

How does SKI-Pro and System 500 apply the geoid separations in a coordinate system containing a WGS84 geoid model?

Answer:

SKI-Pro and System 500 apply geoid separations **directly** between WGS84 ellipsoid heights and orthometric heights regardless of (or bypassing) the local ellipsoid (and transformation in a SR530) specified in the coordinate system. Therefore, WGS84 ellipsoid heights must be correctly set in the absolute sense to obtain correct orthometric heights from WGS84 geoid models.

If there are no transformations between the local coordinate system such as NAD83 and the WGS84 system, then WGS84 geoid models or GRS80 geoid models will correctly convert between local or WGS84 ellipsoid heights and orthometric heights (elevations).

If there are transformations between the local and WGS84 coordinate systems, then local geoid models should be used to compute the correct conversion between orthometric and local ellipsoid heights first before applying the transformation to obtain the correct WGS84 ellipsoid heights.

Using a WGS84 geoid model (from a geoid model field file) in a SR530 having a coordinate system containing a transformation will only convert between RTK WGS84 ellipsoid heights and local orthometric heights. No transformation (even if it exists) will be applied to the height values. Transformations will only be applied to the horizontal coordinates.

So, why there is a different behavior when a WGS84 geoid model is used rather than a local geoid model?

The main reason for this special behavior is to accommodate the handling of (GPS) WGS84 heights and local orthometric heights separate from the handling of horizontal coordinates via local transformations such as 1-Step, 2-Step or CSCS Model.

We can now understand the practical application of this special behavior by examining the answer to the following question:

Which type of geoid models can be used with a NAD27 (NADCON) CSCS model?

1.0 Background Information on NAD27 CSCS Models:

The NADCON and NTV2 CSCS models consist of *.CSC coefficient files converting geodetic latitudes & longitudes between NAD27 (Local) and WGS84 (Global) coordinate systems. There are no transformations in heights performed by these CSCS models.

2.0 Minimum Requirements to use NAD27 CSCS Models in a Coordinate System:

The NAD27 CSCS models or its equivalent CSCS model field files must be specified in a (Local) coordinate system having at least the following elements:

- Ellipsoid: Clarke 1866
- Transformations: None

3.0 Geoid Models with NAD27 CSCS Models:

Geoid models or its equivalent geoid model field files can be specified in a coordinate system containing a NAD27 CSCS model as long as the reference ellipsoid of the geoid model is either WGS84 or Clarke 1866 ellipsoid.

It is highly recommended to use a WGS84 Geoid Model such as Geoid99 or HT1_01 with a NAD27 CSCS model for the correct conversion between WGS84 ellipsoidal and orthometric heights. WGS84 geoid models will correctly address most (if not all) GPS real-time and post-processed positioning applications whereas NAD27 geoid models, based on Clarke 1866 ellipsoid, will correctly convert between NAD27 ellipsoidal and orthometric heights only and not correctly convert to WGS84 ellipsoid heights.

Please use NAD27 CSCS models in a coordinate system having:

- Clarke 1866 Ellipsoid
- No Transformations
- NAD27 State Plane Zone or Projection
- WGS84 Geoid Model.