CO-322

OPTIMISING THE DISTORTIONS OF SINUSOIDAL-ELLIPTICAL COMPOSITE PROJECTIONS

GEDE M.
Eötvös Loránd University, BUDAPEST, HUNGARY

The sinusoidal and the elliptical projections are two large groups of pseudocylindrical projections. A sinusoidal-elliptical composite projection combines the members of these groups by applying one projection for the polar regions and another for the equatorial area.

Although several attempts were made to create equal-area projections of this kind, none of these solutions were perfect. The main issues were the break of meridian lines at the connection latitude and the different scale of the two parts.

This paper's aim is to fill this gap by deducing two different, parametrisable sinusoidal-elliptical combined equal-area projections.

After a short historical overview, the first part of the paper describes the base projections – the sinusoidal (Sanson-Flamsteed or Mercator-Sanson) and the Mollweide – and the Wagner transformation. Then the Érdi-Krausz projection is introduced which is a composite projection widely used in Hungarian atlases for world maps. This projection however, has a few serious disadvantages: the meridians are breaking at the boundary latitude, and although the parts are separately equal-area, the whole projection loses this nature as the scales of the two parts are not the same.

To improve this projection, two solutions are described in the paper:

The first solution combines the elliptical Mollweide projection and a Wagner-transformed form of the sinusoidal projection. The two projections are connected at a specified φ_c connecting latitude without any break. A deduction is given in the paper which results in formulas expressing the m and n parameters of the Wagner transformation for any given φ_c. To make the projection more flexible, an affine transformation is applied on it.

The distortions of this projection are examined by calculating the average Airy and Kavrayskiy angular distortion criteria on a half hemisphere up to the 85° latitude. The dependence of these distortions on the projection parameters is also discussed. Only the angular distortions are examined as the projection is equal-area.

In the second solution the Mollweide part of the previous projection is substituted by an arbitrary equal-area elliptical projection, which gives even more degree of freedom – 3 independent parameters describe the projection.

The angular distortion dependence on the parameters is calculated and described for this latter projection also.