

## **RELATIONSHIP OF ETM AND UTM PROJECTION SCALE FACTORS IN EGYPT**

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### **ABSTRACT**

To convert the 3D coordinates' values ( $\phi, \lambda, h$ ) to 2D coordinates on plane (E, N) such as a map, one expect to have different types of distortions on the projected coordinates. One of these distortions is the Scale distortion. Scale factor has to be used to correct distances plotted or measured from maps. Many countries in the world have more than one coordinates system used for their maps such as in Egypt. In Egypt Universal Transverse Mercator (UTM) and Egyptian Transverse Mercator (ETM) are used for production of maps. To transfer data from one to the other system, the projection scale factors are different for the two systems and ignoring it in these transformations can led to large errors. In this paper we will study the effect of distortion caused by Scale Factor and trying to get the Scale Factor relationship between ETM and UTM systems in Egypt.

**KEYWORDS:** Projection Scale Factor, Map Distortion, ETM system, UTM system, Geodetic Datum, Geodetic Coordinates (Geographic Coordinates), Map Projection, Projected Coordinates, UTM and ETM Zones