PROCESSING OF BAD TRACKS FOR THE CREATION OF BATHYMETRIC GRIDS

Federico D. Esteban[1,2], Juan P. Ormazabal[1,2], Sebastián Principi[1,2], Fermín Palma[1,2], Donaldo Bran[1,2] and Alejandro Tassone[1,2]

[1] Departamento de Ciencias Geológicas, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Buenos Aires, Argentina.
[2] CONICET-Universidad de Buenos Aires, Instituto de Geociencias Básicas, Aplicadas y Ambientales de Buenos Aires (IGeBA), Buenos Aires, Argentina.
E-mail: esteban@gl.fcen.uba.ar

For the creation of global or regional-scale bathymetric grids (e.g., SRTM15_plus, GEBCO), different sources of direct data are used, including single-beam bathymetric profiles. Gridding methods use the position and depth values (XYZ) from the direct data and produce a grid through a gridding algorithm (e.g. Becker et al. 2009; IHO-IOC 2018). If the input data contains errors, these may be visible in the resulting grid. In the case of single-beam profiles, such errors are identified as linear artifacts that match the ship's track during data acquisition. The standard procedure includes reviewing and editing the profiles in order to try to use all the data. But if linear artifacts persist, then the tracks are labeled as "bad tracks" and exclude them from the gridding algorithm.

Survey bathymetric data is expensive and time-consuming, so it is important to be able to use all the data acquired. In this work, preliminary results are presented on a methodology for reusing these bad tracks which involves the use of a custom C code and a bash script. Instead of removing the data, we calculate the gradient and azimuth along the bad track (white dots in figure 1A). We grid the gradient data along with the rest of the XYZ values (black dots in figure 1A) with the greenspline module available in The Generic Mapping Tools, which employs Green's functions (Wessel et al. 2009).

The verification consisted of creating a theoretical surface, extracting an E-W profile and adding a constant error to the profile to create a “bad track”. Then, the data was re-gridded using both the standard method (i.e. gridding the XYZ data), and the new method applied here. Profiles were taken along the bad track to compare the three grids (the original and the two generated grids). The method was applied to two theoretical surfaces: first, an inclined plane, and then to a more complex surface (“hat”, shown in figure 1). For the inclined plane surface, the new method was able to accurately regenerate the original grid. Instead, for the "hat" surface, the grid generated by this new method has some errors although these are less significant than those obtained by the standard method (see figure 1D). The errors are about 10% and are located only along the bad track. The errors decreased when the sampling of the bad track was doubled. The results are promising. Further research is needed to apply this method to real-world examples. Given the excellent results achieved in regions with inclined planes, it is anticipated that this methodology will be highly effective in shelf areas such as the Argentine margin. However, its application in areas with more complex topography, such as seamounts with surfaces resembling "hats," is expected to be more challenging.

