
S2,S4 Step Characteristic SigS = 0.1 = 6
S2,S4 Step Characteristic SigS = 0.5 = 18
S2,S4 Step Characteristic SigS = 0.99 = 200-700 for various numbers of cells

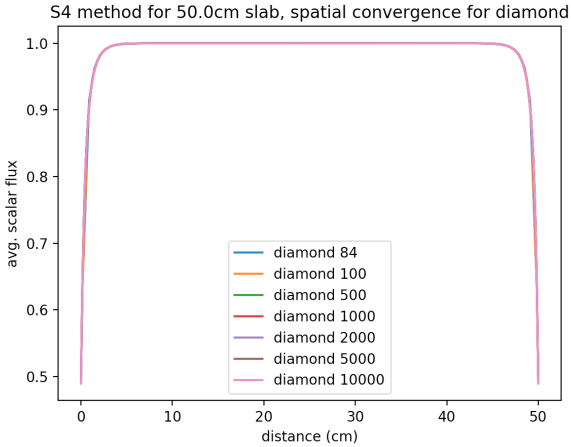
S2,S4 Linear Disc. SigS = 0.1 = 6
S2,S4 Linear Disc. SigS = 0.5 = 18
S2,S4 Linear Disc. SigS = 0.99 = 700ish for various numbers of cells

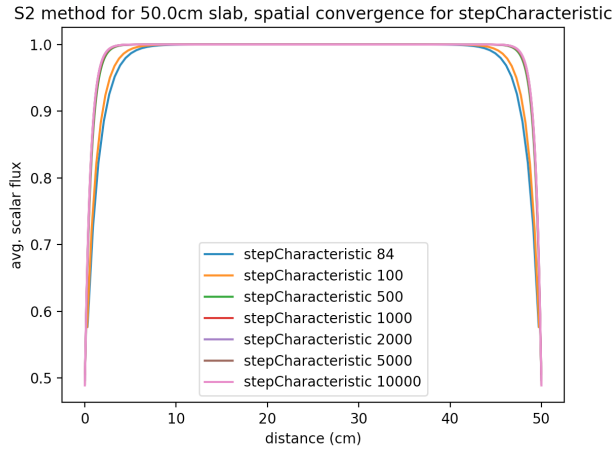
Here are some examples of plots I made

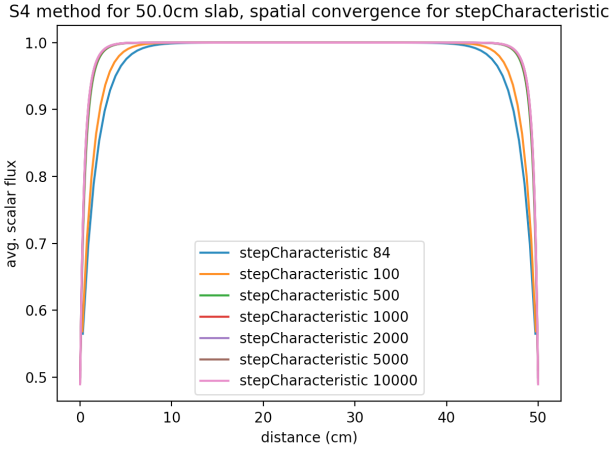






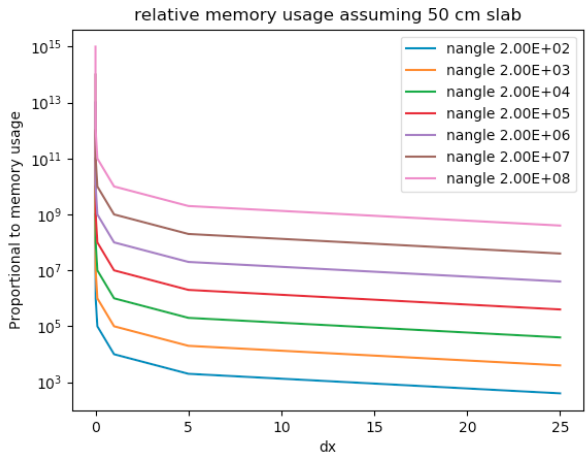






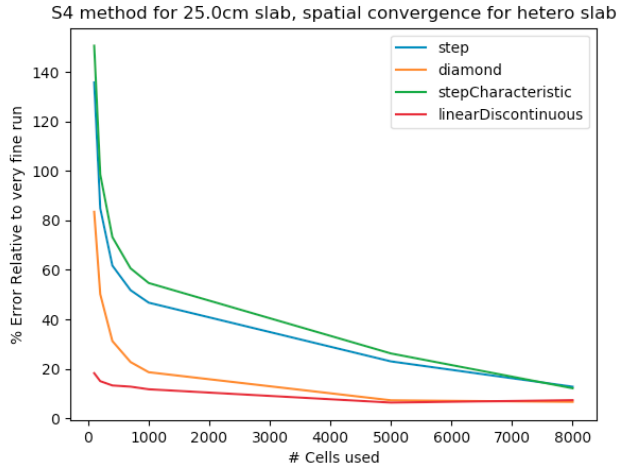
The number of cells we have is L/dx. This means that we will have to store flux in the cell, of which there are L/dx, and save the information at the boundaries, of which there are $L/dx + 1$.

