Tutorial on coupling grid-based LSM runoff with vector-based RAPID rivers

By Peirong Lin (prlin@utexas.edu),
After Cédric H. David (chdavid@uci.edu)
17 Jul 2013

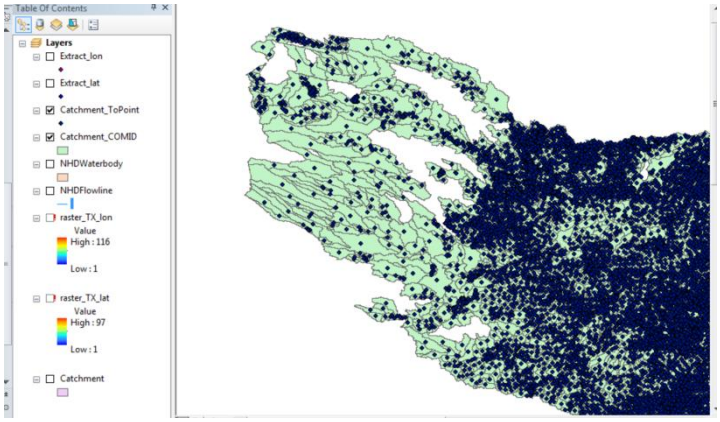
The following is an example on coupling 12.5km Noah-MP runoff with RAPID.

Prerequisite Files

1. **Noah-MP runoff .nc files** (surface and subsurface): 1-hrly time step, 12.5km resolution
2. "**my_make_m3_riv.sh**" shell script: convert 1-hrly to 3-hrly, call "coupler"
3. "**my_rapid_coupler.f90**" fortran file: generate RAPID accepted .nc files (each river reach has a runoff value which equals runoff * catchment area)
4. Coupling file "**Reg12_NoahMP_coupling_file.csv**": Users need to prepare this file in ArcGIS by themselves (detailed instructions will be included in the following part)

Procedure

1. Create coupling file "Reg12_NoahMP_coupling_file.csv"
   a. Select those catchments which have river reaches
      1) Right-click "NHDcatchment.shp" → "Join and Relate…" → "Join"
      2) "Join" catchment "FEATUREID" with "COMID" in "NHDFlowlines.shp"
      3) "Select by Attribute": select "NHDcatchment.shp" where <"Flowline.COMID" IS NOT Null> (the SQL sentence is within bracket <>)
      4) Right-click "NHDcatchment.shp": export selected features as layers (named this exported layer as "Catchment_withCOMID.shp")
   b. Acquire the center point of the "Catchment_withCOMID.shp" file
      1) ArcToolBox → Data Management Tools → Features → Feature to Point
      2) Get the center point of each catchment, the layer named "Catchment_ToPoint"



c. Prepare two raster files (with coordinate system, projection, and spatial reference as the same as the Noah-MP outputs)

1) Prepare **"raster_TX_lat.nc"** and **"raster_TX_lon.nc"** with values shown below: (In my case, my Noah-MP outputs have 97 x 116 grid points)

97	97				97
⋮	⋮		.....		⋮
3	3		.....		3
2	2				2
1	1				1

raster_TX_lat.nc

1	2				116
⋮	⋮		.....		⋮
1	2		.....		116
1	2				116
1	2				116

raster_TX_lon.nc

2) ArcToolBox → Spatial Analyst Tools → Extraction → "Extract Values to Points": to acquire the catchment center's lat/lon grid number on the Noah-MP grids. The lat/lon grid numbers are stored in the output point shapefile "RASTERVALU" field

3) Join these two files with Catchement_withCOMID.shp, and export table. Delete other fields other than "COMID", "AreaSqKm", "lon", "lat", and re-order the files using smallest-to-largest COMIDs. Save the table to .csv files, and name it as "Reg12_NoahMP_coupling_file.csv".

2. Run "my_make_m3_riv.sh" (Note: before that, users must modify the coupling file path in "my_rapid_make.f90", and corresponding "m3_riv_1hr", "m3_riv_3hr" locations)
3. Run "ncrcat.sh" to concatenate those files into one