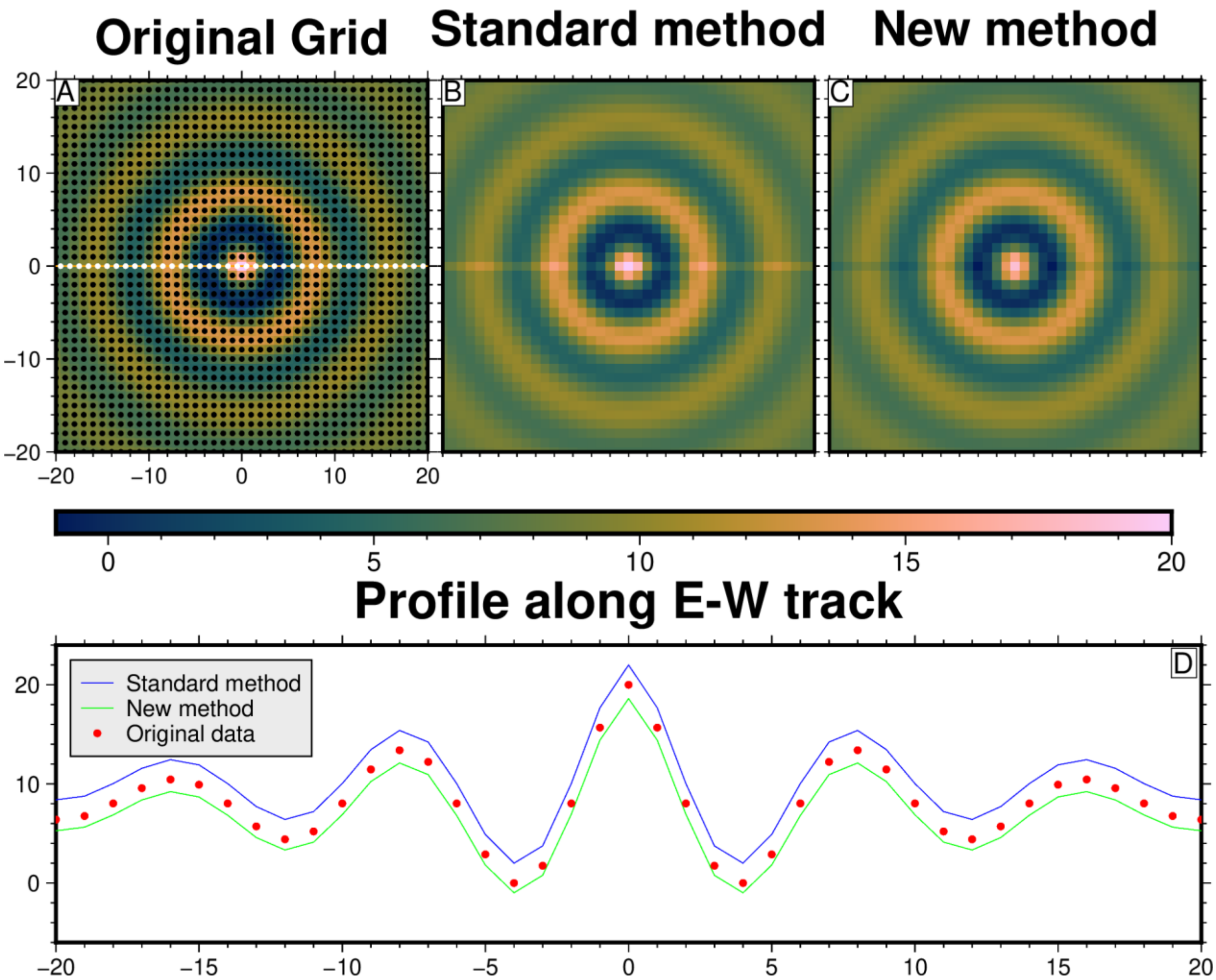

Figure 1. A) Theoretical surface with the XYZ data (black dots) and the E-W profile (white dots) B) Created grid with the standard method. C) Grid generated with this new method. D) Profile along E-W track along the center of the grid (white points in A).

Becker, J.J., Sandwell, D.T., Smith, W.H.F., Braud, J., Binder, B., Depner, J., Fabre, D., Factor, J., Ingalls, S., Kim, S-H., Ladner, R., Marks, K., Nelson, S., Pharaoh, A., Trimmer, R., Von Rosenberg, J., Wallace, G. y Weatherall, P. 2009. Global Bathymetry and Elevation Data at 30 Arc Seconds Resolution: SRTM30_PLUS. Marine Geodesy 32(4): 355 -371.

International Hydrographic Organization, Intergovernmental Oceanographic Commission, The IHO-IOC GEBCO Cook Book, IHO Publication B-11, Monaco, Sep. 2018, 416 pp - IOC Manuals and Guides 63, France, Sep. 2018, 429 p.

Wessel, P. 2009. A general-purpose Green's function interpolator. Computers & Geosciences 35: 1247-1254.