Given a source geometry defined in terms of a 3D pointcloud (lat,lon,depth), the following procedure implemented in SeismicHazard allows assigning the source events from an earthquake catalog



Figure 1 – 3D Surface representation of a seismic source

1. **Convert the source geometry from WGS84 coordinates to ECEF coordinates**: the transformation for every point is

where , a=6387.137 km is the semi-major axis, a=6356.752 km is the semi-minor axis, and is earth’s eccentricity.



1. **Translate the source coordinates to its centroid and rotate the coordinates to its ‘best fitting plane’, .** The transformation for every point is

where is the centroid of points , and is the ‘right singular vector’ form the singular value decomposition (SVD), such that:

The columns of matrix form a base of orthogonal vectors Vectors and are tangent to and vector is normal to .



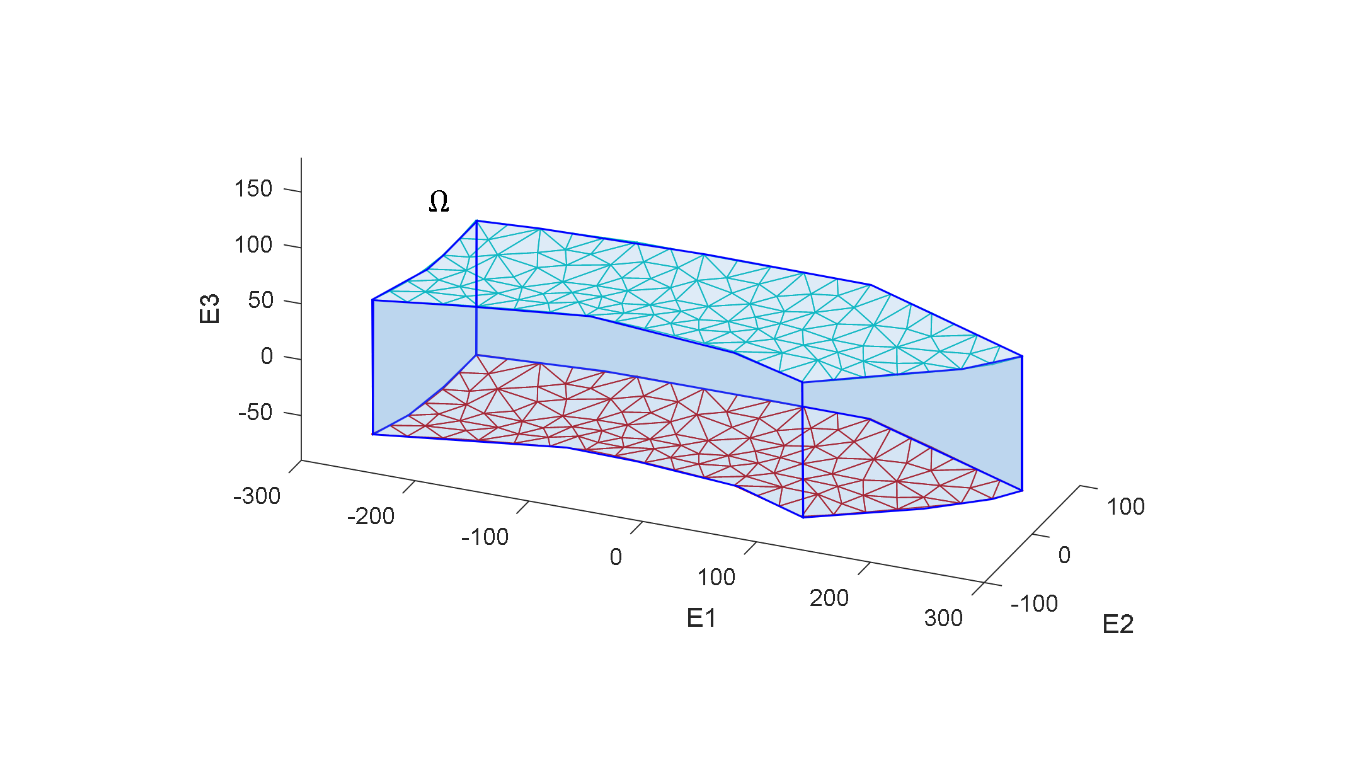
The figure below shows the seismic source in the **E** coordinate system



1. **Translate the events location from WGS84 to the E coordinate system.** For an event with coordinates (,), the transformation takes the form is
2. **Define two additional planes,** and **, by shifting the seismic source a distance along the normal .**



The planes and define a volume . If the event coordinates are inside the event is associate to the source, if not, the event is an outlier to the source.



1. **An additional criterion is applied to dipping sources, in which the event is excluded if the event’s depth is not contained with the maximum and minimum source depths.**