O-015

Shear deformation of radiation recrystallized near surface facets

David J. Walters; Edward E. Adams; Patrick J. Staron; Ladean R. McKittrick
Montana State University, Bozeman, MT, USA

A layer of radiation recrystallized near surface facets was produced in a controlled environmental chamber at Montana State University. Environmental conditions prescribed to produce the weak layer were obtained from field observations. This layer is tested using a GeoTac - GeoJac load actuator attached to a steel shear frame similar to the standard field test. A GOM - ARAMIS optical analysis device is used to record strain at 15 measurements per second. ARAMIS captures high resolution, three dimensional deformation data for a vertical profile of stratified snow containing the developed weak layer. Deformation data is graphically superimposed over real-time photos of the profile. An area showing maximum strain corresponding to the bounds of the weak layer prior to fracture propagation is apparent. Microscopic images at the location of the rupture within the weak layer identify the presence of facets on one or both sides of the fracture plane. Using the deformation data, the magnitude and direction of the strain field is calculated across the exposed surface profile. The strain field in the weak layer orients into an organized pattern of tension and compression consistent with the direction of shearing. In comparison, cohesive slab snow above and below the weak layer show little straining (randomly oriented strain vectors are artifacts of strain too small to calculate), indicating near rigid body displacement. These observations provide a clearer understanding of weak layer deformation immediately prior to fracture.