

GEODETIC DATUMS

A *geodetic datum* is a mathematical model of the earth upon which geodetic computations are based and control information is published. In the past horizontal datums and vertical datums have been treated separately--and still are to some extent--but with the evolution of technology and practice a 3-D datum will integrate the two. As background, we need to discuss the difference between a *regional* geodetic datum and a *global* geodetic datum.

Regional: In a simplified way, a regional geodetic datum is one chosen for its "best fit" in a particular region. The North American Datum of 1927 (NAD27) is a regional geodetic datum based upon the Clarke Spheroid of 1866 and fits North America quite well. The origin of a regional datum is arbitrary with the origin of NAD27 being in Kansas, Station "Meades Ranch." The origin is not at earth's center of mass.

A regional geodetic can be defined with 7 parameters/conditions:

- Two elements to define the geometrical ellipsoid
- Latitude and longitude of the initial point.
- A reference azimuth for orientation.
- The geoid height at the initial point, usually assumed to be 0.0.
- The assumption that the ellipsoid minor axis is parallel to earth's spin axis.

Global: While a regional geodetic datum has an arbitrary origin, the origin of a global geodetic datum is taken to be earth's center of mass and a reference ellipsoid is chosen on the basis of a global "best fit." Thus, points on or near any part of the world can be accurately related to any other point tied to the same datum. According to Helmut Moritz (1980), a global geodetic datum is defined by:

- The datum origin is located at earth's center of mass.
- The Z axis points in the direction of the Conventional International Origin (CIO) defining a mean North Pole.
- The X axis is parallel to the Zero Meridian adopted by the Bureau International De L'Heure (BIH) and known as the Greenwich Mean Astronomical Meridian.
- A reference ellipsoid defined by 4 physical geodesy parameters: