Last edited by **uedak** 3 years ago

matlab_condition_gen

Applies to branch: `raster_read_nonlib`

See further below for:

2.) Generating and exporting a MATLAB matrix by hand
3.) Generating and exporting a matrix from a GIS

1. Generating input rasters graphically with MATLAB

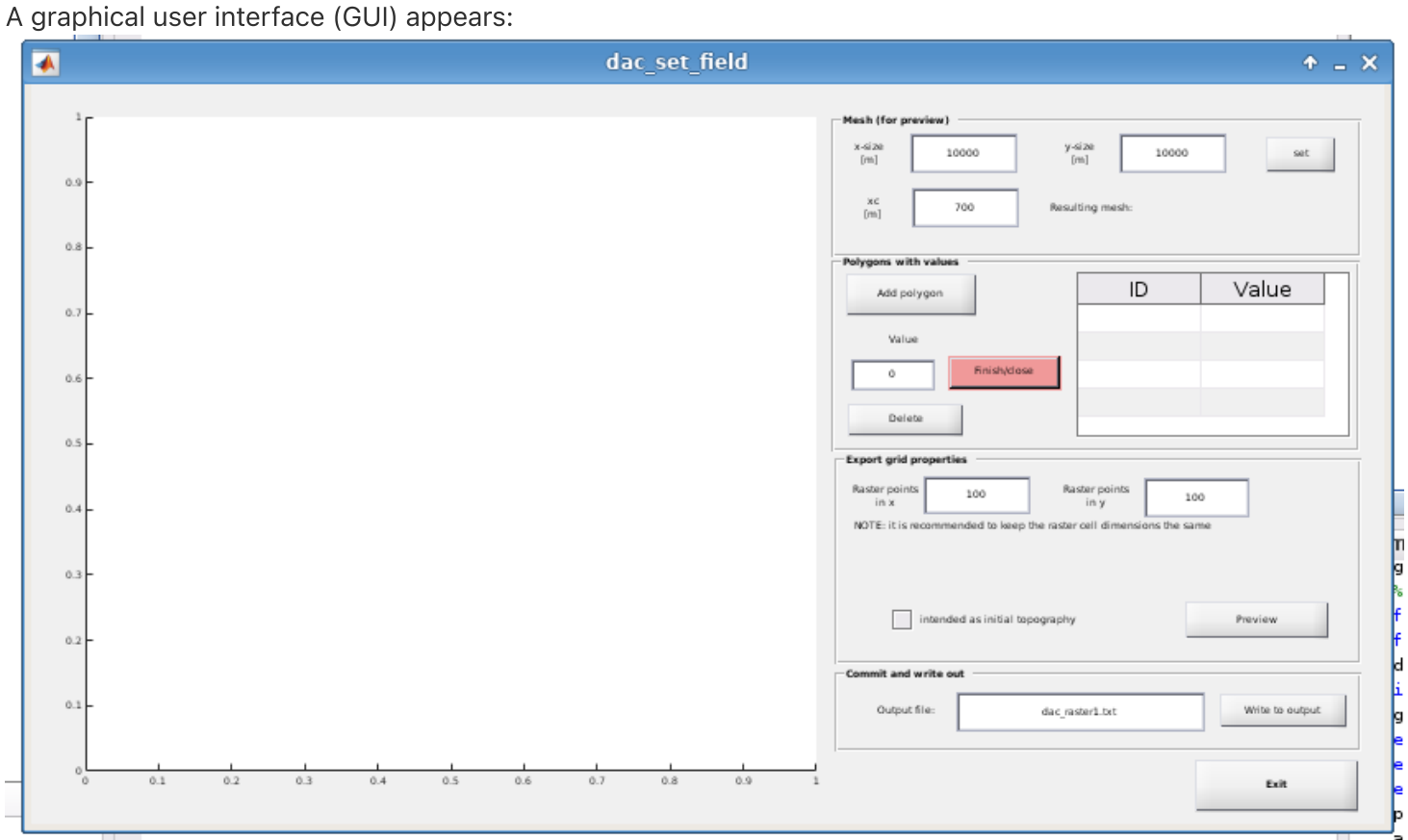
For code versions (branches) with the capability to read raster files, a MATLAB tool is available. It can be found in the subdirectory `condition_generator` in the repository, respectively local copy.

It features graphical preview of a typical mesh, and editable polygon features to set values in regions. If polygons overlap, the latest additions take precedence. A grid can be generated, preview, and exported. The export contains a flat raster file, and a text snippet to insert into the *init.dac* master input file.

Usage:

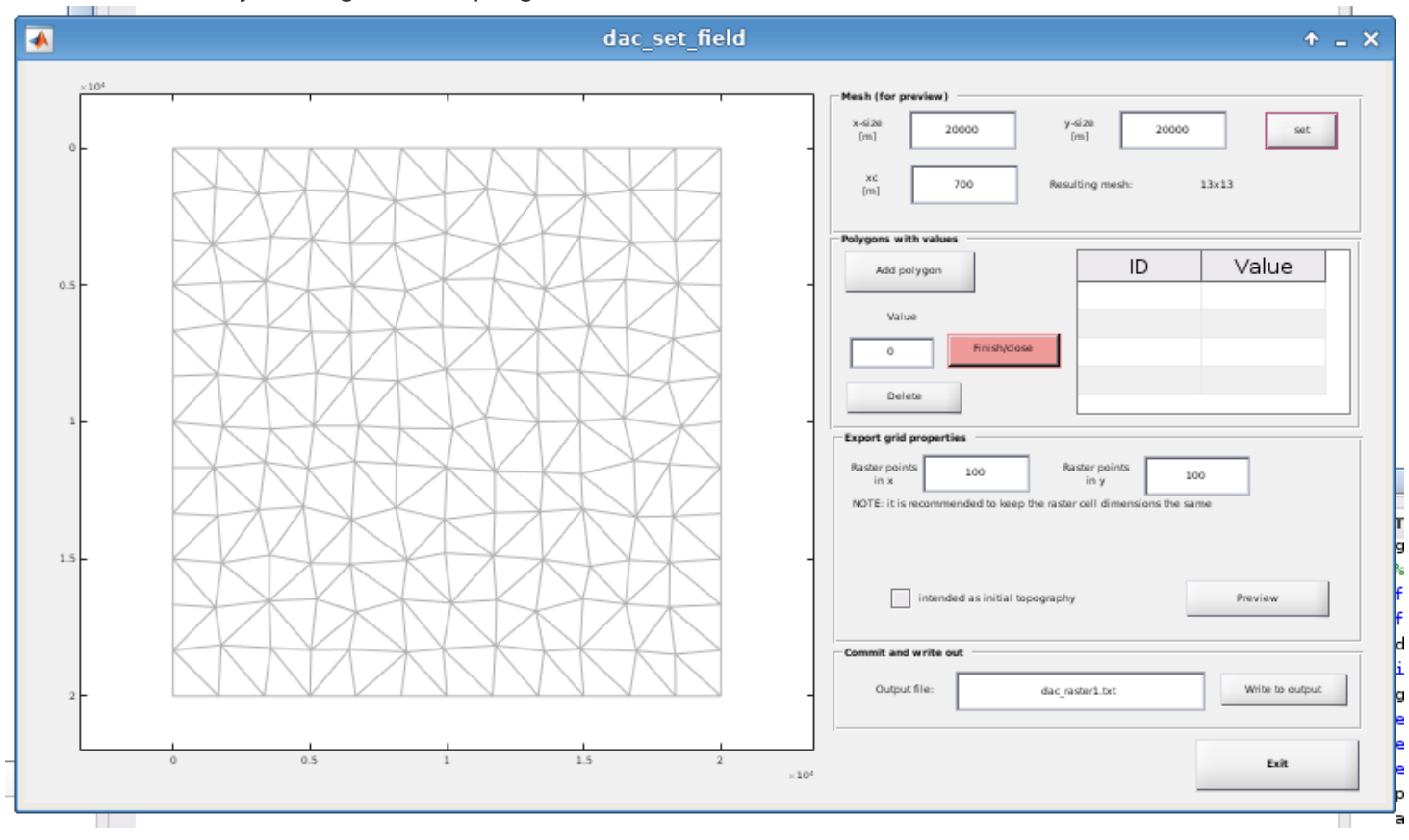
Navigate in MATLAB to the *condition_generator* directory, and issue:
`dac_set_field`
(Alternatively, you can open the *dac_set_field.m* script and run it.)

A graphical user interface (GUI) appears:



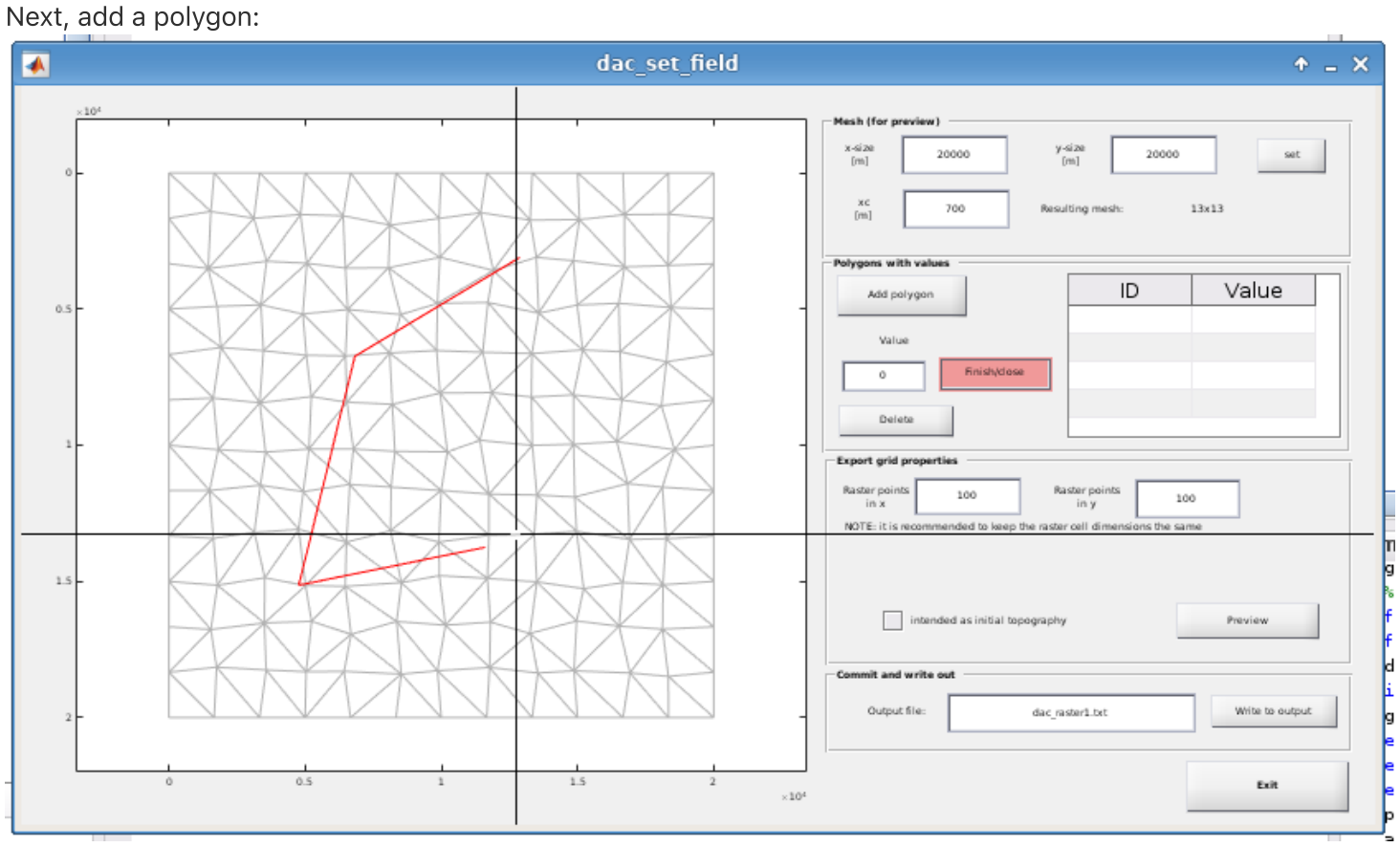
There is a preview window on the left, and four control panels on the right. The top one controls the mesh preview - how a mesh of certain dimensions at given resolution would look like. The second panel from the top features the addition of polygons. Values can be assigned to them, and misfitting ones deleted. The third panel sets a grid for information exchange. One can preview how the settings would look like over the mesh. The last panel is for writing to a file.

First set a mesh by clicking on the top-right "Set" button:

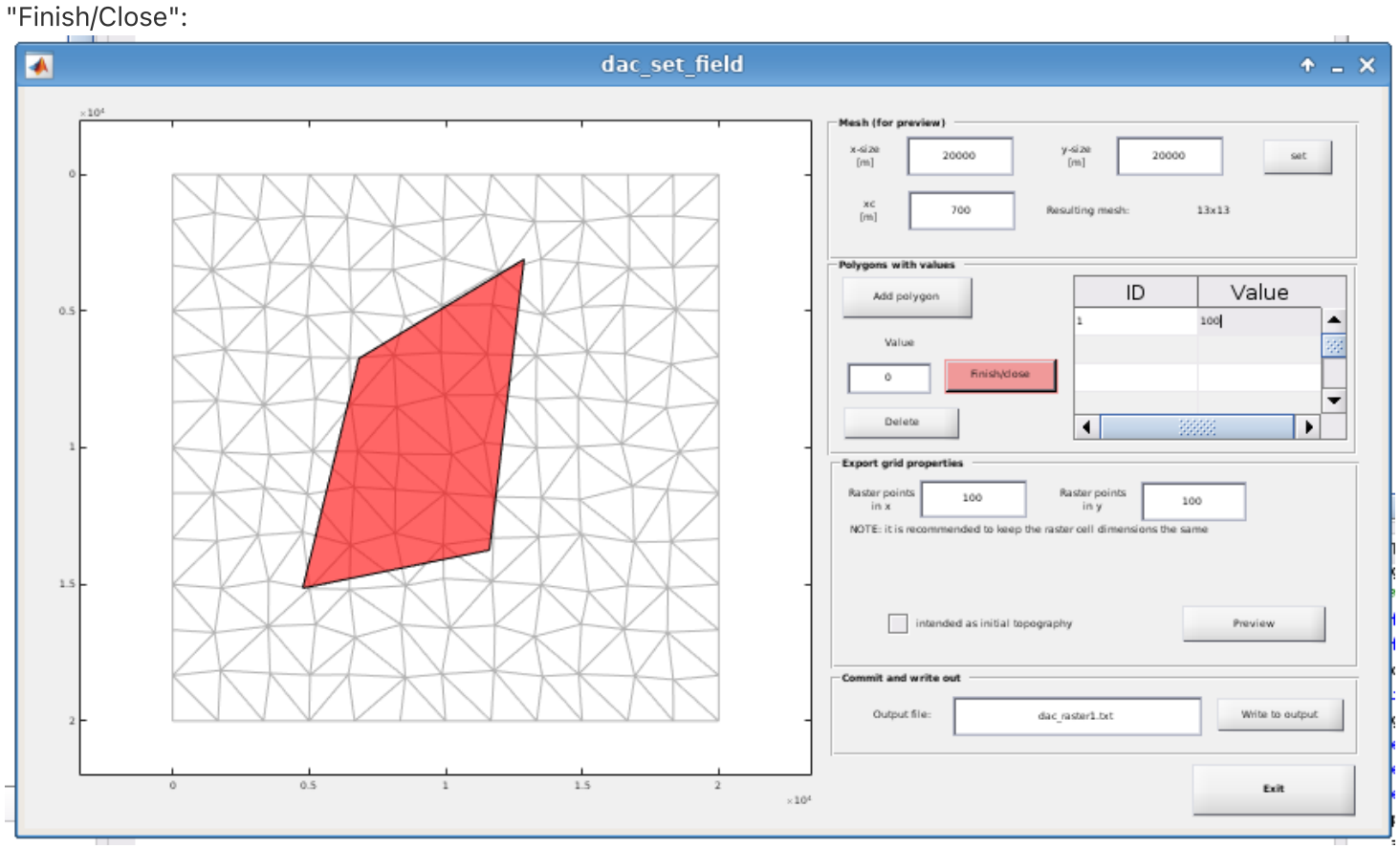


Experiment with changing sizes and resolution (controlled via xc) - this can be done live.

Next, add a polygon:

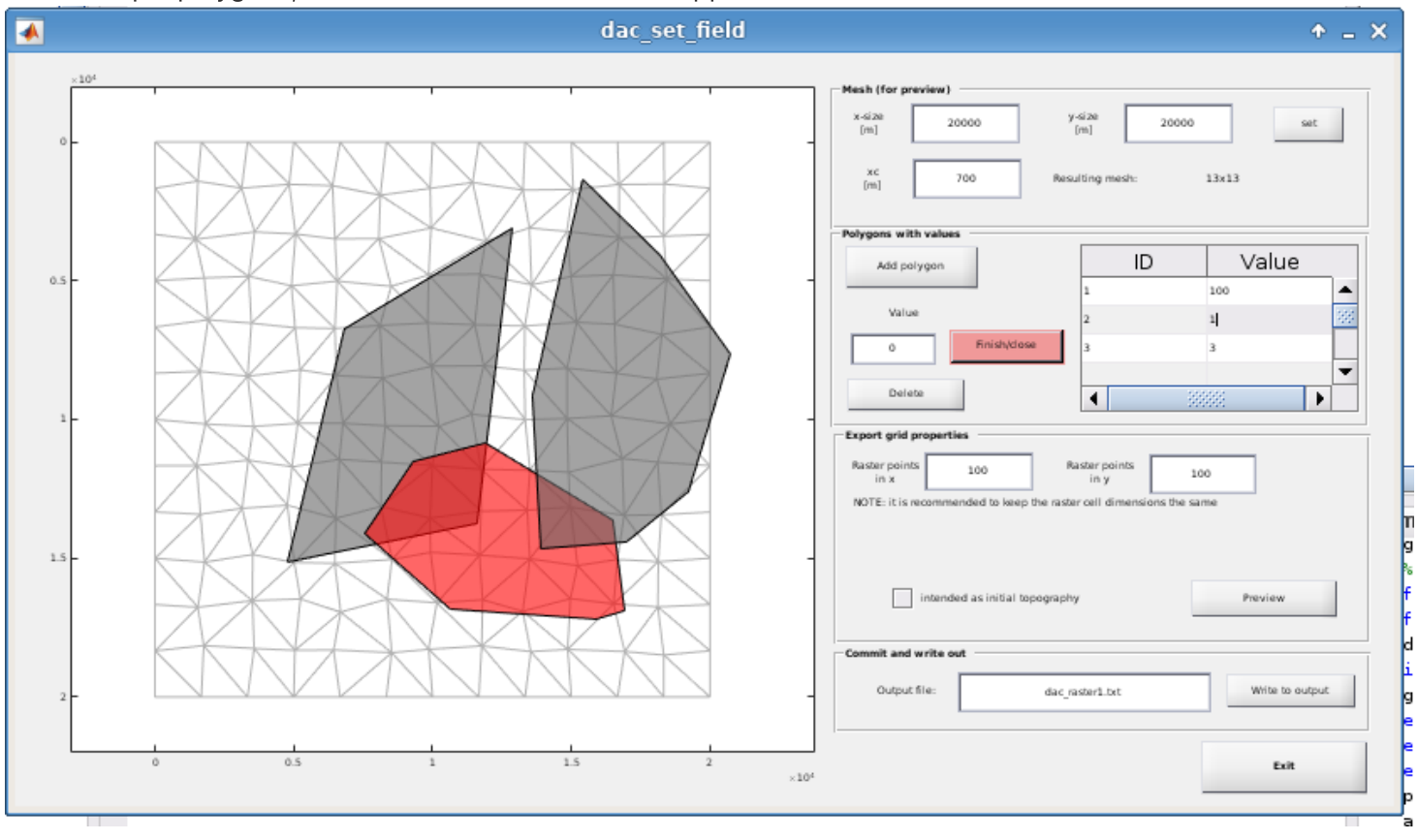


In the second panel, click on "Add polygon", click on the places where you want to set points. Once done, click "Finish/Close":



