Söderfjärden impact crater, new results and new drilling plan

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Söderfjärden is one of the best preserved Early Paleozoic impact structures on Earth. As seen from the air, there is a distinct circular field surrounded by a crater rim of hills. The diameter of the crater is 6.5 km and the depth over 300 m. The target rock consists of Svecofennian rocks, such as the Vaasa granite dated at 1875 Ma (Suikkanen et al. 2014). Geological research has been conducted at Söderfjärden since 1970's. Seven drill holes have been drilled into the crater, the deepest reaching down to 347 m. The age of the crater was earlier estimated at ∼525 Ma, based on microfossils in the Cambrian sediments (Tynni 1982, Uutela, pers. comm.). New 40Ar/39Ar dating results for a melt vein from boulder, suggests a Neoproterozoic age of ∼640 Ma (Schmieder et al. 2014).

So far only few impactites have been found. The previous drillings have yielded polymict allochtonous breccias, which contain planar deformation features, feather lamellae and planar fractures in quartz grains. (Öhman&Preeden 2013) No melt or suevites had been found until 2013 when new findings from the south-east side show distinct evidence of impact origin. Moreover, magnetic and gravity data indicate that a small buried impact melt body may occur near the center (Abels et. al. 2002).

Our new research plan calls for a new drilling coupled with seismic surveys crossing the central uplift and possible the melt body. The drilling may also shed new light on life evolution during the Cambrian, on the various Pleistocene glacial deposits and related to the development of the Baltic Sea, and many other geological, environmental and anthropogenic interferences, which affected soils and waters in Söderfjärden during historic times. The new drilling plan includes also modeling of the heat energy that emerged from the collision, and an attempt to obtain absolute (using shocked zircons) radiometric dating of the impact event and the original crater dimensions. Sampling of the entire sediment sequence can provide very valuable research information, including estimates of the post-glacial sulphur-rich sediments and potential chemical variations in stratigraphy within them. Such knowledge is valuable in the evaluation of the environmental risks that might arise from land-use in areas with acid sulphate soils in Ostrobothnia.