

Structural data measured in orientated drillcores

Structural data are regularly measured in **orientated drillcores**. These data can be priceless for understanding the subsurface architecture of a target but require they require a special measurement technique and a correspondingly unique nomenclature.

Important Note:

Structural data from **partially orientated** and **non-orientated** core cannot be used in Leapfrog.

Leapfrog accepts downhole structural data in the following ways:

- planar data:
 - dip and dip direction
 - alpha-beta
- linear data:
 - trend and plunge
 - alpha-beta-gamma

Leapfrog can convert between both systems on-the-fly. However, in the scene and in graphical and statistical representations of the data, dip and dip direction, and trend and plunge are used.

Alpha-beta-gamma measurements

The **alpha-beta-gamma** system is typically used to record structural measurements from orientated drillcore.

The accompanying diagram shows a piece of core drilled through a layered (foliated) rock. There is a **lineation** developed upon the **foliation**.

The **core axis** is an imaginary line running through the center of the core.

The '**bottom of core**' line is identified during drilling and is the principal reference for correct rotation of the core. Alternatively, the 'top-of-core' line can be used instead: both options are available in Leapfrog.

Angle **alpha** (α) is the minimum acute angle measured between the **core axis** and the geological plane, in this case a foliation. When $\alpha < 90$ the foliation plane presents as an ellipse with a long axis **E-E'** (sometimes called the 'apical trace').

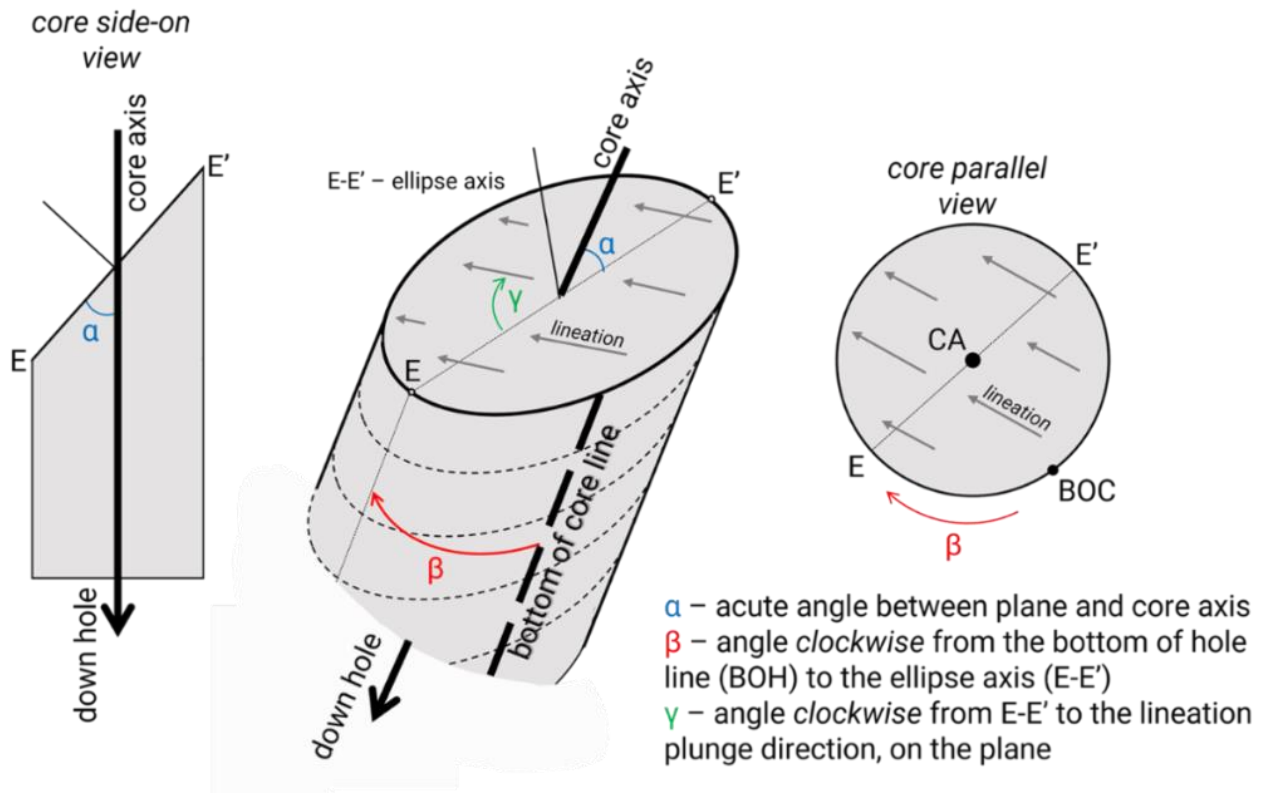
Alpha is measured for both planar and linear structural data.

Angle **beta** (β) is the angle of rotation clockwise from the **bottom of core line**.

Beta is measured for both planar and linear structural data.

Angle **gamma** (γ) is the angle of clockwise rotation between E and the **lineation plunge direction**, when measured on the defined by α and E-E' plane.

Gamma is only measured for linear structural data on the plane.



Important Note:

Although the alpha-beta-gamma system is commonly used, there are no established 'rules' regarding the specific definitions and conventions of gamma. This can lead to great confusion as different drilling, mining, and software companies may or may not use the alpha-beta-gamma system differently. Leapfrog follows the same convention as the following publications:

- **Blenkinsop et al. (2015)** A unified approach to measuring structures in orientated drill core. In: Richards, Richardson, Rippington, Wilson, Bond, (eds): *Industrial Structural Geology: Principles, Techniques and Integration*. Geological Society, London, Special Publications, v. 421, p. 99–108. [Peer-reviewed].
- **Holcombe (2016)** Mapping and structural geology in mineral exploration. HCOV Global, 233 p.
- **Bernhard et al. (2020)** Structural analysis of drillcore for mineral exploration and mining: Review and workflow toward domain-based 3-D interpretation. In: Rowland, Rhys (eds): *Applied Structural Geology of Ore-Forming Hydrothermal Systems*. Reviews in Economic Geology, v. 21, p. 215-245. [Peer-reviewed].