

PROGRAM DEM2GRD

User's Manual, Version 3.0

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Utility to interpolate digital elevation model to ADCIRC mesh nodes

Introduction

This FORTRAN90 program assigns ADCIRC mesh nodes an elevation based on a digital elevation model (DEM).

Algorithm

The algorithm employed is the Cell Area Averaging (CAA) window for each node, and is based on the DEM raster cell size and local node density:

$$N = \frac{0.25\Delta_M}{\Delta_{DEM}} \quad (1)$$

$$CA = \begin{cases} 1 & \text{for } N < 1 \\ [2(N) + 1]^2 & \text{for } N \geq 1 \end{cases} \quad (1)$$

where N is the number of DEM grid cells radiating omnidirectionally from the DEM cell containing the node in question. Details can be found in Bilskie & Hagen (2013):

M.V. Bilskie, S.C. Hagen (2013). "Topographic Accuracy Assessment of Bare Earth lidar-derived Unstructured Meshes." *Advances in Water Resources*, 52, 165-177, <http://dx.doi.org/10.1016/j.advwatres.2012.09.003>

Note: Only nodes that contain an elevation = 0 will get interpolate (i.e. nodes that already have an elevation value will not get a new one).

Inputs

This program requires three inputs. The first is a general control input file that contains the necessary information to run the program. The other two inputs are an ADCIRC mesh and raster DEM (in *.flt format).

Control input file (*.inp)

The contents are as follows:

- Line 1 and 2: header lines
- Line 3: Name of ADCIRC mesh that need elevations assigned
- Line 4: Coordinate System type (0 for Cartesian or 1 for a mesh that is in lat/long).
- Line 5: Raster DEM file name (no extension). The file format must be in the *.flt format and should also include a header file (*.hdr). Any raster can be converted to this format using ESRI ArcGIS [ArcToolbox > Conversion Tools > From Raster > Raster to Float]
- Line 6: Multiplication factor. This can be used to convert between units or convert DEM elevations to the ADCIRC standard (-1).
- Line 7: Averaging scheme. Use 0 for the automated CAA method. For smoothing, use any integer greater than 1 and CAA will be multiplied by this integer to increase the averaging window. This may be useful in marsh systems.
- Line 8: Output ADCIRC mesh file containing elevations.

The following is an example of a typical control input file (input.inp):

```
Headerline1 - Keep comments out of first 60 columns
Headerline2
fort.14
0
irl_bathy_utm17
-1.0
0
fort_z.grd
```

Compiling and running the program

Under Intel FORTRAN compiler:

```
ifort DEM2GRD.F90 -o DEM2GRD.exe
```

Under gfortra compiler:

```
gfortran DEM2GRD.F90 -o DEM2GRD.exe
```

To run the program:

```
./DEM2GRD.exe -i input.inp
```

Disclaimer

This program is to be used as-is, and the developers do not provide warranty of any kind. The software may not be error free and may not be appropriate for all projects or decisions. The developers have undergone basic checks, but has not undergone a formal Quality Assurance of any kind. Please report any bugs to matt.bilskie@gmail.com