NEW GEOPHYSICAL AND PETROGRAPHIC RESULTS OF THE SUVASVESI N IMPACT STRUCTURE, FINLAND; L.J. Pesonen[1], M. Lehtinen[2], A. Deutsch[3]; S. Elo[1] and H. Lukkarinen[4]; [1]Geological Survey of Finland, FIN-02150 Espoo, Finland; [2]Geological Museum, Finnish Museum of Natural History, FIN-00014 Univ. of Helsinki, Finland; [3]Institut für Planetologie, Univ. Münster, D-48149 Münster, Germany; [3]Geological Survey of Finland, FIN-70211 Kuopio, Finland.

Summary. Petrographic analysis of drill core samples, as well as new high-resolution geophysical data, confirm that the northern of the Suvasvesi twin-lakes in Central-East Finland is an impact structure. Here, we summarise morphological, geophysical and petrographic data for Suvasvesi N.

Geological setting. Suvasvesi N (Lat. 62°41′N, Long. 28°11′E) is part of a probable crater doublet seen as nearly circular twin-lakes (Suvasvesi N, Suvasvesi S) in satellite and topographic maps (Fig. 1a). Geologically, lake Suvasvesi N is located at the border of the Svecofennian (1.88 Ga) and Archaean (2.7 Ga) terranes of the Fennoscandian Shield, which are separated by a huge fracture zone crossing the structure in NW-SE direction. Main target rocks are Svecofennian medium grained granite, migmatites and schists, and Archaean granites north of the fracture.

Petrographic outlines. Verification of the impact origin for the Suvasvesi N structure came through petrographic analysis of chipped material from a drillhole, which penetrated a 80 m thick layer of impactites, including melt breccias. These clast-rich impact melt rocks have a cryptocrystalline matrix with dendritic pyroxenes and partly display flow structures; alteration is generally low. Among the clasts, quartz is most abundant, beside feldspar and rock fragments occur. Quartz clasts contain either up to three crossing sets of well developed fresh PDF's (Fig.1c) or decorated PDF's, some clasts are recrystallized to ballen quartz, but unshocked quartz grains are also present. Rock fragments show various degrees of shock metamorphic overprint and indications for thermal annealing. In thin sections of the latter material, zircon grains with crossing sets of planar fractures have been observed.

Geophysical observations. High-altitude aeromagnetic data indicate that Suvasvesi N is associated with a weak magnetic relief extending slightly beyond the lake. At the center of this magnetic relief, a small magnetic anomaly occurs. High-resolution low-altitude aeromagnetic data clearly delineate a circular (∅ = 600 m) negative magnetic anomaly with an amplitude of ~200 nT, coinciding roughly with the bathymetric maximum of 96 m of the lake, and with the high-altitude anomaly (Fig.1b). High-resolution shipborne magnetic measurements also yield this magnetic minimum. Preliminary interpretations of the magnetic data, together with palaeomagnetic data, indicate that the central negative anomaly is caused by strong reversed remanent magnetization of impact melt breccias, probably of Permian or younger in age [1]. The peak minimum in the high-resolution magnetic map (Fig.1b) is surrounded by a very weak, yet distinct anomaly deficient magnetic relief, with a diameter of 4 km, roughly matching with the lake morphology. We interpret this weak magnetic relief to represent the area where impactites are to be found with reduced magnetic properties (they may be capped with weakly magnetized post-impact sediments), or target rocks in which the shock has reduced their pre-impact magnetic properties.

Summary. The dimension of the Suvasvesi N impact structure is still controversial. The present lake morphology suggests that the structure is roughly 4 km in diameter [1, 2]. However, shock effects in the bedrocks at the lake shore are absent, and impactites have not been found as boulders on the shoreline. With the exception of some weakly developed cone-like features found in some of the small islands, no definite shatter cones were discovered yet. Future geophysical modelling (gravity, magnetics, EM) is planned to better define the crater dimensions and to investigate whether the Suvasvesi N structure is a simple or a complex impact structure. For lake Suvasvesi S, so far, evidence for shock metamorphism has not been dedected during a preliminary survey along the shoreline; the ultimate proof if the Suvasvesi lakes represent a twin structure is therefore lacking.