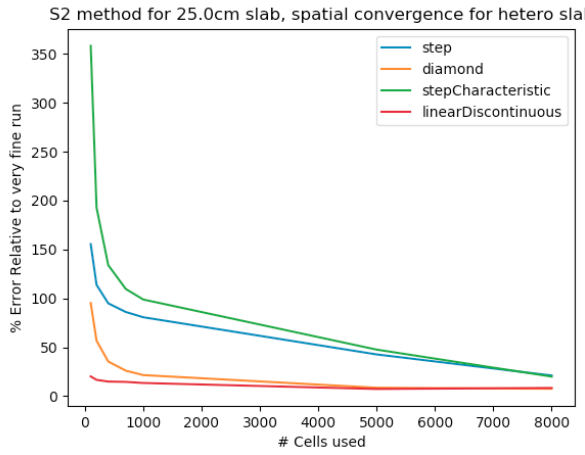
If we store angular flux in each slab instead of scalar flux, we will have an additional $L/dx \times \#$ angles.

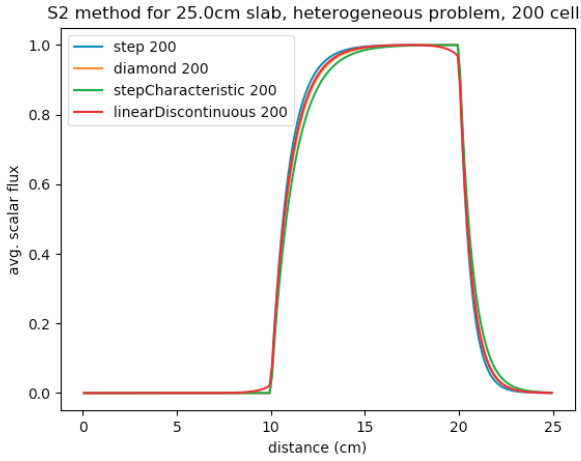


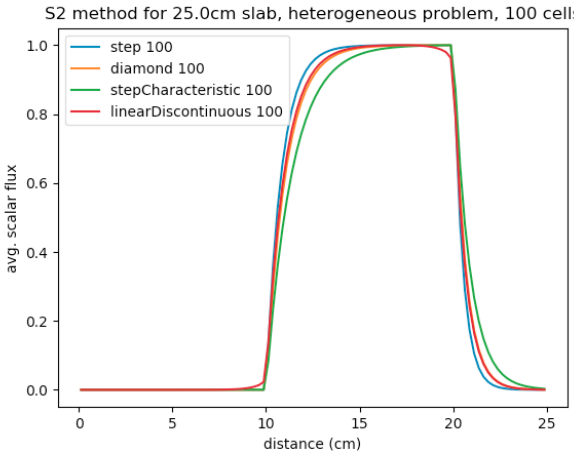
Heterogeneous Slab

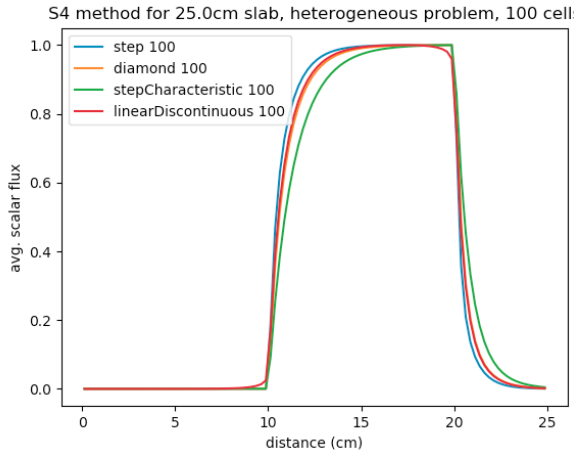
All my methods, for various mesh sizes, took between 15 and 20 iterations to converge.

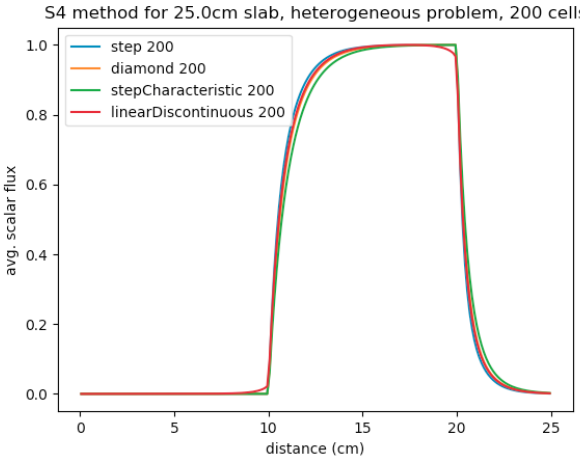

S4 method for 25.0cm slab, spatial convergence for hetero slab
step
diamond
stepCharacteristic
linearDiscontinuous
% Error Relative to very fine run
# Cells used


S2 method for 25.0cm slab, spatial convergence for hetero slab
step
diamond
stepCharacteristic
linearDiscontinuous
% Error Relative to very fine run
# Cells used


S2 method for 25.0cm slab, heterogeneous problem, 200 cells
step 200
diamond 200
stepCharacteristic 200
linearDiscontinuous 200
avg. scalar flux
distance (cm)


S2 method for 25.0cm slab, heterogeneous problem, 100 cells
step 100
diamond 100
stepCharacteristic 100
linearDiscontinuous 100
avg. scalar flux
distance (cm)


S4 method for 25.0cm slab, heterogeneous problem, 100 cells
step 100
diamond 100
stepCharacteristic 100
linearDiscontinuous 100
avg. scalar flux
distance (cm)


S4 method for 25.0cm slab, heterogeneous problem, 200 cells
step 200
diamond 200
stepCharacteristic 200
linearDiscontinuous 200
avg. scalar flux
distance (cm)