Assignment Set for Laboratory 8: Optional Lab

EOSC 511/ATSC 506:

Problem numbers below refer to the problems in the lab text itself.

I. Do FIRST this subset of problem 3. Set loop=True, and compare the efficiency of the SOR method (currently implemented, suggest over-relaxation coefficient of 1.7) and the Jacobi iteration (you need to implement, suggest coefficient of 1; I find 1.7 unstable). Also compare to indexing the loops and doing Jacobi interation by setting loop=False. You can time functions using %timeit

II. Then using the most efficient scheme, choose one parameter of the problem (eg depth, width of ocean, vertical viscosity, wind stress, latitude) vary it (3 or 4 choices) and compare the solutions.

III. Continue to use the most efficient scheme. Set the wind-stress to zero. Initialize the stream-function (both psi_1 and psi_2) with a blob of fluid somewhere over to the east (say a Gaussian 3/4 of the way across with a radius of several grid points). Make sure that the boundary condition (psi = 0 on all walls) is enforced.

    The blob should move west like a Rossby wave (the natural wave in this problem, a one-way wave, only moves west). Compare the time-scale of the westward movement to the time-scale of reaching steady state in the wind-driven case.

    (Wikipedia entry on Rossby waves is currently okay if you want a quick read about them. The time scale given for Rossby waves across the ocean is for baroclinic (slow) waves. You are doing barotropic (fast) waves).