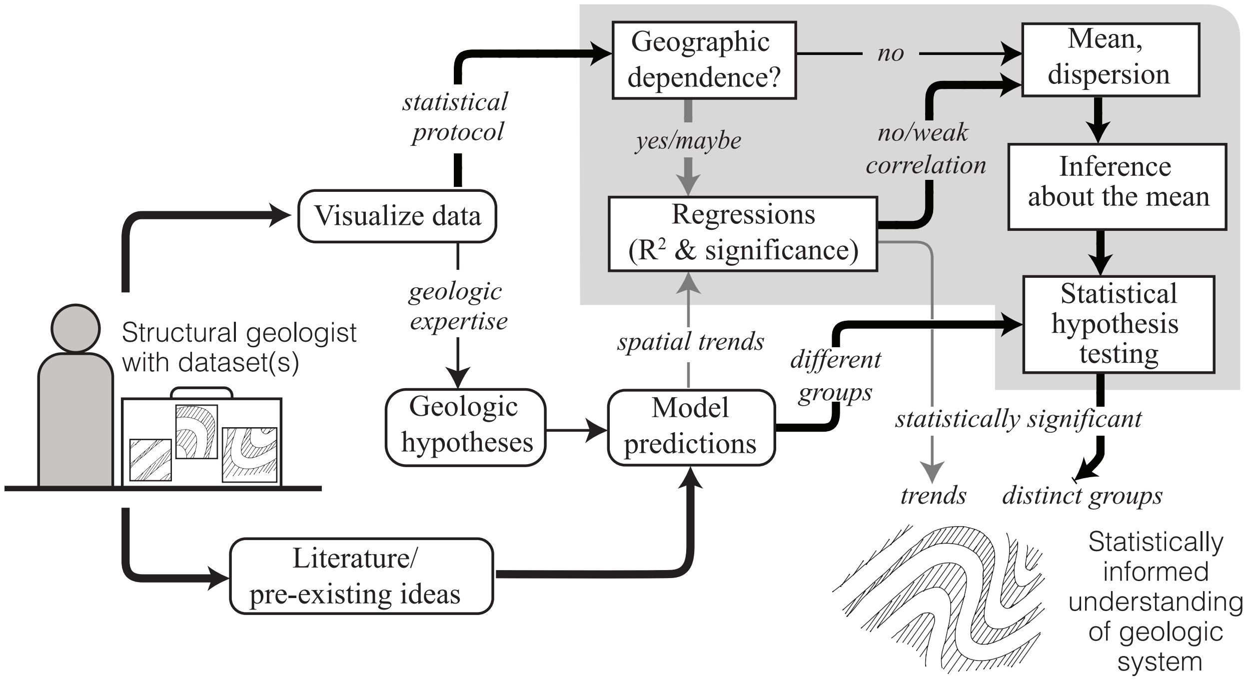

Figure 1. Schematic diagram of a structural geology workflow that takes advantage of statistical tools to aid interpretations of the geologic system. The grey box surrounds the statistical component of the workflow, and is a simplification of the statistical flowchart from Davis and Titus (2017). Grey arrows denote steps that involve regressions. Thicker arrows represent paths that are taken in the statistical analysis of the Orofino dataset in this paper. The structural geologist begins with an incomplete representation of the geologic system (the dataset). After visualizing the data, two simultaneous processes begin—the generation of geologic hypotheses and predictive models as well as a statistical protocol that should be done on any dataset. Importantly, all interpretations of the geologic system run through the grey statistical box.

