|  |  |  |
| --- | --- | --- |
| Table S2. GLiMR attribute definitions. |  |  |
| Type | Dimension | Source | Attribute | Definition | Units |
| Angle | Angle | Blade\_Haft | Haft\_collar\_slope | Angle of haft collar from horizontal | degrees |
| Angle | Angle | Whole\_Point | Hull\_orientation | Bearing of axis connecting antipodal points on the convex hull | degrees |
| Angle | Angle | Reentrant\_means | Re\_divergence | Mean of Angle between orientation and edge bearing (orientation - edge bearing) | degrees |
| Angle | Angle | Reentrant\_means | Re\_edge\_bearing | Mean of Bearing of outward normal to the one long exterior reentrant edge | degrees |
| Angle | Angle | Reentrant\_means | Re\_orientation | Mean of Bearing of reentrant ellipse Reentrant ellipse major axis | degrees |
| Coordinate | Linear | Whole\_Point | Area\_xz\_y | Y coordinate at which maximum transverse cross-section occurs | mm |
| Coordinate | Linear | Blade\_Haft | Blade\_centroid\_x | X coordinate of blade centroid | mm |
| Coordinate | Linear | Blade\_Haft | Blade\_centroid\_y | Y coordinate of blade centroid | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_centroid\_x | X coordinate of haft centroid | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_centroid\_y | Y coordinate of haft centroid | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_collar\_mid\_x | X coordinate of haft collar mid-point | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_collar\_mid\_y | Y coordinate of haft collar right endpoint | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_collar\_xl | X coordinate of haft collar left endpoint | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_collar\_xr | X coordinate of haft collar right endpoint | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_collar\_yl | Y coordinate of haft collar left endpoint | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_collar\_yr | Y coordinate of haft collar right endpoint | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_max\_thick\_y | Y coordinate where haft maximum thickness occurs | mm |
| Coordinate | Linear | Blade\_Haft | Haft\_max\_width\_y | Y coordinate at which maximum haft width occurs | mm |
| Coordinate | Linear | Whole\_Point | Max\_width\_y | Y coordinate where maximum width occurs | mm |
| Coordinate | Linear | Whole\_Point | Max\_x\_pt\_x | X coordinate of point with maximum X value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_x\_pt\_y | Y coordinate of point with maximum X value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_x\_pt\_z | Z coordinate of point with maximum X value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_y\_pt\_x | X coordinate of point with maximum Y value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_y\_pt\_y | Y coordinate of point with maximum Y value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_y\_pt\_z | Z coordinate of point with maximum Y value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_z\_pt\_x | X coordinate of point with maximum Z value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_z\_pt\_y | Y coordinate of point with maximum Z value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Max\_z\_pt\_z | Z coordinate of point with maximum Z value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_x\_pt\_x | X coordinate of point with minimum X value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_x\_pt\_y | Y coordinate of point with minimum X value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_x\_pt\_z | Z coordinate of point with minimum X value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_y\_pt\_x | X coordinate of point with minimum Y value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_y\_pt\_y | Y coordinate of point with minimum Y value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_y\_pt\_z | Z coordinate of point with minimum Y value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_z\_pt\_x | X coordinate of point with minimum Z value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_z\_pt\_y | Y coordinate of point with minimum Z value for the ppt | mm |
| Coordinate | Linear | Whole\_Point | Min\_z\_pt\_z | Z coordinate of point with minimum Z value for the ppt | mm |
| Coordinate | Linear | Reentrant\_means | Re\_centroid\_y | Mean of centroid y coordinate of left and right reentrants | mm |
| Dimension | Area | Whole\_Point | Area\_xy | Area of outline in XY plane (plan view) | sq mm |
| Dimension | Area | Whole\_Point | Area\_xz | Maximum area of XZ (transverse) cross-section | sq mm |