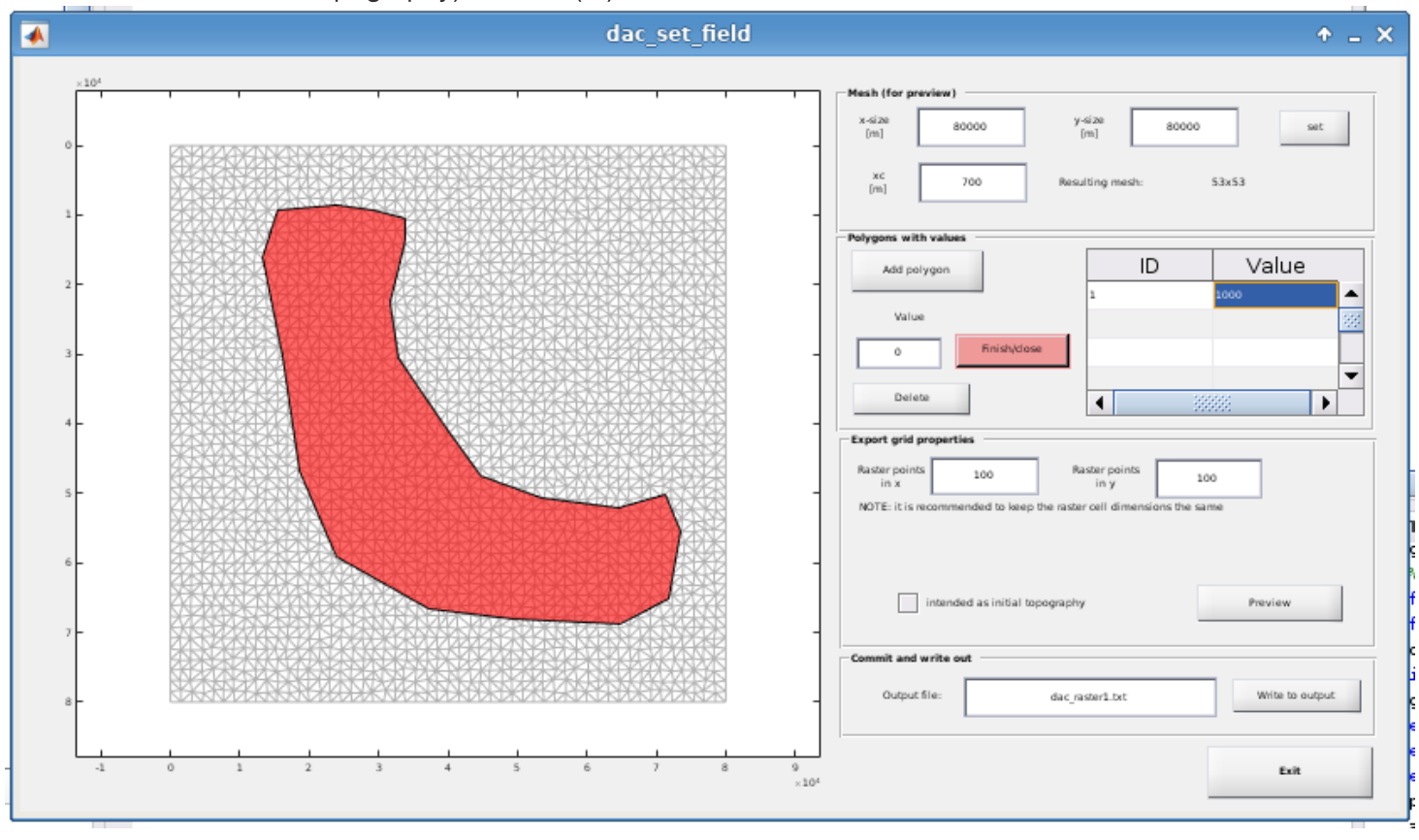
The object appears now in the list. You can edit the value that it represents.

With multiple polygons, the active selection in the list appears red:

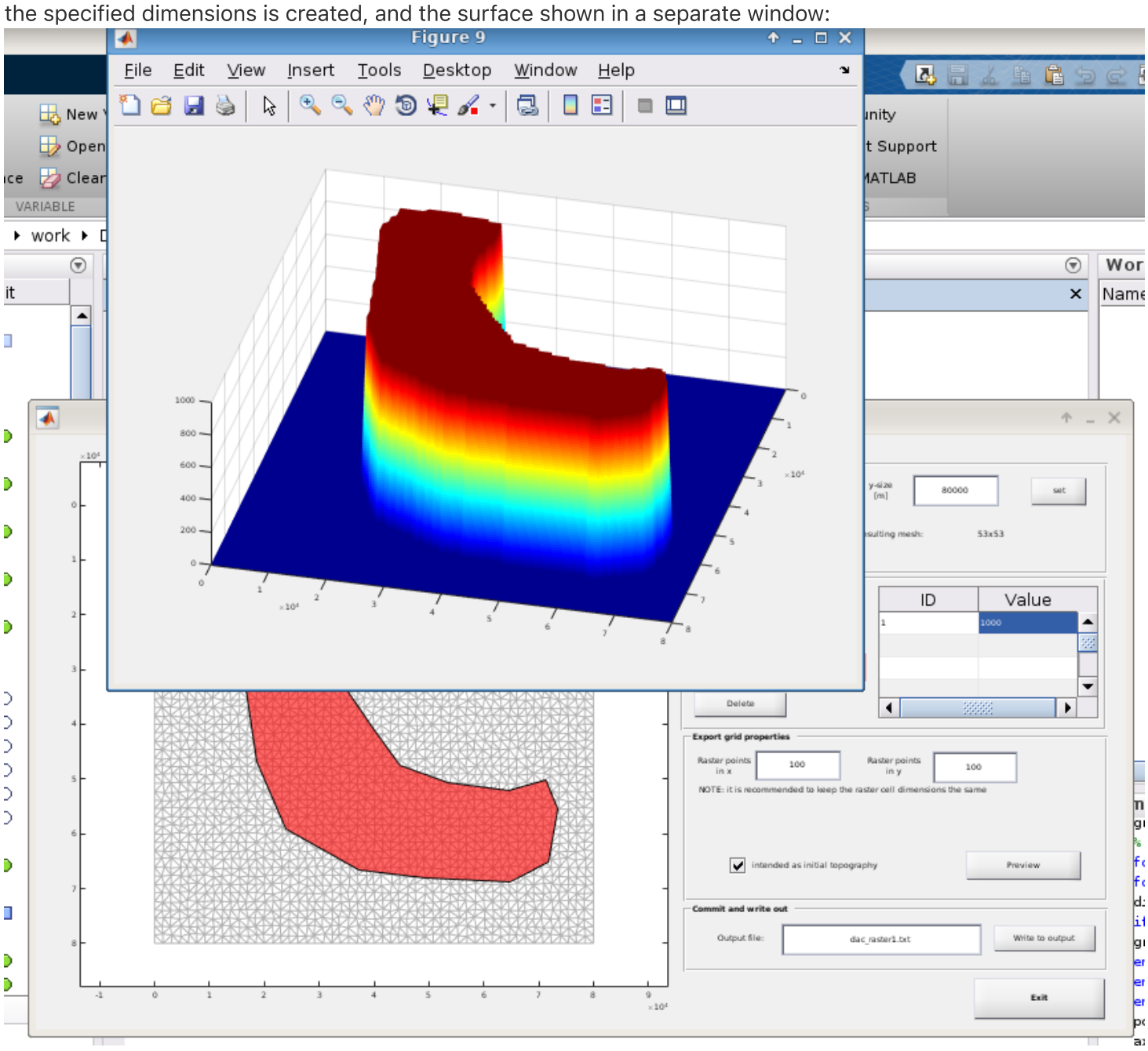


A worked example

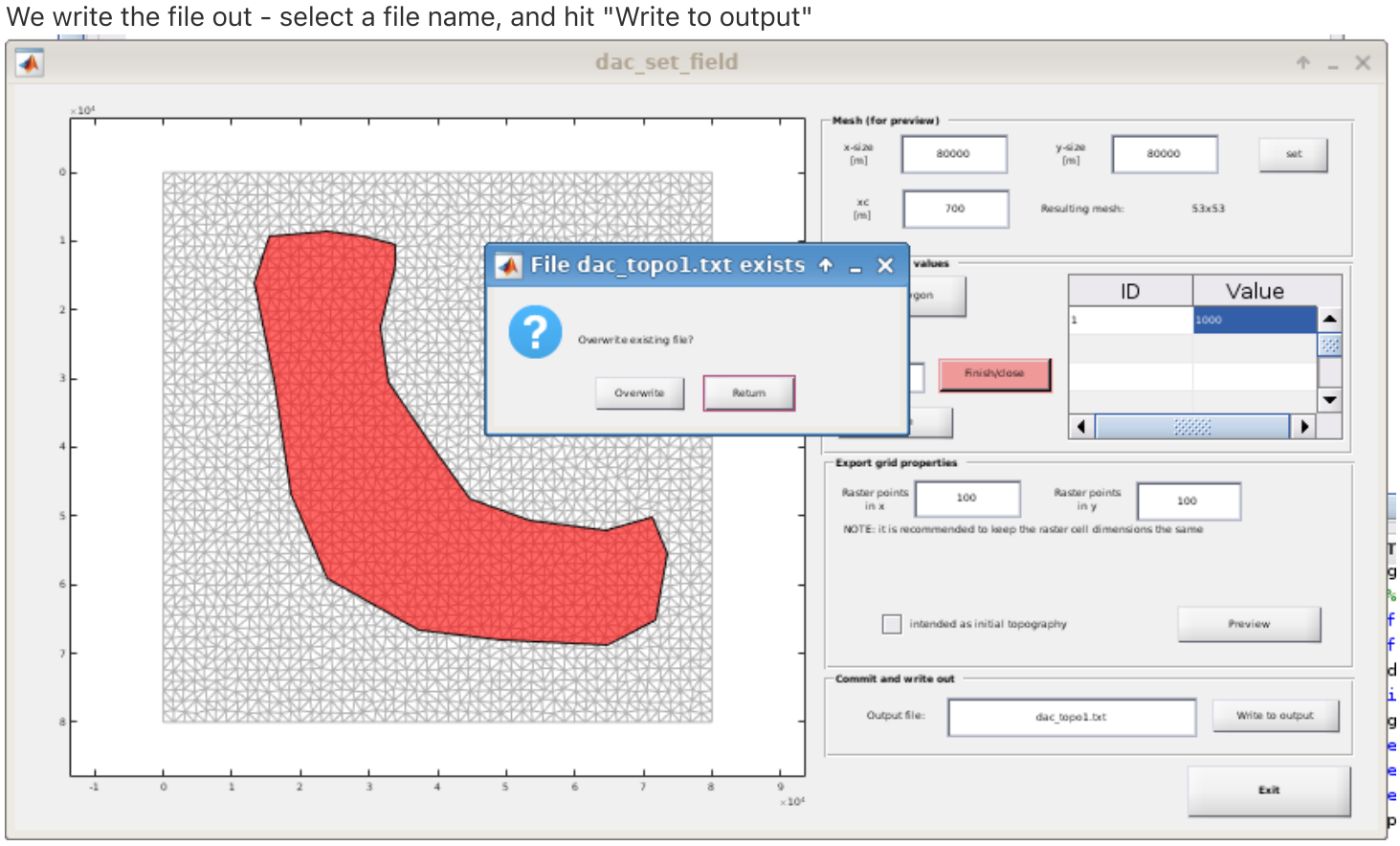
We start with a finer mesh and a complex polygon - it could grotesquely resemble an orogen. We set a value (we intend to use it as initial topography) of 1000 (m) :



