**Steps for optimization and sensitivity runs**

Modified 7/25/17

All paths relative to the SageParm repository: https://github.com/krenwick/SageParm

**Sensitivity Analysis:**

1. Create master ins file with desired settings and dummy variables for parameters to optimize.
   1. Example: automate\_tests/LHC.ins
2. Modify and run the code-processing/latin\_hypercube.R script to generate sets of ins files
   1. To start I set the # of runs to a multiple of 32 to maximize use of hyalite. Should have > 10 x n.parameters
3. Copy ins files to hyalite
4. Create new slurm folder and slurm script
   1. example slurm script: code-processing/LHC\_scripts/LHC.sh
5. Run slurm script. Merging of output now takes place on the compute node as part of this step.
   1. NOTE: merging can take longer than actually running the model if files are large. Works best if only output data from historic period. Can run on express node for 640 simulations, 1 patch, 4 grid cells
6. Download merged data.
7. Run through R script code-analyze/tables\_RPCC.R to generate .tex tables of RPCC
   1. This depends on functions defined in code-analyze/fx\_RPCC.R
      1. Functions will need to be updated if using a different number of PFTs or parameters than I used
8. Pick out parameters that model is sensitive to (used cutoff |RPCC| >.2)

**Optimization:**

1. Create new master ins with new dummy variables for this new set of parameters to optimize
   1. Example ins: optim\_hyalite\_bundle/summergreen\_optim1\_LM.ins
   2. Make and R script to run the optimization
      1. example: optim\_hyalite\_bundle/DE\_paroptim.R
   3. Make a slurm script
      1. Example: optim\_hyalite\_bundle/DEparoptim\_slurm.sh
         1. This optimizes based on monthly GPP and LAI, treating each site and each month as independent observations and weighting them all equally. Cost function is SSR
   4. Make a “run” script for R (necessary due to hyalite quirks)
      1. example: optim\_hyalite\_bundle/runRDEpar.sh
2. Copy ins, R script, slurm script, run script, and any necessary data files to hyalite
   1. I copy 2 data files: lai\_gpp.csv and RCflux\_15\_16.csv
3. Run slurm script: for my runs this takes ~ 5 hours
   1. NOTE: max iterations in DEoptim defaults to 200. Read package documentation on how to increase; I haven’t played with this.
4. Download .Rdata file with model object
5. Re-run the model using these new parameter values, 100 patches
   1. Example R script: code-analyze/plot\_gpp\_lai\_DEoptimparms
      1. Rscript will re-run LPJ-GUESS, so must be compiled

**LHC and Optimization Part 2: New Phenology Model**

1. Re-do the LHC analysis using important parameters from first round and including new phen parameters
2. Check which parameters matter: code-analyze/sensitivity\_newphen\_parms.R
3. Take newly-important parameters and optimize using same steps as before
   1. keep values of non-important parms at optimized value from initial optimization run