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Making the Schmidt Hammer Great Again!

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Have you ever applied the Schmidt hammer method and wondered what the R -value represents? What SI unit it would have and which material properties it actually assesses? The Schmidt rebound hammer is a device initially intended to test the curing state and strength of concrete. Since then, the concept has been transferred to determine the strength, weathering, and sometime even surface exposure age of rocks in geomorphology. The advantage of the Schmidt hammer that it is non-destructive, easy to handle, light, and readily applicable in the field. However, the method is only based on correlation, without physical explanation of the measured value being provided, and using a seemingly arbitrary resolution of the scale without reference. Here we present our approach to put the Schmidt hammer and especially the physics behind the R -value on solid ground. Using a dataset of material properties and R -Values, we find that the Schmidt hammer best represents the elasticity of the material. The elasticity and, along with it, the elastic modulus, can be independently and complementarily assessed with other geophysical methods. Both metrics are known to vary with i) moisture level, ii) stress state, and iii) temperature. Consequently, we conducted controlled experiments to constrain the influence of these conditions on R -values. A major disadvantage of the Schmidt hammer, the resolution of the scale, remains and needs further calibration.