KARIKKOSELÄ - A NEW IMPACT STRUCTURE IN FINLAND; M. Lehtinen1, L.J. Pesonen2, R. Puranen2 and A. Deutsch3; 1Geological Museum, Finnish Museum of Natural History, FIN-00014 Univ. of Helsinki, Finland; 2Department of Geophysics, Geological Survey of Finland, FIN-02150 Espoo, Finland; 3Institut für Planetologie, Univ. Münster, D-48149 Münster, Germany

Observations on a circular and deep small lake have revealed a new impact structure in Finland, hereafter called the Karikkoselälä structure (Lat. 62°13'N; Long. 25°15'E). This simple impact structure, with an estimated present diameter of 1.5 km, is located in central Finland, about 230 km north of Helsinki and 25 km west of the town of Jyväskylä (Fig. 1a). Geologically the structure lies within the Central Finnish Granite Complex of Paleoproterozoic age (~1.88 Ga). The target rock is a porphyritic granite exposed in shoreline outcrops, where shatter cones have been found in situ. Preliminary morphological, geophysical and petrographic data of the Karikkoselälä impact structure are summarized.

The following evidences support the impact origin of the Karikkoselälä structure:
(i) The strikingly circular morphology of the lake along with gradually steepening water depth-contours reaching a maximum depth of 26 m (Fig. 1b). Most lakes in central Finland have water depths less than 15 m.
(ii) Well developed shatter cones, ranging in size from a few cm up to two meters, are found in the medium to fine grained porphyritic granite around the lake, particularly along its south-eastern shoreline (Fig. 1c). Preliminary measurements of shatter cone orientations indicate that the cone axes point towards the lake but not always to the bathymetric maximum (compare Figs. 1b and 1c). Shatter cones are also found on glacial boulders transported to the south-eastern side of the lake.
(iii) High altitude aeromagnetic data reveal a weak magnetic minimum at the southern edge of the lake whereas aeroelectromagnetic (AEM, phase angle) data show a clear anomaly related to lake Karikkoselälä. New high-resolution aeromagnetic maps, particularly the shaded relief map (Fig. 2a), delineate a nearly circular, magnetically weak structure for Karikkoselälä. Moreover, the new AEM data demonstrate distinct circular anomalies related to lake Karikkoselälä (Fig. 2b). The most likely explanation for these AEM anomalies is the occurrence of a fairly conductive sedimentary layer below the lake water, under which there must be a more conductive layer of rocks, probably fragmental impact breccias and suevites and/or fractured bedrock. The good conductivity of this layer is possibly due to impact generated pores and fractures filled with saline water. Below the moderate and good conductive layers is the highly resistive target granite.
(iv) In thin sections, the rock specimens from the shoreline exposures are strongly brecciated. Quartz grains display planar deformation features (PDF's), feldspars show mosaicism, and kinking is almost omnipresent in biotite. Feldspars and matrix are rich in hematite pigment, probably due to secondary alteration.

Based on the above evidences we propose that the Karikkoselälä structure is a new proven impact crater, thus increasing the number of verified impact structures in Finland to 7 (Fig 1a and [1]). Impactites, e.g., breccias containing impact melt particles, glassy spheres or pseudotachylite dikes, have not been detected so far in Karikkoselälä, making dating of the structure difficult. Concluding from the "young" morphology of the lake structure, the age of Karikkoselälä cannot be very high. Oriented samples have been collected from the shatter cone outcrops in a search for shock remanent magnetisation, which in favourable conditions could help to bracket the age of the impact event. Other samples are investigated with mineralogical, geochemical, palaeomagnetic and petrophysical methods in order to identify more shock features and to give constraints for future geophysical modelling. Drilling is planned in the winter of 1996 in order to obtain an oriented core of the lake bottom sediments for a multidisciplinary study. We are also planning to make gravity surveys with the aim to determine a 3 D-view of this small impact crater and to better characterize the point of impact.
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Fig. 1. (a) Proven impact structures in Finland [1], Karikkoselkä is shown with an arrow; (b) Water depth-contours (bathymetry) of lake Karikkoselkä; (c) Preliminary data of shatter cone orientations.

Fig. 2. (a) High resolution shaded relief aeromagnetic map; (b) AEM (in-phase component) map of the Karikkoselkä impact structure.


Acknowledgements. We thank Timo Lahdelma, Auvo Hamarius and Matti Härkäla for calling our interest on lake Karikkoselkä. Salme Nässling drew the figures and Maija Kurimo helped in preparing the high resolution geophysical maps. This work is supported by DAAD - Academy of Finland grants to AD & LJP.