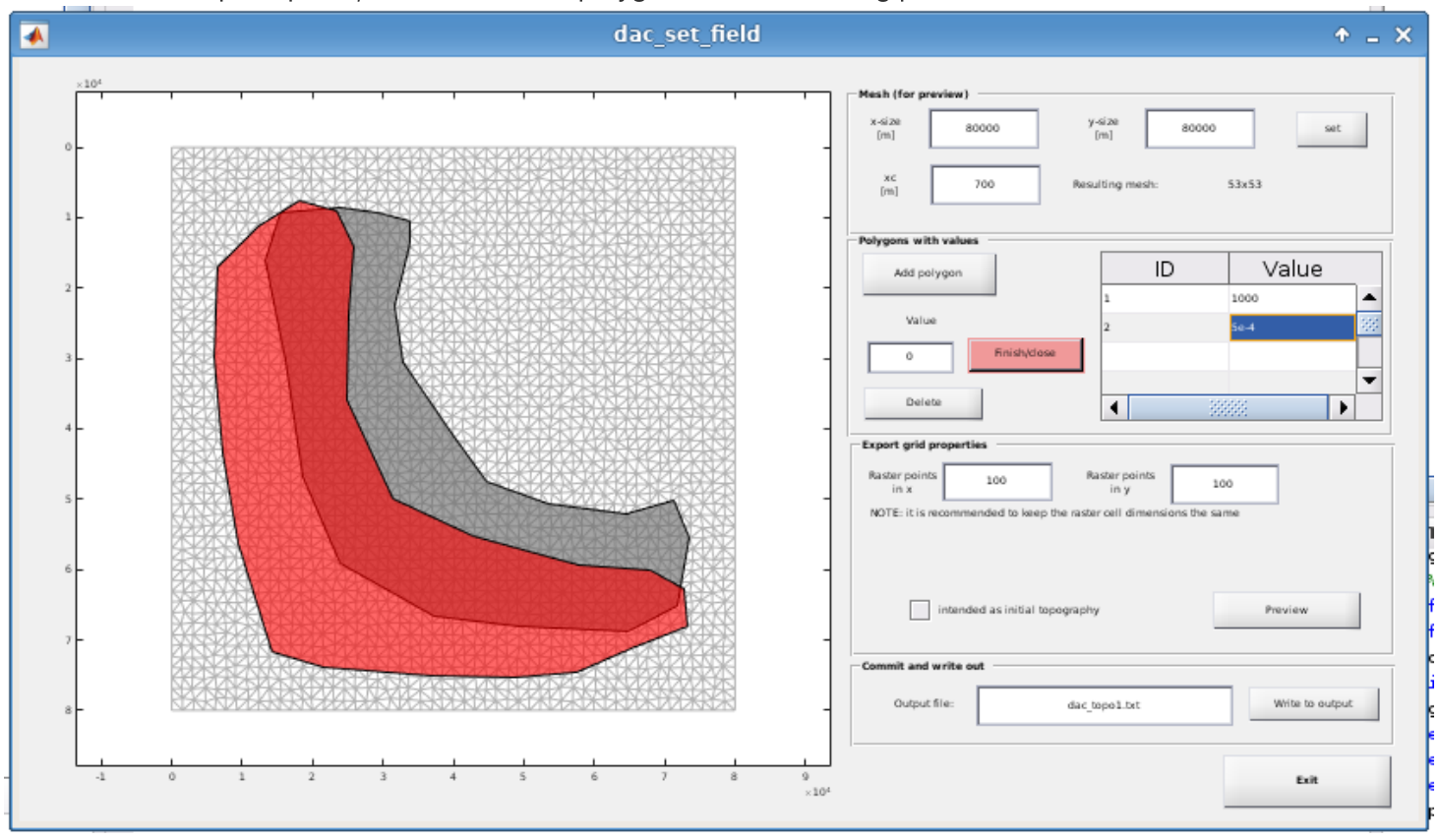
We can preview our condition. Select the checkbox for initial topography on. Once we click "Preview", a grid of the specified dimensions is created, and the surface shown in a separate window:



We write the file out - select a file name, and hit "Write to output"

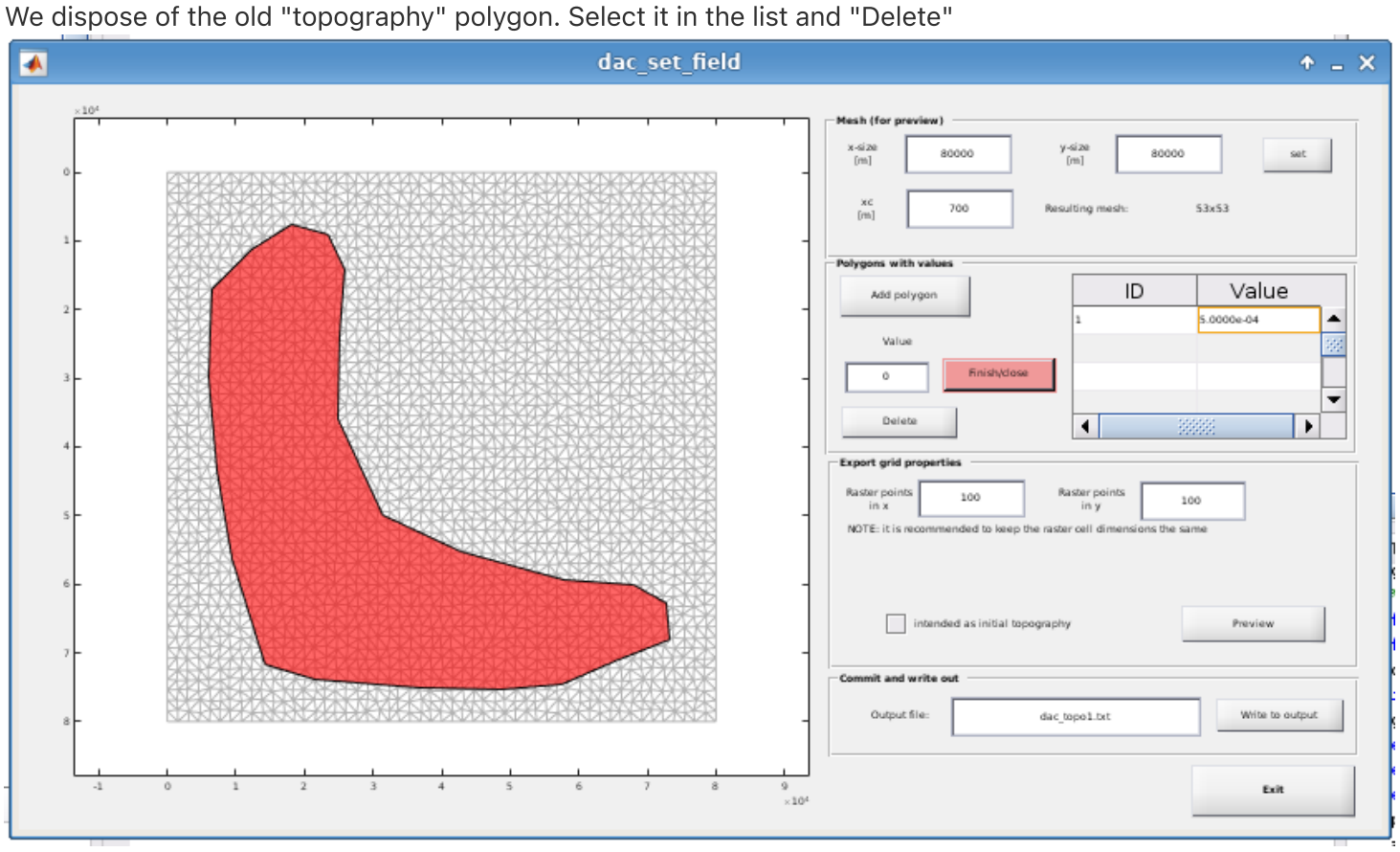


Next we would like to form an uplift field - say only the accreting front of the growing orogen is uplifting. So we leave the old shape in place, and draw a new polygon in the according position.



The value that we enter, *1e-4*, is in meters per year, i.e. 1 mm/a uplift.