| Dimension | Area | Blade\_Haft | Blade\_area | Blade area | sq mm |
| Dimension | Area | Blade\_Haft | Haft\_area | Haft area | sq mm |
| Dimension | Area | Whole\_Point | Hull\_area | Area of convex hull | sq mm |
| Dimension | Area | Reentrant\_means | Re\_area | Mean of area of left and right reentrants | sq mm |
| Dimension | Area | Whole\_Point | Total\_reentrant\_area | Sum of areas of all reentrants (Convex hull area - Outline\_area\_xy) | sq mm |
| Dimension | Density | Whole\_Point | Density | Computed total volume / Weight | gm/cc |
|   |   |   |   |   |   |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Dimension | Linear | Blade\_Haft | Blade\_length | Blade length (from haft collar mid-point to tip) | mm |
| Dimension | Linear | Blade\_Haft | Blade\_max\_thick | Blade maximum thickness | mm |
| Dimension | Linear | Blade\_Haft | Blade\_max\_thick\_y | Y coordinate where blade maximum thickness occurs | mm |
| Dimension | Linear | Blade\_Haft | Blade\_max\_width | Blade maximum width | mm |
| Dimension | Linear | Blade\_Haft | Blade\_width\_avg | Blade\_area / Blade\_length | mm |
| Dimension | Linear | Blade\_Haft | Haft\_length | Haft length (haft min y to haft collar mid-point y) | mm |
| Dimension | Linear | Blade\_Haft | Haft\_max\_thick | Haft maximum thickness | mm |
| Dimension | Linear | Blade\_Haft | Haft\_max\_width | Blade maximum width | mm |
| Dimension | Linear | Blade\_Haft | Haft\_width\_avg | Haft\_area / Haft\_length | mm |
| Dimension | Linear | Whole\_Point | Hull\_perimeter | Perimeter length of convex hull | mm |
| Dimension | Linear | Whole\_Point | Length | Length of ppt. (bounding box from min y (haft base) to max y (tip)) | mm |
| Dimension | Linear | Whole\_Point | Max\_width | Maximum edge to edge width | mm |
| Dimension | Linear | Whole\_Point | Outline\_perimeter | Length of bifacial outline perimeter | mm |
| Dimension | Linear | Reentrant\_means | Re\_diameter | Mean of Diameter of largest circle the fits within reentrant | mm |
| Dimension | Linear | Reentrant\_means | Re\_edge\_length | Mean of Length of the one long exterior reentrant edge | mm |
| Dimension | Linear | Reentrant\_means | Re\_major\_axis | Mean of Reentrant ellipse major axis length | mm |
| Dimension | Linear | Reentrant\_means | Re\_minor\_axis | Mean of Reentrant ellipse minor axis length | mm |
| Dimension | Linear | Reentrant\_means | Re\_perimeter | Mean of perimeter length of left and right reentrants | mm |
| Dimension | Linear | Whole\_Point | Thickness | Thickness of ppt (bounding box from min z to max z) | mm |
| Dimension | Linear | Whole\_Point | Width | Bounding box width (minimum x to maximum x) | mm |
| Dimension | Volume | Blade\_Haft | Blade\_lower\_volume | Volume of blade below bifacial midline surface | cc |
| Dimension | Volume | Blade\_Haft | Blade\_upper\_volume | Volume of blade above bifacial midline surface | cc |
| Dimension | Volume | Blade\_Haft | Blade\_volume | Blade total volume | cc |
| Dimension | Volume | Blade\_Haft | Haft\_lower\_volume | Volume of haft below bifacial midline surface | cc |
|   |   |   |   |   |   |
| Dimension | Volume | Blade\_Haft | Haft\_upper\_volume | Volume of haft above bifacial midline surface | cc |
| Dimension | Volume | Blade\_Haft | Haft\_volume | Haft total volume | cc |
| Dimension | Volume | Whole\_Point | Volume | Volume of entire ppt | cc |
| Dimension | Volume | Whole\_Point | Volume\_lower | Volume of entire point below bifacial midline surface | cc |
| Dimension | Volume | Whole\_Point | Volume\_upper | Volume of entire point above bifacial midline surface | cc |
| Dimension | Weight | Whole\_Point | Weight | Measured weight of ppt | gm |
| Math | Math | Curves | A\_diff | Polyfit: Difference between L and R blade edge segments. 'a' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | A\_left | Polyfit: Left blade edge segment. 'a' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | A\_mean | Polyfit: Mean of both blade edge segments. 'a' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | A\_right | Polyfit: Right blade edge segment. 'a' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | B\_diff | Polyfit: Difference between L and R blade edge segments. 'b' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | B\_left | Polyfit: Left blade edge segment. 'b' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | B\_mean | Polyfit: Mean of both blade edge segments. 'b' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | B\_right | Polyfit: Right blade edge segment. 'b' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | BB\_diff | Linear: Difference between L and R blade edge segments. 'bb' in y = mX + bb | -- |