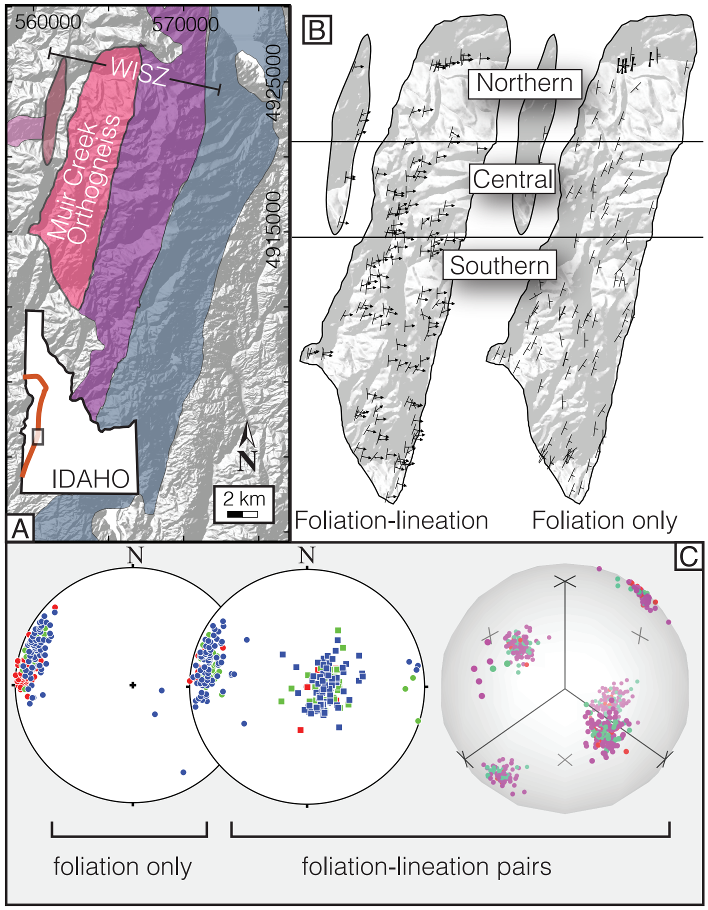

Figure 2. Simplified geologic map and overview of data from the West Mountain, ID area of the Late Cretaceous western Idaho shear zone published in Braudy et al. (2017). **A)** Geologic units of the western Idaho shear zone (Red—Muir Creek orthogneiss, Purple—Sage Hen orthogneiss, Magenta—Payette River Tonalite) superimposed on a hill shade model of topography. The Muir Creek orthogneiss was the focus of the structural study in Braudy et al. (2017). Inset map shows the location of the field area on the Western Idaho Shear Zone (WISZ), shown by the red line. **B)** A cutout of the Muir Creek orthogneiss with hill shade model of topography, showing the geographic locations and symbols of foliation-lineation data (left) and foliation-only data (right). There are 148 foliation-only measurements and 129 foliation-lineation pairs. **C)** Equal area nets with data for foliation-only (left) and foliation-lineation datasets (middle). Also shown is an equal volume plot (right) (Davis and Titus, 2017), in which each line-plane pair is represented by a single point, and which shows four symmetric copies of the data. All plots are color-coded by the geographic domains used by Braudy et al. (2017) (Red—northern, Green—central, Blue—southern). Map modified from Braudy et al. (2017).