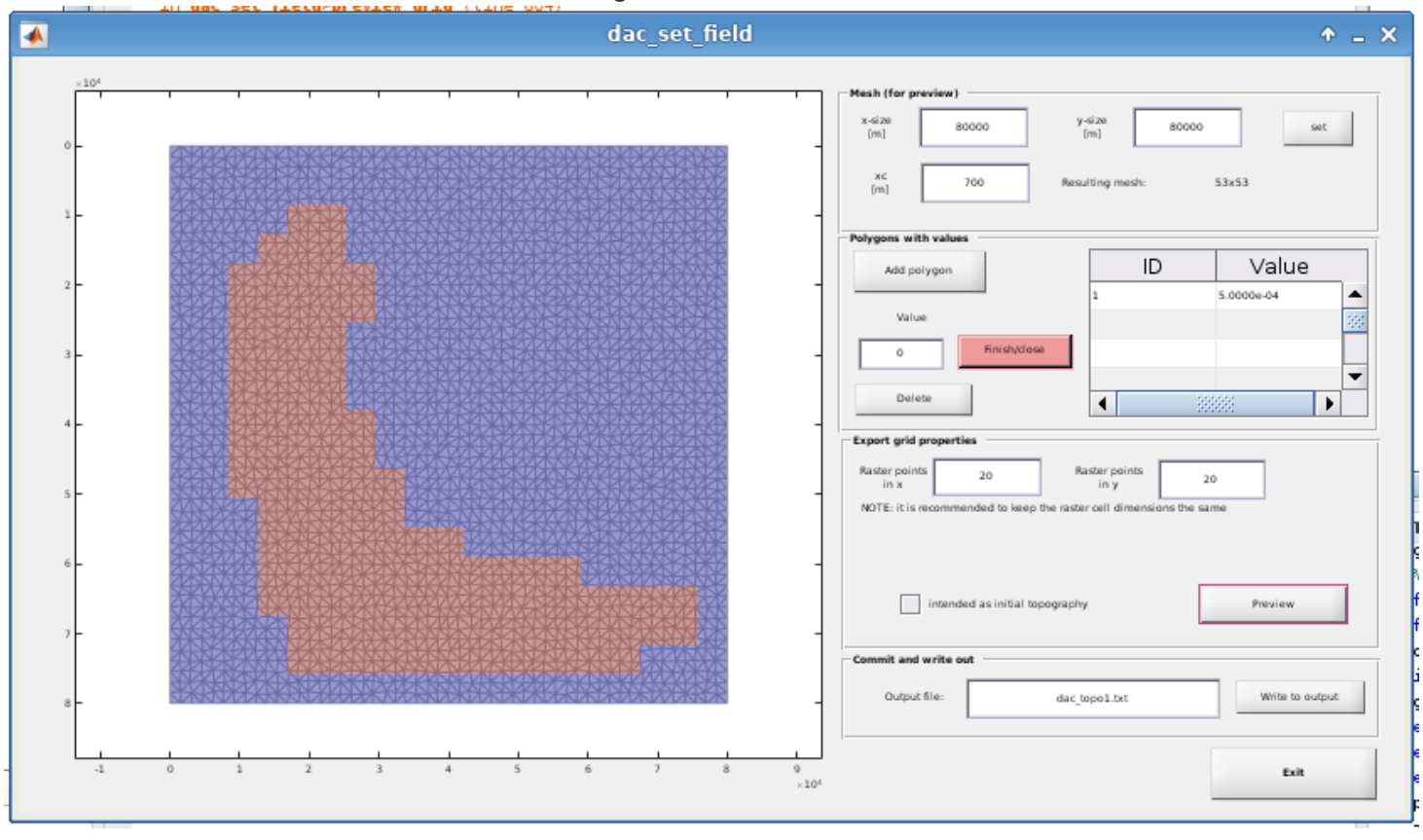
We dispose of the old "topography" polygon. Select it in the list and "Delete"



Preview how well the grid would transport the information - hit "Preview":

It seems that with the default 100x100 grid cells for the raster, the shape is very well resolved.

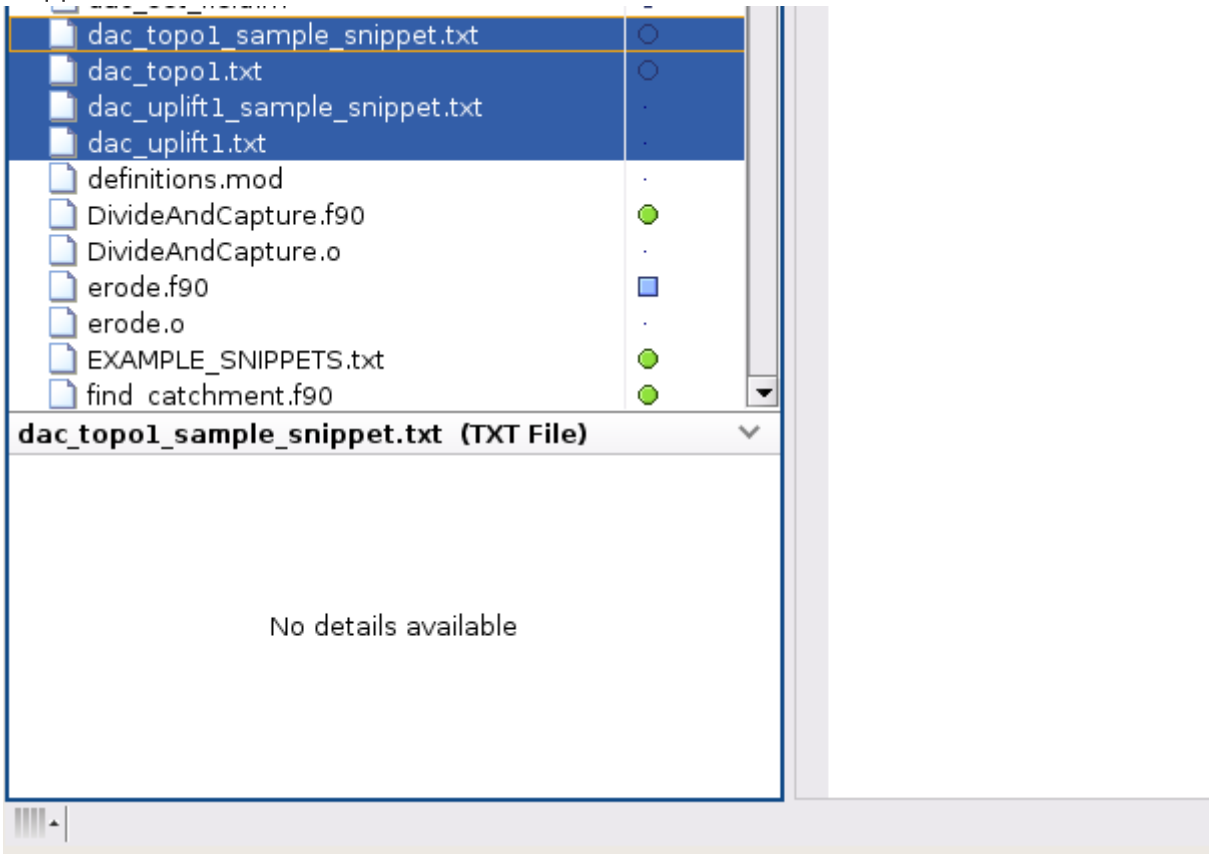
We can reduce the raster resolution and check again:



Now the grid cells show as a tad large.

Export again, different file name.

It appears that MATLAB has created these files:



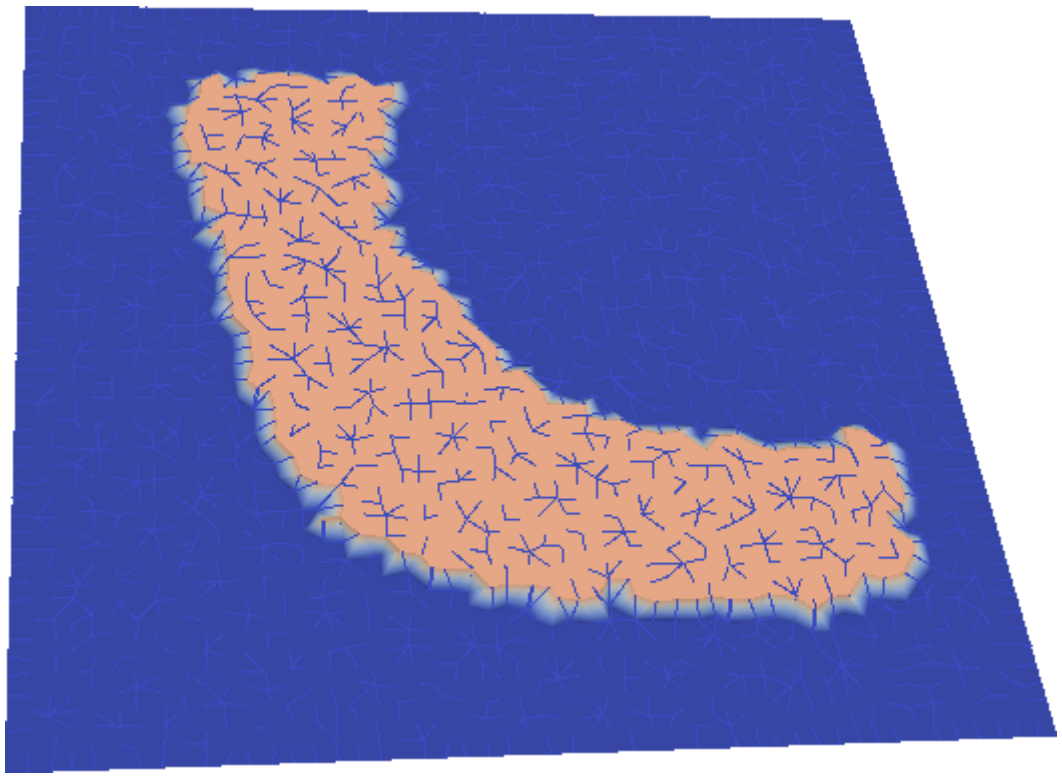
The *topo* and *uplift* rasters, which contain the field information, and two according files *sample_snippet*.

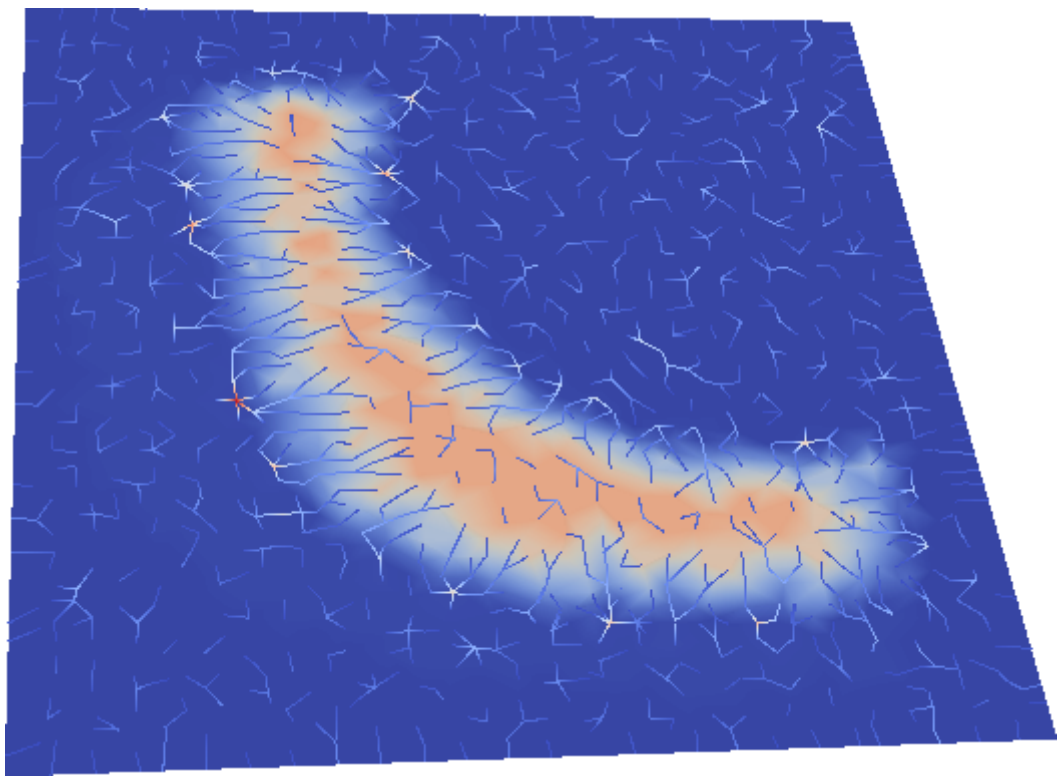
In these, the template for the master input file `init.dac` is already pre-filled (not completely!). Copy these into the input file, and insert the missing values:

