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# Preliminary geophysical survey of the Malingen structure, Sweden

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Målingen is a 1km wide circular structure situated about 15km to SW of the similar age, 8km wide Lockne impact crater, Sweden. It has been observed exposed sedimentary breccias that are similar to the resurge deposits at Lockne of the same age, and a recent drilled core reached the crystalline basement at 149m depth. The ongoing Geophysical survey will provide data for a geophysical modeling that will aid the geological studies to determine the dimensions and shape of the Målingen structure. In turn, the geophysical/geological models will be used as constrains for numerical simulations to evaluate the potential impact formation of this structure and its relation with the Lockne impact crater.

The gravity survey of the structure comprises 152 measurements with a spacing of about 25m along two roads crudely oriented N-S and E-W that intersect the western and northern parts of the rim and apparent center of the structure. Location, time, and gravimeter reading were collected at every point. Although no topographic correction was implemented, after removal of the regional trend, the residual 2x2.5km Bouguer anomaly map obtained shows a general gravity low over the interior of the structure that is consistent with the gravity signatures of known, bowl-shaped, simple impact craters. The extremes values obtained from the Bouguer anomaly are around 1 mgal and -0.83 mgal.

In order to estimate general susceptibility values for main lithologies around the Målingen structure, 482 susceptibility measurements were taken with a field kappabrige KT-6 from two different areas. The measured susceptibility values for granite and dolerite at Målingen are presented in two histograms. The histogram for the granite presents a normal distribution centered around 0.75E-04[SI]. The histogram for the dolerite also presents a normal distribution centered around 8E-03 [SI], which is two orders of magnitude higher than the granite.

The magnetic survey covers the whole structure and extends about one diameter outside the apparent rim where the terrain allows it. It includes 555 measurements in a grid with a line spacing of about 100-150m and about 50m separation between measurement points. The correction for diurnal variation was done with readings obtained from the Uppsala Observatory. The magnetic anomaly map shows distinct anomalies distributed along the topographic rim. This supports the geological interpretation of a circular structure. The anomaly associated with the SE part of the apparent topographic rim of the structure coincides with the dolerite outcrop at which susceptibility measurements were carried out. Most likely, the other strong anomalies can be linked with masses of dolerite possibly relocated during the formation of the topographic rim.

The residual Bouguer anomaly map and the magnetic anomaly map suggest a likely impact origin of the Målingen structure. The geophysical support for the impact hypothesis is mainly the negative gravity signature over the interior of the structure, and the circular distribution of the magnetic anomalies along the topographic rim. After developing a magnetic and gravity model of the Målingen structure, we will be able to analyze the impact hypothesis for the Målingen structure suggested by geological interpretation and numerical simulations. Moreover, the quantitative results we obtain will give us more information about the lithologies of Målingen. The comparison of these features with the Lockne crater will provide us information about the possible doublet impact origin of these structures.