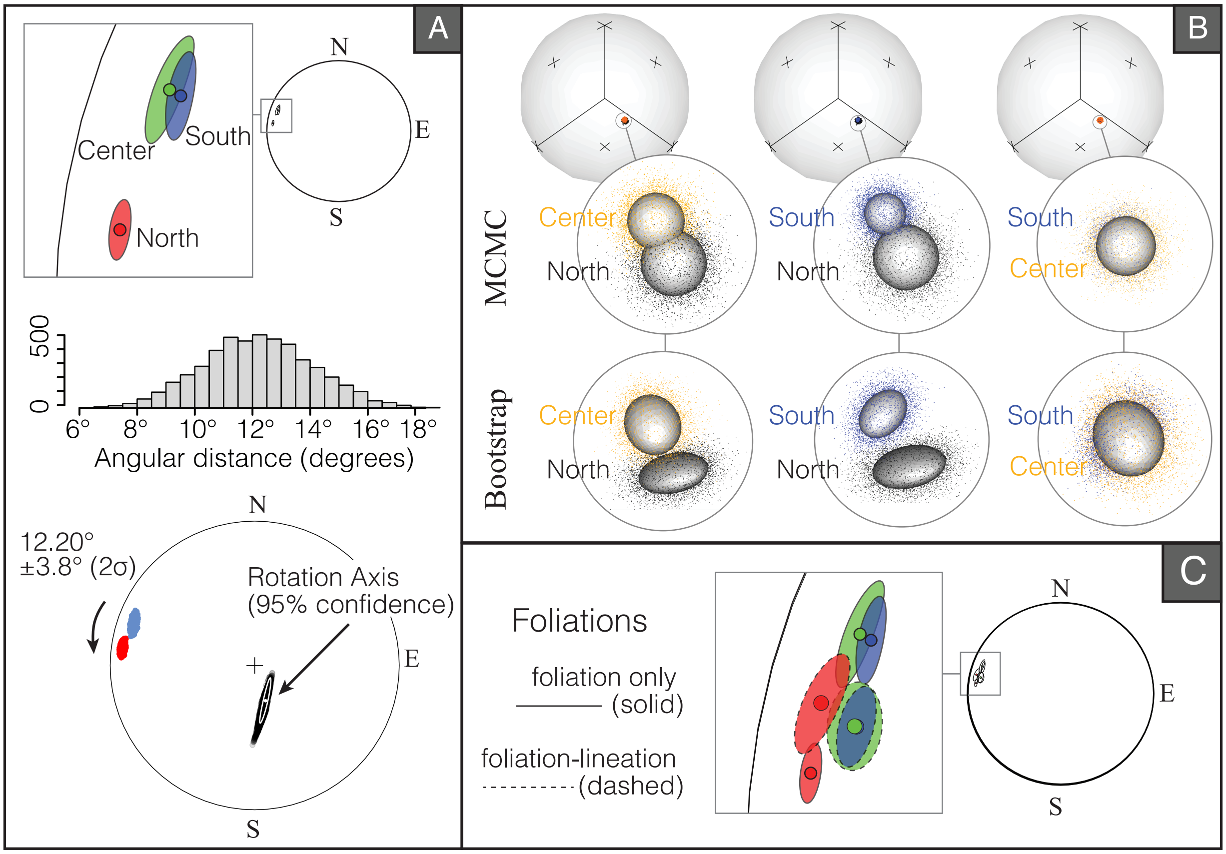

Figure 3. Summary of the statistical analyses for the West Mountain field fabrics dataset, the location for which is shown in Figure 2. **A)** An analysis of the claim from Braudy et al. (2017) that there is a 20° rotation between the northern and southern domains: Top, a lower hemisphere equal area projection (with zoomed-in cutout) with the 95% confidence regions for the mean of foliation-only data in each of the three domains (Red—northern, Green—central, Blue—southern) as determined from bootstrapping; Middle, a histogram of angular distances between bootstrap iterations of the northern and southern domains; Bottom, a lower hemisphere equal area net projection visualization of the rotation computed from the bootstrapped angular distance and corresponding rotation axes. **B)** A series of two-sample hypothesis tests plotted on equal volume plots (with zoomed-in cutouts). Both bootstrapping and 95% confidence ellipsoids as well as Markov chain Monte Carlo (MCMC) mean probability clouds and their 95% credible ellipsoids are used to compare each pair of domains (Black—northern, Orange—central, Blue—southern). **C)** A comparison of 95% confidence ellipses from bootstrapping foliations. Foliations from foliation-lineation data are compared with those from foliation-only data within each domain: Colors are the same as in (A).

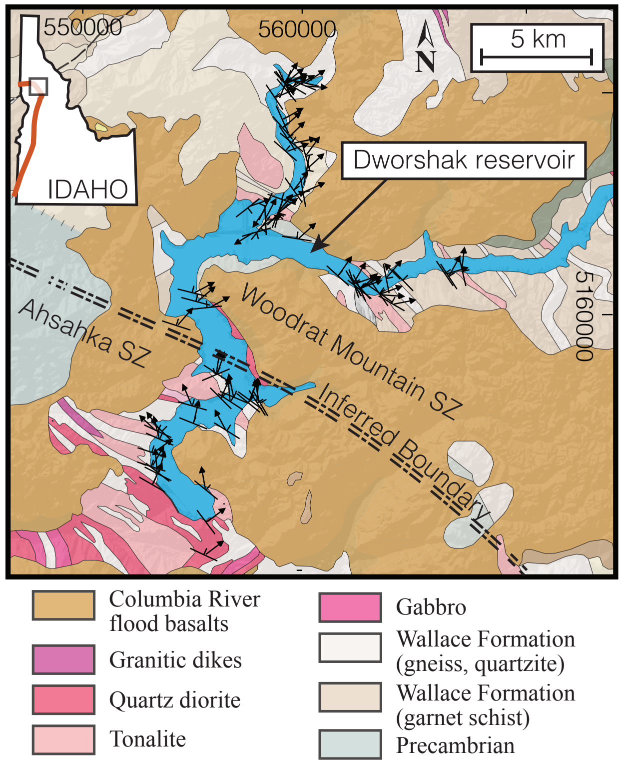

Figure 4. Simplified geologic map of the Orofino area, with the foliation-lineation dataset superimposed. A cutout map of Idaho shows the location of the Orofino field area. The red line shows the location of that Ahsahka shear zone, interpreted as part of the western Idaho shear zone. Exposure of sheared Late Cretaceous basement below the Miocene Columbia River basalts is limited to the shoreline of Dworshak reservoir, where all foliation-lineation pairs were measured. An interpretation of the boundary between the Woodrat Mountain and Ahsahka shear zones is shown. Modified from Lewis et al. (2005) and Lewis et al. (2012).