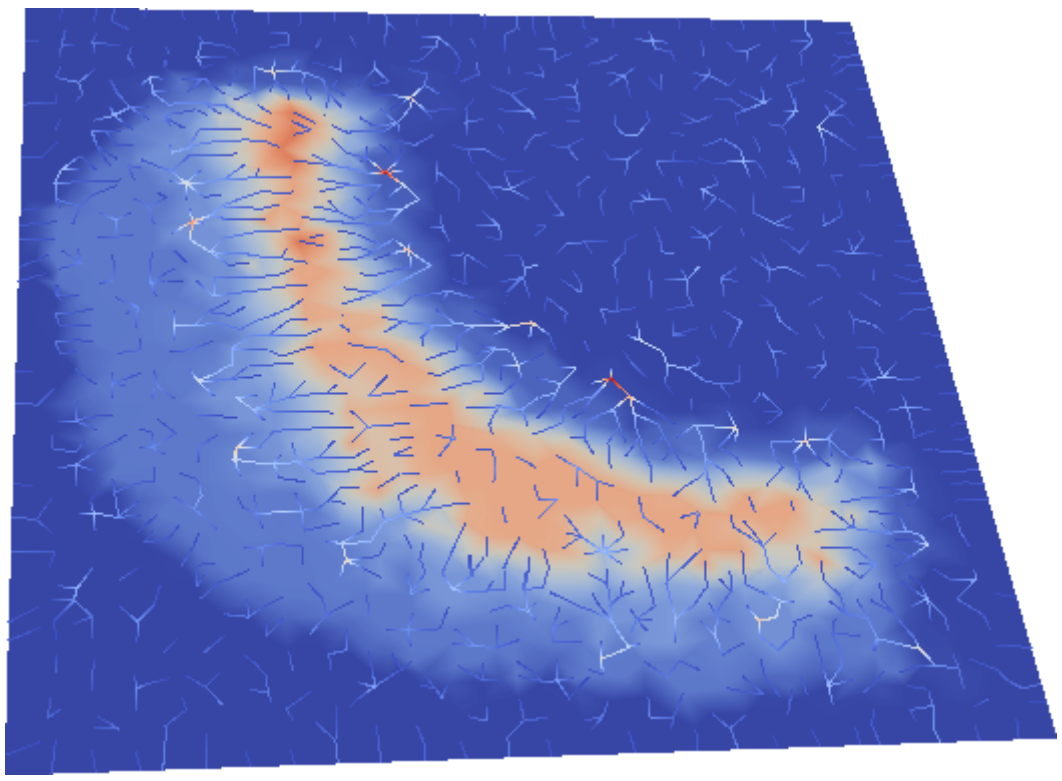
```
//---------------- raster block
/f_input_type
R
/raster filename
dac_topo1.txt
/f_raster_format : 0 - plain text,  1 - asc, 2 - csv
0
/f_variable_determined  - choice:  u,v,w, p,k
<YOUR CHOICE>
/superposition  0 - overwrite, 1 - add, 2 - multiply
<YOUR CHOICE>
/time bounds [a], if any -  write 0, 0 for eternity; e.g. 0, 1.d6 makes condition only vali
<YOUR CHOICE>,<YOUR CHOICE>
/margin exceedance - use to set conditions where DAC is advected to. Left, right, front(bot
0, 0, 0, 0
//---------------- raster block
```

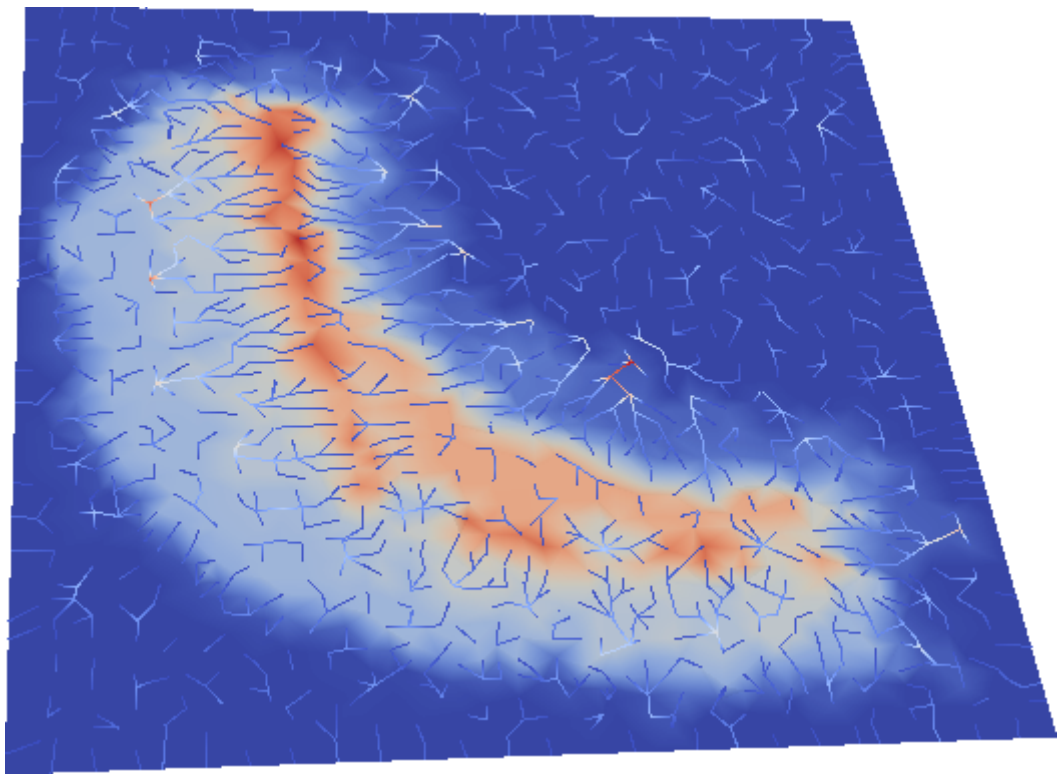
... and the output, as intended:

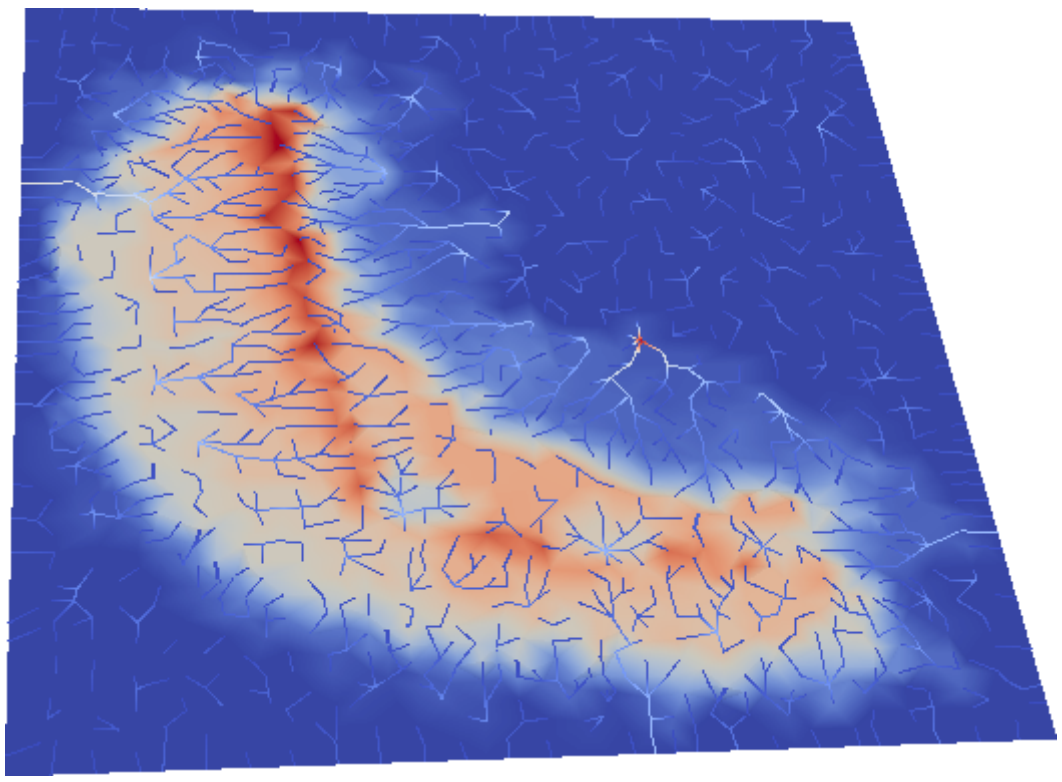
(OK, this is maybe not the best model, but it shows the workflow)

