Novel application of Rock Schmidt in Structural Geology: analysis of folds

A collaboration of researchers at the University of Oviedo, Spain and Terractiva, a geological consultancy in Barcelona, have used Screening Eagle Technologies' Rock Schmidt hammer to investigate geological structures in the North Western Iberian Peninsula. In particular they investigated folds and it is understood that this is the first time that this was done using a Schmidt rebound hammer. In geology, folds are a stack of originally planar and horizontal beds that are permanently bent or curved. In the area that was studied – the Cantabrian zone - folds of various sizes, from centimetre-scale to kilometre-scale can be found, in limestone.

The Rock Schmidt is a dedicated rebound hammer for rock testing applications. It is lightweight and ultra-portable making it ideal for testing in difficult terrains. Testing is quick and easy so multiple readings can be taken in a short time, and importantly it is a non-destructive testing device which means the rock is not damaged or altered in any way. The Rock Schmidt hammer measures impact resistance (rebound) with a unique optical measurement system which ensures low dispersion and maximum accuracy in comparison with classical mechanical rebound hammers. In addition, unlike classical rebound hammers the measurement of the Rock Schmidt is independent of the impact angle angle, which is very useful when measuring on non-uniform objects like rock formations.

For their study, the researchers used a Rock Schmidt hammer with a normalized impact energy of 2.207 Nm and they followed the procedure prescribed in 'Standard test Method for Determination of Rock Hardness by Rebound Hammer Method ASTM D 5873' (2001). They took rebound measurements from hinges (bends) and limbs (straighter portions) of a particular metre-scale fold. The fold is referred to as a 'syncline' because beds dip (are inclined) toward each other from either side i.e. it is 'V' shaped.

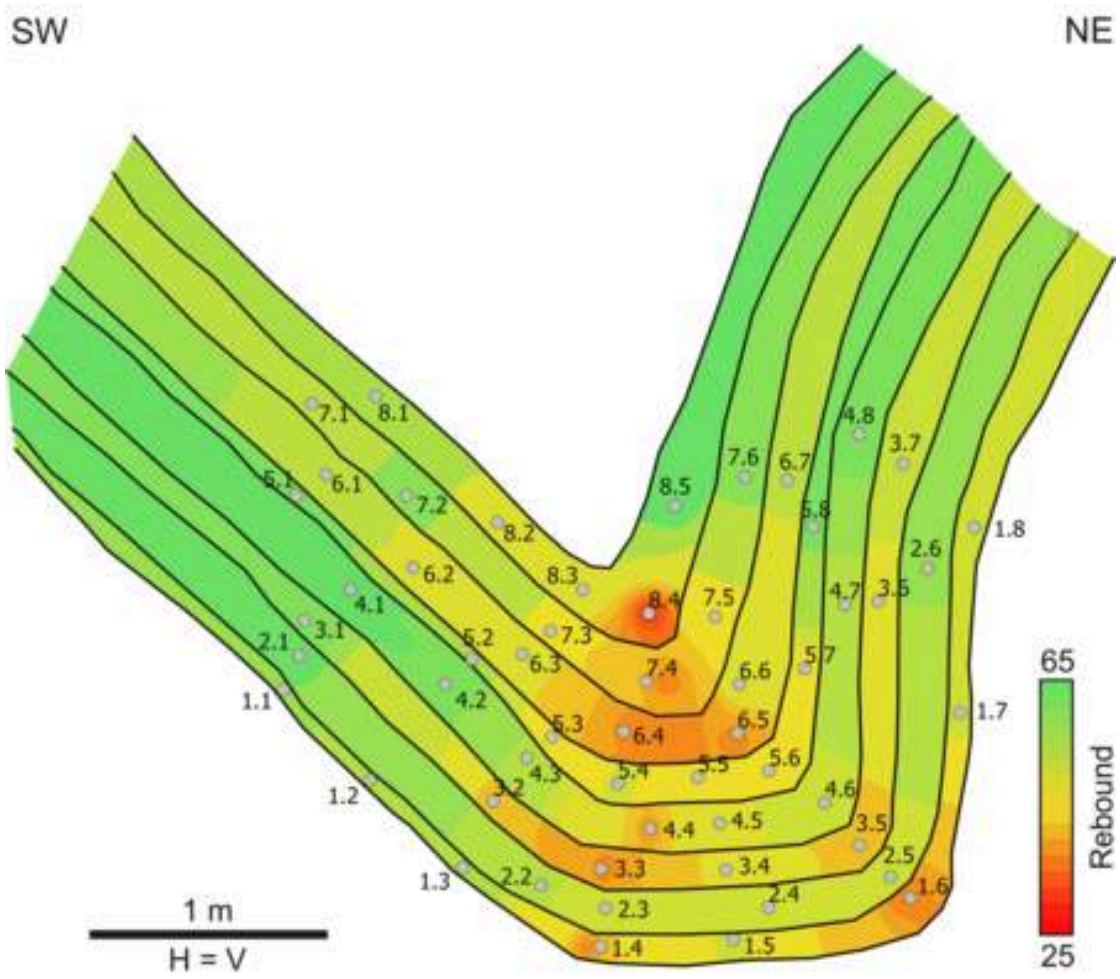

Figure 1: Geological profile across the studied syncline including contours of equal Schmidt hammer rebound constructed using data from 55 stations. Each station has been labelled with two numbers separated with a dot. The first number is the bed number, whereas the second number is the station number.

The researchers found that the variations in the Schmidt-hammer rebound value along a folded layer are consistent with other indicators such as variations of dip (angle) and thickness. Thus, the Schmidt hammer rebound may be an additional suitable parameter for fold characterization. They also found that the rebound values depend on the structural position of a layer (bed) within a fold and that the rebound values may be different for beds with apparently the same lithologies. Therefore, care must be taken when interpreting rebound results from geological folds and especially so when deriving other values from them such as Young's modulus.

We are delighted to share this novel application of the trustworthy Rock Schmidt and look forward to sharing more exciting research stories with Inspection Space readers.