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SAR IN SUPPORT OF GEOLOGICAL INVESTIGATIONS OF THE SUDBURY STRUCTURE. V. Singhroy[1], R. Mussakowski[2], B. O. Dressler[3], N. F. Trowell[3], and Richard Grieve[4], [1]Canada Centre for Remote Sensing Department of Energy, Mines and Resources of Energy, Mines and Resources, Canada, [2]Provincial Remote Sensing Office, Ontario Ministry of Natural Resources, Canada, [3]Ontario Geological Survey Ministry of Northern Development and Mines, Canada, [4]Geological Survey of Canada, Department of Energy, Mines and Resources, Canada.

Imaging radar is an important contributing source of information for a range of geological problems and environments. Airborne SAR and ERS-1 data integrated with other geoscience datasets are being used in an attempt to characterize the crustal fracturing associated with the Sudbury structure. This presentation highlights examples of integrated and composite images aimed at facilitating the interpretation of the Sudbury structure. This work is the result of an ongoing cooperative multidisciplinary SAR study of the basin carried out by the Canada Centre for Remote Sensing, Ontario's Provincial Remote Sensing Office, the Ontario Geological Survey, and the Geological Survey of Canada.

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VISCOSITY DETERMINATIONS OF SOME FRICTIONALLY GENERATED SILICATE MELTS: IMPLICATIONS FOR SLIP ZONE RHEOLOGY DURING IMPACT-INDUCED FAULTING. John G. Spray, Department of Geology, University of New Brunswick, Fredericton, New Brunswick, Canada.

Analytical scanning electron microscopy, using combined energy dispersive and wavelength dispersive spectrometry, has been used to determine the major-element compositions of some natural and artificial silicate glasses and their crystalline equivalents derived by the frictional melting of acid to intermediate protoliths. The major-element compositions are used to calculate the viscosities of their melt precursors using the model of Shaw [1] at temperatures of 800°–1400°C, with $Fe^{2+}/Fe(tot) = 0.5$ and for 1–3 wt% H_2O. These results are then modified to account for suspension effects (i.e., the presence of mineral and rock clasts) in order to determine effective viscosities.

The critical factors in controlling the viscosities of the silicate melts are SiO_2 and H_2O contents and temperature, as has been well established for silicate melts of magmatic origin. Additionally, for fault-generated melts, the effects of shear thinning can reduce the viscosity to a significant degree. At 1200°C, the viscosities range from 7 p for the more basic melt sample (40 wt% SiO_2) to 1×10^5 p for the more acid melt sample (64 wt% SiO_2). These viscosities are low and indicate that at least the friction melt derived from the more basic protolith would have been highly fluid within the slip zone during displacement. The effects of shear thinning at very high strain rates would reduce these viscosities even further.

Where friction melts are generated during coseismic slip (to form pseudotachylites) this implies that the melt may help to lubricate the sliding interface and dissipate stored strain energy. These results are contrary to the views of earlier workers, who suggested that any melts generated by frictional heating would possess high viscosities and so inhibit slip. Part of this inference was based on the erroneous assumption that pseudotachylite generation involved the bulk fusion of wallrocks. Although a pseudotachylite matrix plus clasts has a very similar chemistry to the wallrock lithology, the matrix typically possesses a more basic chemistry and hence, due to its lower SiO_2 content, a significantly lower viscosity than that of its protolith. On the other hand, smaller entrained clasts (<1 cm diameter) are typically felsic and dominated by quartz.

These results have implications for the generation of pseudotachylitic breccias as seen in the basement lithologies of the Sudbury and Vredefort structures and possibly certain dimict lunar breccias. Many of these breccias show similarities with the more commonly developed pseudotachylite fault and injection veins seen in endogenic fault zones that typically occur in thicknesses of a few centimeters or less. The main difference is one of scale: Impact-induced pseudotachylite breccias can attain several meters in thickness. This would suggest that they were generated under exceptionally high slip rates and hence high strain rates and that the friction melts generated possessed extremely low viscosities.

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THE LARGE IMPACT PROCESS INFERRED FROM THE GEOLOGY OF LUNAR MULTIRING BASINS. Paul D. Spudis, Lunar and Planetary Institute, Houston TX 77058, USA.

The nature of the impact process has been inferred through the study of the geology of a wide variety of impact crater types and sizes. Some of the largest craters known are the multiring basins found in ancient terrains of the terrestrial planets [e.g., 1]. Of these features, those found on the Moon possess the most extensive and diverse data coverage, including morphological, geochemical, geophysical, and sample data. The study of the geology of lunar basins over the past 10 years [2–4] has given us a rudimentary understanding of how these large structures have formed and evolved.

Basin Morphology: Basins on the Moon begin to form at diameters of about 300 km, the 320-km-diameter Schrodinger being an example [5,6]. At these diameter ranges, only two distinct rings are apparent; the transition diameter at which multiple rings appear is uncertain, but appears to be between 400 and 500 km in diameter [6]. Above these diameters, basins possess multiple rings, as few as three and as many as seven [1,5,6]. In every basin, one ring appears to be very prominent and is believed to correspond structurally to the topographic rim of complex craters. This ring has various names (basin rim of [5], Ring IV of [6], MOR of [7]), but corresponds to the Cordillera ring of the Orientale Basin. Rings inside and outside this ring are recognized, each having distinct morphology. Basin inner rings tend to be clusters or aligned segments of massifs, arranged into a crudely concentric pattern; scarplike elements may or may not be present. Basin outer rings tend to be much more scarplike and massifs are rare to absent. Within a certain subset of basins on the Moon (e.g., Crisium [8], Humorum [9]), the main topo-