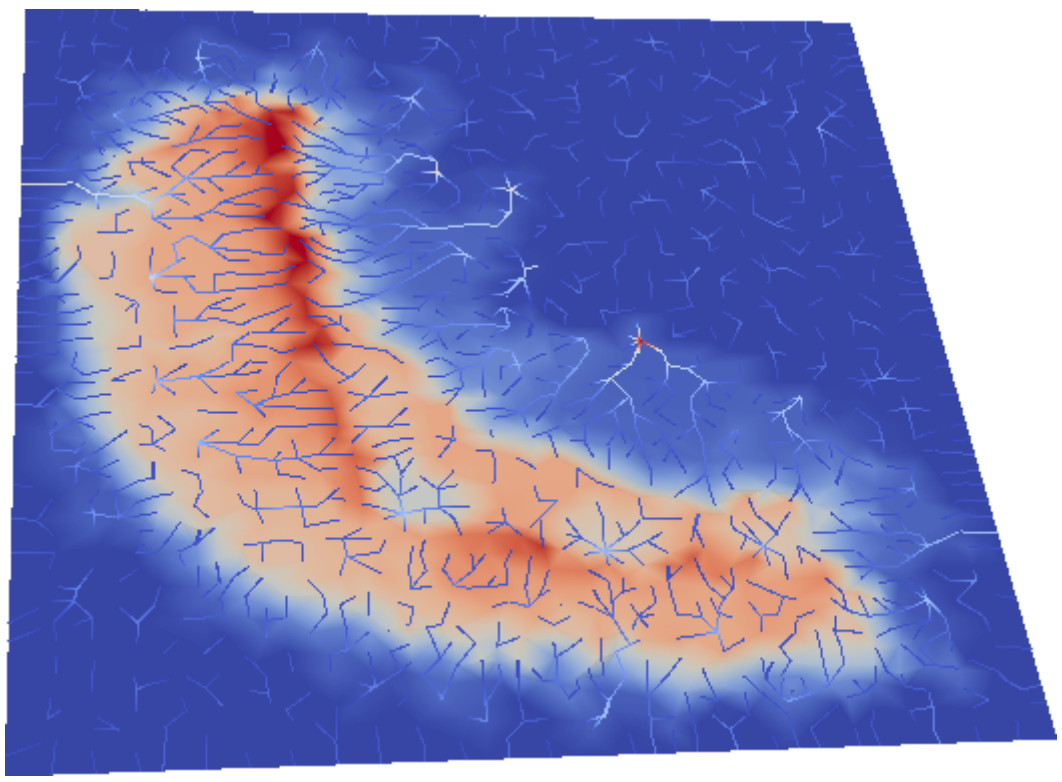


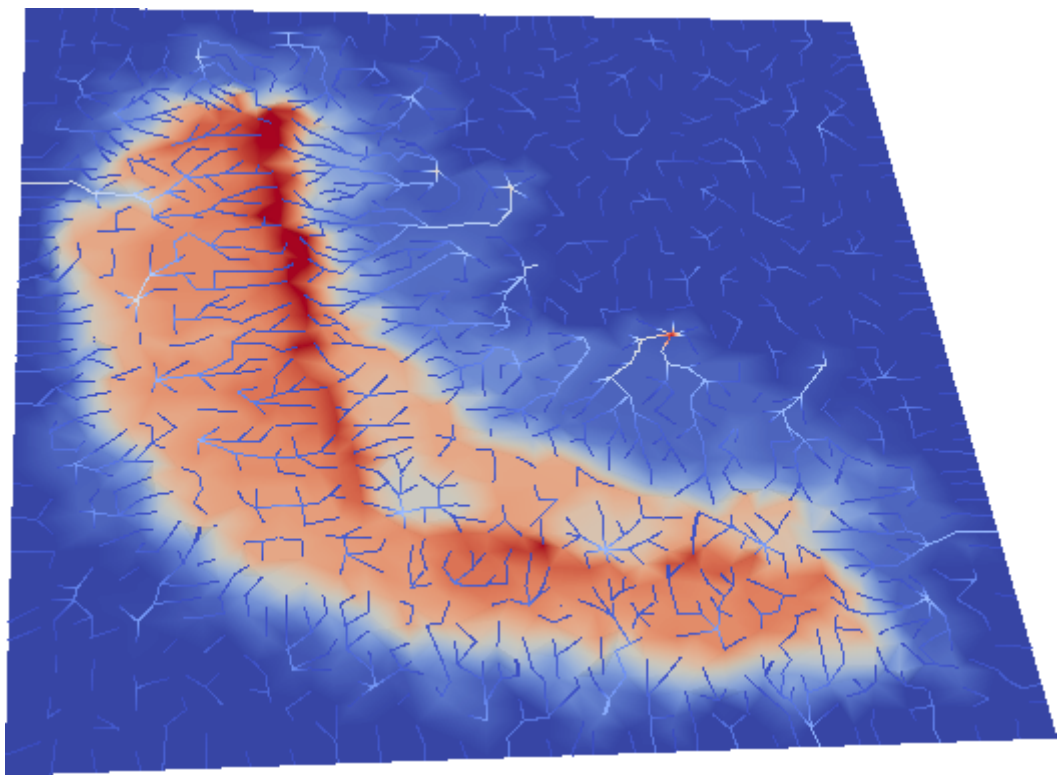


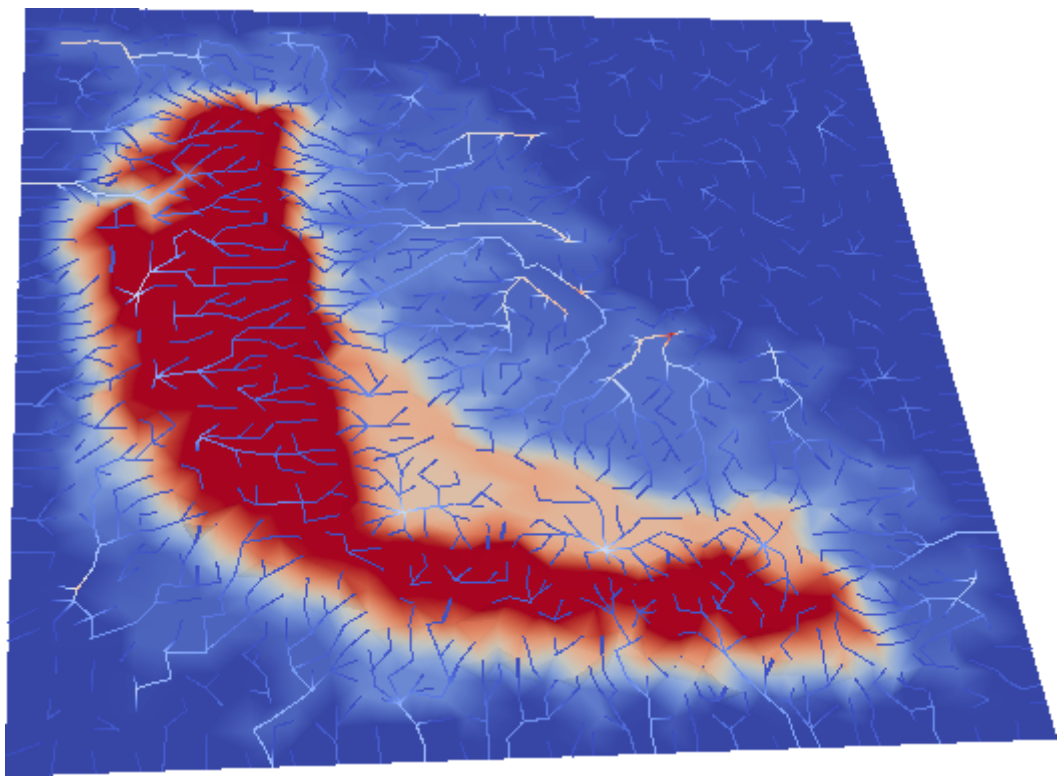












2. Generating and exporting a MATLAB matrix by hand

Arbitrary operations on matrices in MATLAB are possible in preparation for DAC import. It is important to note that DAC will interpret a raster as covering its whole model, and raster resolution is assumed accordingly. Co-ordinates or intrinsical resolution are neglected. Therefore, the matrix should have the approximate shape of the model domain - if you only describe the feature of interest, the matrix will be scaled and stretched to match the model.

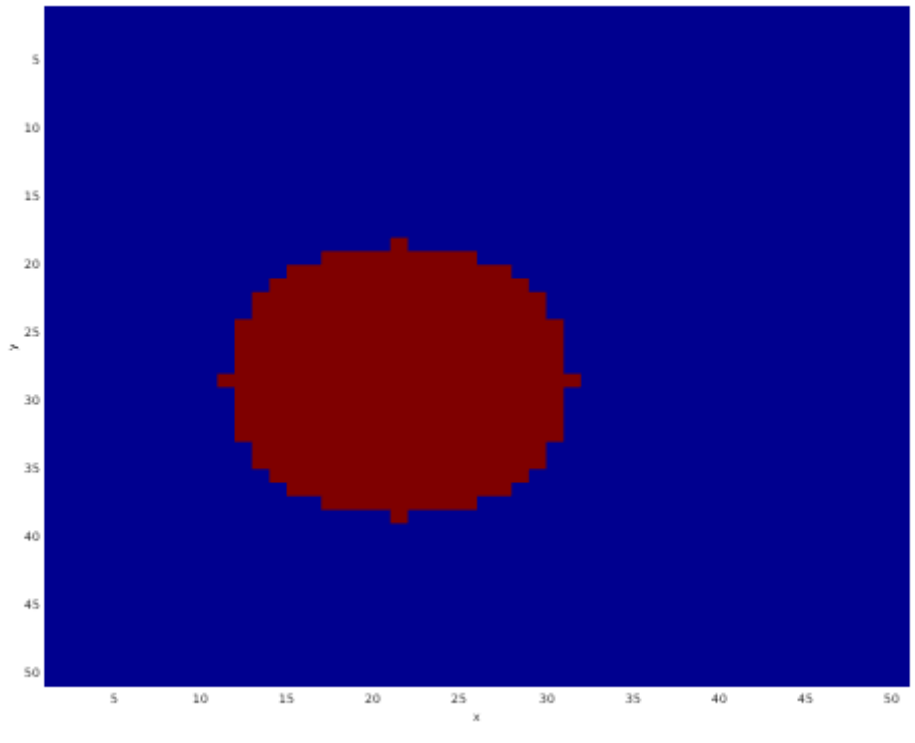
Example: uplift in a circle

```
% the values below integer/indices - DAC is coordinate agnostic on read-in
x = 0:50;             % vector x-raster
y = 0:50;             % vector y-raster
nx = numel(x);        % elements in x
ny = numel(y);        % elements in y
center = [20,27];     % circle center
radius = 10;          % circle radius
gr = zeros(nx,ny);    % grid

% loop raster, set values in circle
for j = 1:ny
  for i = 1:nx
    dist = sqrt(  ( x(i)-center(1) )^2   +   ( y(j)-center(2) )^2 );
    if(dist<=radius)
      gr(j,i) = 1;
    end
  end
end

%save
output_file = 'dac_circle_raster.txt';
save(output_file,'gr','-ascii');
```

