Revealing the Internal Flow of Salt Structures Using Anisotropy of Magnetic Susceptibility

Jack Richardson[1], Ian Alsop[2], and Carl Stevenson[1]

[1]School of Geography, Earth and Environmental Sciences, University of Birmingham, Birminhgam, United Kingdom.
[2]School of Geosciences, The University of Aberdeen, Aberdeen, United Kingdom.

ABSTRACT

The mobilisation and intrusion of salt plays a major role in the evolution of basins. Although the geometry and distribution of salt structures can be easily examined, the internal dynamics of salt intrusion are only partially understood. Collecting detailed structural data from outcrop is difficult due to limited exposure, inaccessibility and poorly preserved visible fabrics. To overcome this crucial impasse in salt tectonics, detailed and high quality strain data is required from salt outcrops. To obtain structural strain data we have used anisotropy of magnetic susceptibility (AMS) measurements on oriented samples collected from mine and coastal exposures of evaporites in Nova Scotia, Canada. With any AMS study it is important to have a grasp of the magnetic components of the rock. Further magnetic techniques along with chemical analysis have been used to better constrain these magnetic properties. It is unusual to find diapiric structures so well exposed as they are on the west coast of Cape Breton, Nova Scotia. These evaporites form as part of the carapace overlying a predominantly halite core surrounded by Carboniferous sediments. Deformation within the structural carapace reflects deformation of the underlying halite core of the diapir and the overall structure. Both brittle and ductile deformation fabrics have been recorded within the surrounding sediments and we have observed them imprinted within the evaporite facies. To understand the AMS measurements these must first be fully understood. 3D Models have been created using aerial drones and photogrammetry to help understand the relationships between fabrics and geological structures related to halokinesis. Pugwash mine offers a perfect opportunity to study diapiric growth structures at a much larger scale. Using 5 maps at different depths we can better understand the deformation of the deposit and the 3D geometries formed.