| Math | Math | Curves | BB\_left | Linear: Left blade edge segment. 'bb' in y = mX + bb | -- |
| Math | Math | Curves | BB\_mean | Linear: Mean of both blade edge segments. 'b' in y = mX + b | -- |
| Math | Math | Curves | BB\_right | Linear: Right blade edge segment. 'bb' in y = mX + bb | -- |
| Math | Math | Curves | C\_diff | Polyfit: Difference between blade edge segments coefficient 'c' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | C\_left | Polyfit: Left blade edge segment. 'c' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | C\_mean | Polyfit: Mean of both blade edge segments. 'c' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | C\_right | Polyfit: Right blade edge segment. 'c' in y = aX\*\*2 + bX +c | -- |
| Math | Math | Curves | M\_diff | Linear: Difference between L and R blade edge segments coefficient 'm' in y = mX + b | -- |
| Math | Math | Curves | M\_left | Linear: Left blade edge segment. 'm' in y = mX + b | -- |
| Math | Math | Curves | M\_mean | Linear: Mean of both blade edge segments. 'm' in y = mX + b | -- |
| Math | Math | Curves | M\_right | Linear: Right blade edge segment. 'm' in y = mX + b | -- |
| Ratio | Area | Blade\_Haft | Blade\_area\_pct | Blade area as % of Total area (Total area = PPT.area\_xy) | % |
| Ratio | Area | Blade\_Haft | Haft\_area\_pct | Haft area as % of Total area (Total area = PPT.area\_xy) | % |
| Ratio | Area | Reentrant\_means | Re\_hull\_area\_pct | Mean of Left and Right reentrant area as % of convex hull area | % |
| Ratio | Area | Reentrant\_means | Re\_re\_area\_pct | Mean of total reentrant area as % of convex hull area | % |
| Ratio | Area | Whole\_Point | Total\_reentrant\_area\_pct | Total\_reentrant\_area as % of Convex hull area | % |
| Ratio | Linear | Blade\_Haft | Blade\_centroid\_y\_pct | Blade centroid as % of ppt length | % |
| Ratio | Linear | Blade\_Haft | Blade\_length\_pct | Blade length as % of ppt length | % |
| Ratio | Linear | Blade\_Haft | Blade\_max\_width\_y\_pct | Percentage of blade length where max blade width occurs. (collar= 0; tip= 100) | % |
| Ratio | Linear | Blade\_Haft | Blade\_width\_avg\_pct | Blade\_width\_avg as % of Width (Width = PPT.Width) | % |
| Ratio | Linear | Blade\_Haft | Haft\_centroid\_y\_pct | Haft centroid as % of ppt length | % |
| Ratio | Linear | Blade\_Haft | Haft\_collar\_mid\_y\_pct | Haft collar mid-point as % of ppt length. (base= 0; tip= 100) | % |
| Ratio | Linear | Blade\_Haft | Haft\_length\_pct | Haft length as % of ppt length | % |
|   |   |   |   |   |   |
| Ratio | Linear | Blade\_Haft | Haft\_max\_width\_y\_pct | Percentage of haft length where max haft width occurs. (base= 0; collar= 100) | % |
| Ratio | Linear | Blade\_Haft | Haft\_width\_avg\_pct | Haft\_width\_avg as % of Width (Width = PPT.Width) | % |
| Ratio | Linear | Whole\_Point | LW\_ratio | Length / Width ratio | ratio |
| Ratio | Linear | Whole\_Point | Max\_width\_y\_pct | Percentage of ppt length where Max\_width occurs (0=base; 100=tip) | % |
| Ratio | Linear | Reentrant\_means | Re\_centroid\_x\_pct | Mean of X centroid from outside edge as % of width | % |
| Ratio | Linear | Reentrant\_means | Re\_centroid\_y\_pct | Mean of Y centroid as % of ppt length | % |
| Ratio | Linear | Reentrant\_means | Re\_edge\_LA\_ratio | Mean of Edge\_Length / Reentrant\_area ratio | ratio |
| Ratio | Linear | Reentrant\_means | Re\_edge\_length\_pct | Mean of Re\_edge\_length as % of hull\_perimeter | % |
| Ratio | Linear | Reentrant\_means | Re\_ellipse\_ratio | Mean of Reentrant ellipse: Major\_axis / (Major\_axis + Minor\_axis) (0.5=equant; 1.0=elongate) | ratio |
| Ratio | Linear | Whole\_Point | TL\_ratio | Thickness / Length ratio | ratio |
| Ratio | Linear | Whole\_Point | TW\_ratio | Thickness / Width ratio | ratio |
| Ratio | Volume | Blade\_Haft | Blade\_lower\_volume\_pct | Blade\_lower\_volume as % of total volume | % |
| Ratio | Volume | Blade\_Haft | Blade\_upper\_volume\_pct | Blade\_upper\_volume as % of total volume | % |
| Ratio | Volume | Blade\_Haft | Blade\_volume\_pct | Blade volume as % of total volume | % |
| Ratio | Volume | Blade\_Haft | Haft\_lower\_volume\_pct | Haft\_lower\_volume as % of total volume | % |
| Ratio | Volume | Blade\_Haft | Haft\_upper\_volume\_pct | Haft\_upper\_volume as % of total volume | % |
| Ratio | Volume | Blade\_Haft | Haft\_volume\_pct | Haft volume as % of total volume | % |
| Ratio | Volume | Whole\_Point | Volume\_upper\_pct | Volume\_upper as % of total Volume | % |