

THE LYCKSELE STRUCTURE, A HUGE RING FORMATION IN NORTHERN SWEDEN: RESULT OF AN IMPACT? D.H. Nisca¹, H. Thunehed¹, L.J. Pesonen², S-Å Elming¹ ¹Division of Applied Geophysics, Luleå University of Technology, S-97187 Luleå, Sweden, ²Department of Geophysics, Laboratory for Palaeomagnetism, Geological Survey of Finland, P.O.Box 96, FIN-02151 Espoo, Finland

The current data base of impact structures in Fennoscandia reveal 28 proven impact craters of various ages and sizes (1). Recently, we started to search for large and old impact structures, which may show traces of the impact in their shape or in their rocks and minerals and which can be diagnostically identified through the masking effects of post-impact deformations. Since we are dealing with strongly eroded and often deformed structures, the classical criteria (1) to prove an impact origin for them are not tenable.

On the basis of a combined analysis of topography, drainage, gravity, magnetic and petrophysical data a circular structure has been identified in northern Sweden (Fig. 1). The structure is characterized by a circular system of faults, arc-shaped contacts between rocks and a circular distribution of granitic intrusions (2). The fault zone at the edges is defined from gradients in the gravity data (Fig. 1a), from magnetic data by arc-shaped anomalies (Fig. 1b) and from topographic data by an arc-shaped relief, which is also reflected in the drainage pattern. The zone is

characterized by vertical faults that also cut the granitic intrusions at the edge of the formation and from interpretation of gravity data an uplift of high density rocks (ca 2850 kgm⁻³) is indicated in the central part. The age of granites and pegmatites range from 1.82 Ga to 1.78 Ga (3). Therefore based on age data and on paleomagnetic results of various generations of dykes that cut and are being truncated by the structure, the age of the formation lies within 1.80-1.26 Ga. The rocks have not been studied petrologically to see if any traces of shock metamorphism can be found. At present, four models for the origin of the structure are possible: (i) basement doming, (ii) meteorite impact, (iii) large buried pluton, or (iv) fault-bounded block, however an impact origin seems most plausible.

(1) **References:** (1)Pesonen, L.J., 1996. Earth, Moon and Planets, 72, 377-393., (2)Nisca, D., 1996. PhD thesis, Luleå University of Tech., 228 pp., (3)Romer, R. And Smeds S.-A., 1994. Prec. Res., 67, 141-158.

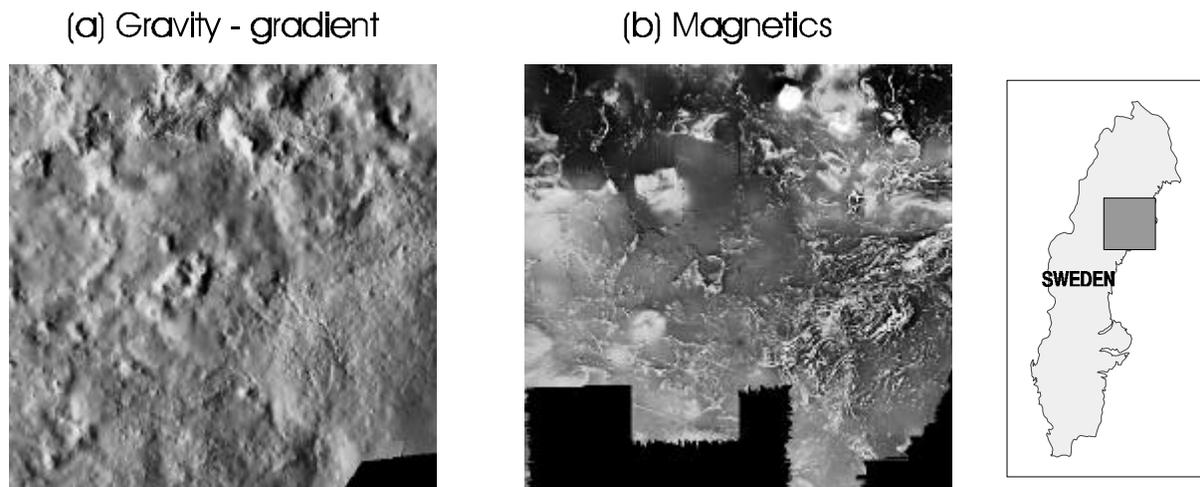


Fig. The Lycksele structure seen in (a) gravity gradient map and (b) in magnetic data.