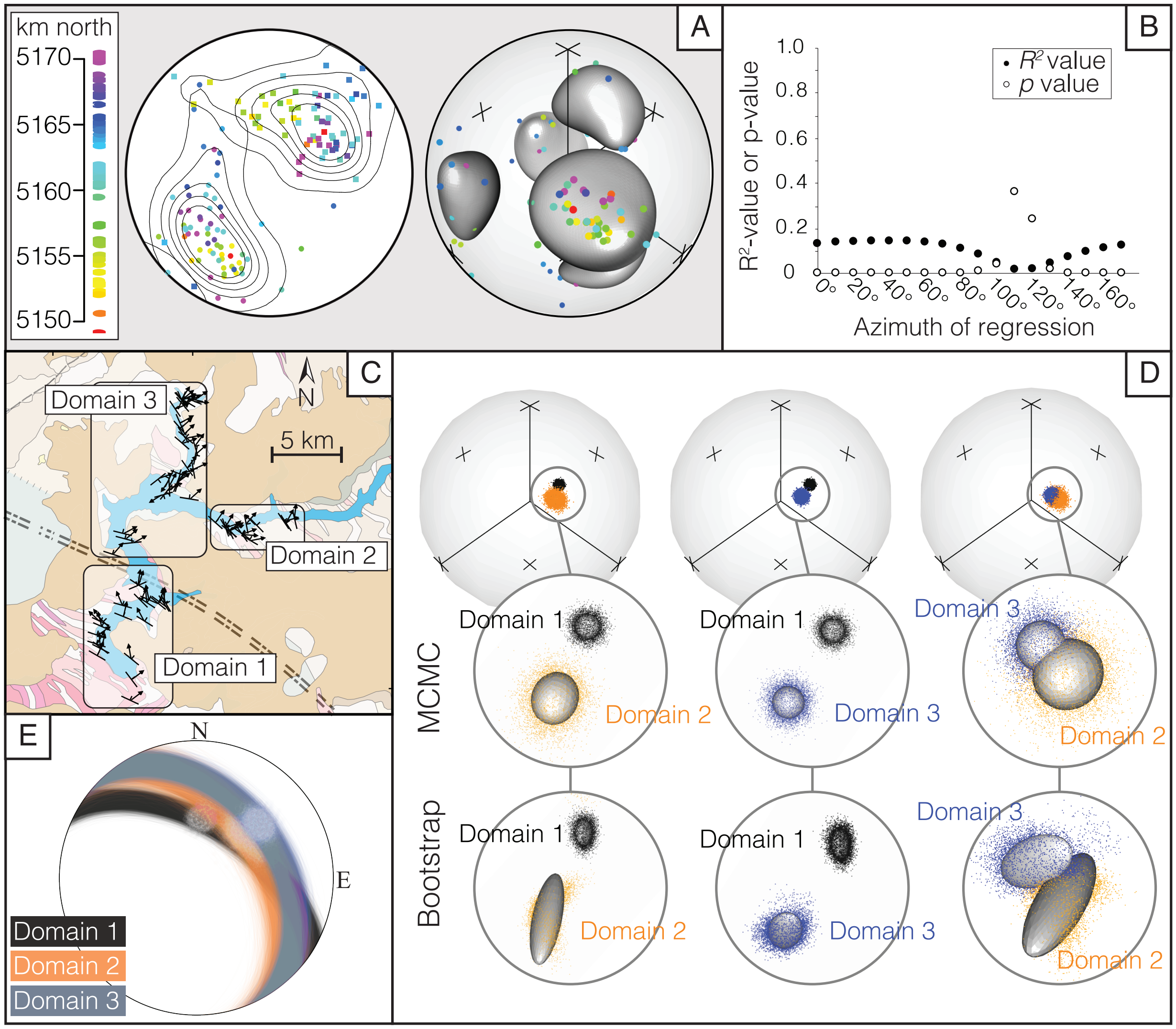

Figure 5. Summary of statistical analysis for the Orofino, ID area foliation-lineation dataset. **A)** Two different plots of the foliation-lineation data colored by kilometers north in UTM: Left, an equal-area plot with lineations (squares) and foliation poles (circles), each with 2σ, 6σ, 10σ, 14σ, and 18σ Kamb contours; Right, an equal volume plot after Davis and Titus (2017) with translucent 2σ Kamb contours. Each point in the equal volume plot is a foliation-lineation pair represented as a rotation from a reference plane-line pair. Note that there are four copies of the dataset due to four-fold symmetry of such data (See Davis and Titus (2017) for more information). **B)** A series of 18 geodesic regressions testing geographic variation along specific azimuths. Each solid dot is a regression with a corresponding *p*-value based on 100 permutations (open circle). **C)** The geologic map from Figure 4 superimposed with the domains used in this statistical analysis. **D)** A series of two-sample hypothesis tests plotted on equal volume plots (with zoomed-in cutouts). MCMC mean probability clouds and their 95% credible regions as well as bootstrapped mean clouds and their 95% confidence region are used to compare each pair of domains (Black—domain 1, Orange—domain 2, Blue—domain 3). **E)** A lower-hemisphere, equal-area projection showing the results of the MCMC analysis. It can be seen that both the foliation and lineation are different for Domain 1.

	Frechét Mean
Domain 1	302.00/57.81 74.14 NW
Domain 2	325.49/49.98 82.44 NW
Domain 3	323.13/39.18 87.16 NW

Table 1. Two conceptions of the mean strike, dip, and rake for the three domains in the Ahsahka segment of the western Idaho shear zone. Strike/dip is in right hand rule.