

**THE LAKE SAARIJÄRVI: A NEW IMPACT STRUCTURE IN NORTHERN FINLAND.** L. J. Pesonen<sup>1</sup>, A. Abels<sup>2</sup>, M. Lehtinen<sup>3</sup>, and P. Tuukki<sup>4</sup>; <sup>1</sup>Laboratory for Paleomagnetism, Geological Survey of Finland, FIN-02150 Espoo, Finland (lauri.pesonen@gsf.fi); <sup>2</sup>Institut für Planetologie, Universität Münster, D-48149 Münster, Germany, <sup>3</sup>Finnish Museum of Natural History, University of Helsinki, FIN-00014 Helsinki, Finland; <sup>4</sup>Malmikaivos Oy, Luikonlahti, Finland.

Petrographic analysis of drill core material, supported by other data, confirm that the lake Saarijärvi, northern Finland, is a remnant of a deeply eroded meteorite impact structure [1,2]. It is the eighth impact structure so far found in Finland and the first located in Archean terrain.

The Saarijärvi impact site (center co-ordinates: 65°17,4'N 28°23,3'E) is visible on Landsat images as a rounded feature with a diameter of ~1.5–2.0 km occupied by the present lake Saarijärvi and extending northwards into a swampy area. The structure occurs in the Archaean basement of the Suomussalmi block, which consists at the impact site mainly of gneissose granitoid. The target rock is cut by diabase dykes as seen by high-resolution aeromagnetic maps and in outcrops including the island in the center of the lake. A drilling located about 100 m NW of this island revealed, that an up to 156 m thick sedimentary unit consisting of a variety of sandstones, siltstones and claystones overlies the fractured basement. Between these sediments and the basement occurs a breccia layer of a few centimeters thickness. Two outcrops of granitoid breccia were found on the central island, too.

Petrographic observations of a core sample from the drilled breccia layer shows convincing evidence for shock metamorphism. It consists of a very fragile breccia with quartz grains and granite clasts. In thin sections some of the quartz grains show PDFs with three (011;<sup>-</sup>3, 101;<sup>-</sup>3 and 101;<sup>-</sup>0/112;<sup>-</sup>0) Some biotite grains show kink bands, and feldspar reveals mosaicism. Petrographic investigations of the samples from the breccia outcrops on the central island also display shock effects, but of weaker nature than observed in the drill core.

Strikingly circular airborne electromagnetic and ground electromagnetic anomalies are associated with the structure. They are partly related to the lake water and bottom mud of

Quaternary age, but also reflect deeper located conductors, presumably highly porous breccia layers and/or fractured bedrock. The aeromagnetic data show a generally weak magnetic relief over the structure, and some of the linear aeromagnetic anomalies due to mafic dykes appear to be truncated by it. Furthermore, the impact site is associated with a gravity anomaly of about -1.5 mGal. Seismic refraction profiles, carried out mainly north of the lake, define a 1,5 km large, bowl-shaped structure filled with sediments. The bedrock seismic velocities have a tendency to increase radially away from the lake periphery, confirming that the target rocks in the center of the impact structure are more fractured than those further away.

The age of the Saarijärvi impact event is still not known, but it is older than 0.6 Ga, which is the approximate microfossil (acritarchs) age of the subsequently infilled sediments, and younger than 2.45 Ga, which is the estimated age of the truncated mafic dykes. If the central island, with its breccia outcrops, turns out to be a remnant of a central uplift, the original diameter of the structure must have been much larger than the present 1.5-2.0 km diameter structure. Indeed, the outline of the gravity anomaly hints to such a possibility. Concerning its preservation state, Saarijärvi appears quite similar to the Iso-Naakkima impact structure in central Finland (diameter: ~3 km, age: 1.15-1.2 Ga [3]).

We will present morphological, geophysical, and petrographic results of the Saarijärvi structure and discuss its implications for impact cratering in Fennoscandia.

**References:** [1] Pesonen L. J. et al. (1997) Negotiating Days of the Applied Geophysics, Univ. Oulu, Finland, *abstract vol.*, 8–9. [2] – (1998) LPS XXIX, abstract #1262 (CD-ROM); [3] J. Järvelä *et al.* (1995) *Open File Report*, Lab. for Paleomag., Geol. Surv. Finland, 53 pp.