Result:



3. Generating and exporting a matrix from a GIS

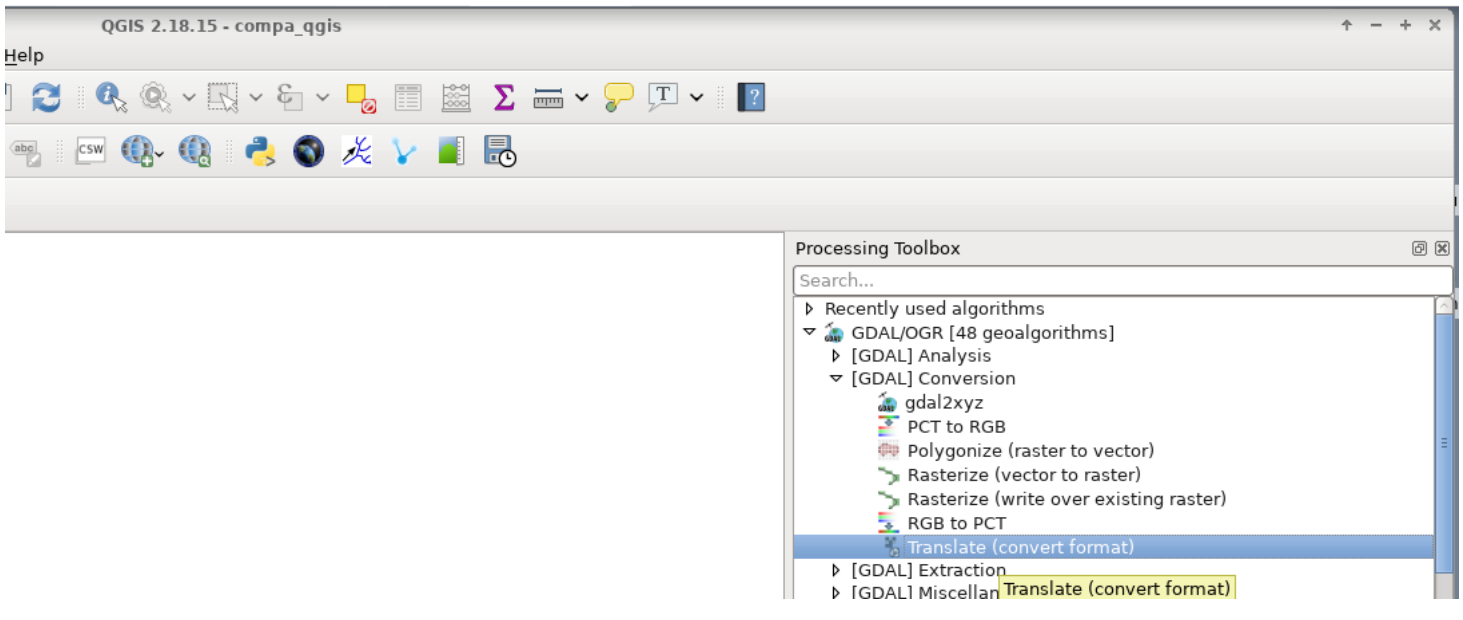
Matrices can be generated and converted internally from raster and vector data in most GIS software.

In addition to flat value matrices, the suggested GIS export formats are *ASC(**.asc**)*, dimensions *nrow,ncol*, and *XYZ(**.xyz**)/CSV(.csv)*, dimensions *npoints,1* files. File endings do not matter as long as they are passed to the input file.

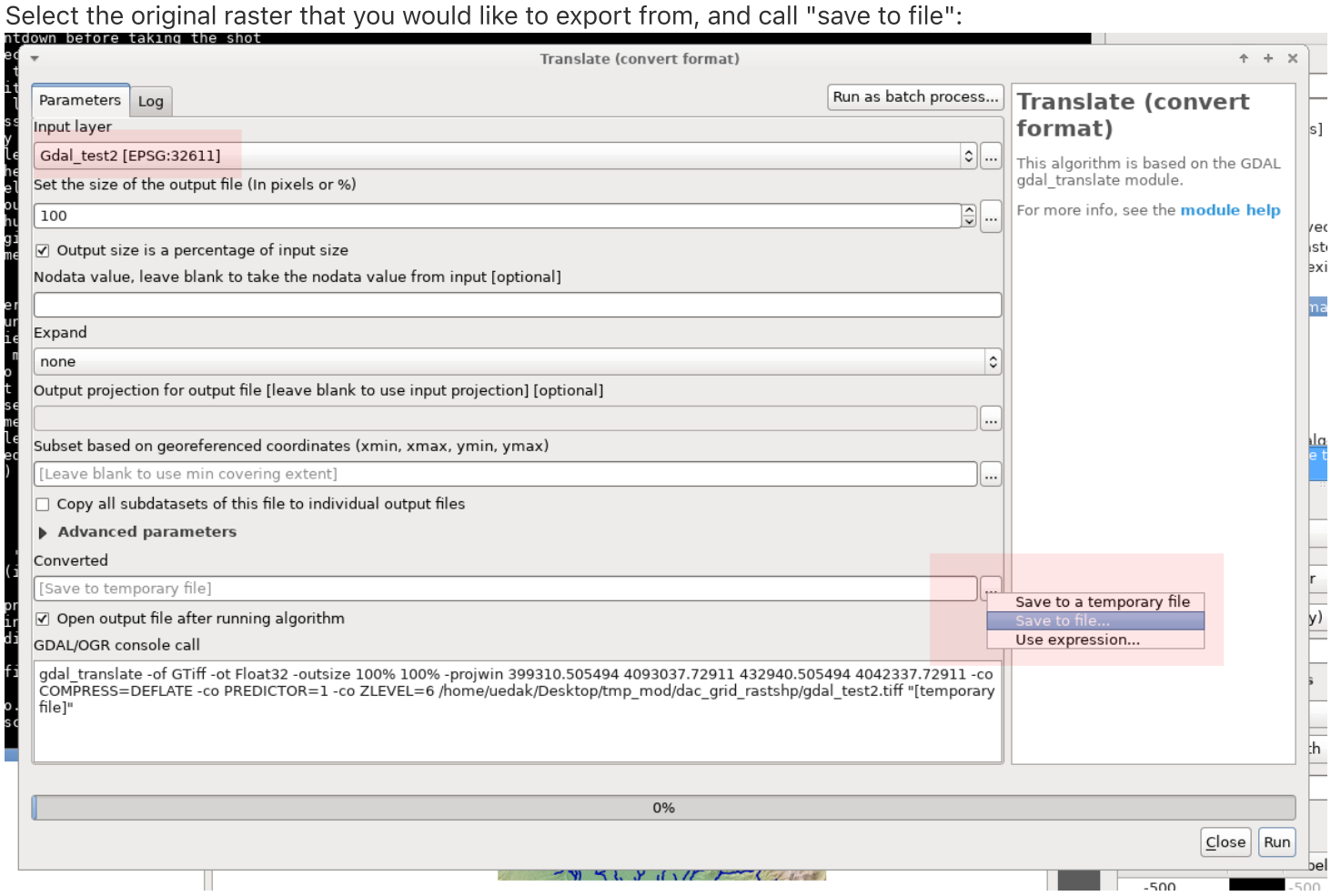
Below are examples for QGIS and `ArcGIS` .

3.1 QGIS

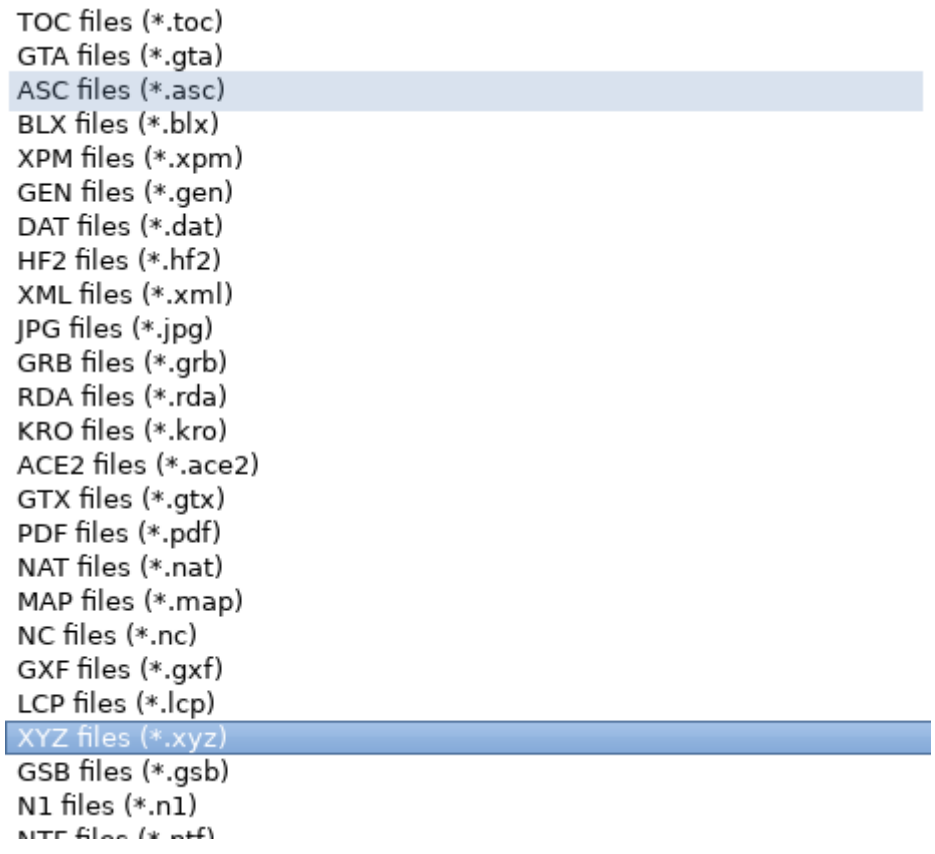
Use the GDAL conversion tool in the toolbox:



Select the original raster that you would like to export from, and call "save to file":



From the available file formats, pick:



and follow the rest of the dialog.

3.2 ArcGIS

NOTE: Regardless of coordinates, projection, and resolution, the raster is on runtime fitted over DAC to cover it exactly or with the specified margins.