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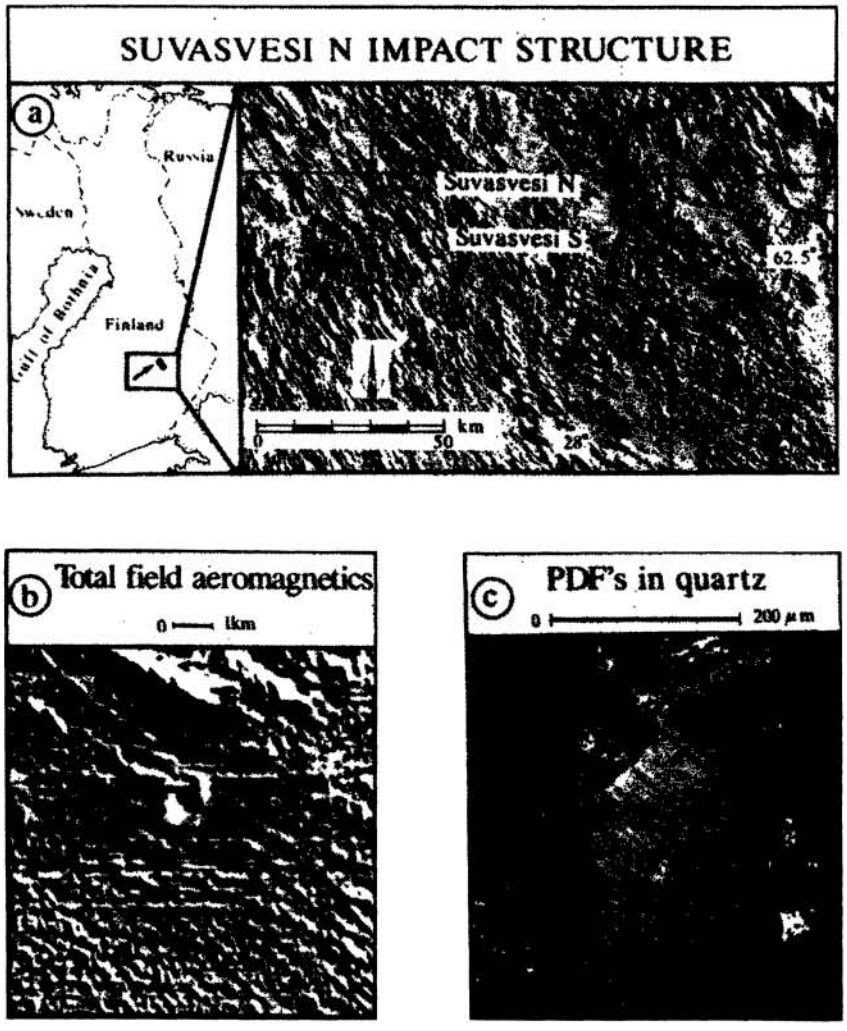

Fig. 1. ***(a)*** *Left*: The Suvasvesi twin lakes, the arrow pointing to Suvasvesi N; *Right*: Shaded relief topographic map of SE Finland showing the Suvasvesi structures, with Suvasvesi N on top of a fracture zone. ***(b)*** High-resolution low-altitude aeromagnetic map depicting the negative central anomaly of Suvasvesi N. The weak magnetic relief for this structure has a diameter of ~4 km (shaded relief, illumination from NE). ***(c)*** Quartz clast in an impact melt breccia with PDF's // {1013}; photomicrograph by K. A. Kinnunen.

Literature: [1] Pesonen L.J. (1996) Earth, Moon and Planets, Special. Volume., i. p. [2] Lehtinen M. (1995) Tähdet ja Avaruus, 1/95, 4 (in Finnish).

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