ENVIRONMENTAL EFFECTS OF SMALL METEORITE IMPACT IN UNCONSOLIDATED SEDIMENTS - CASE OF IRON METEORITE SHOWER IN MORASKO, POLAND.

W. Szczuciński[1], K. Pleskot[1], M. Makohonienko[2], R. Tjallingii[3], K. Apolinarska[1], S. Cerbin[4], T. Goslar[5], N. Nowaczyk[3], M. Rzodkiewicz[2], M. Słowiński[6], M. Woszczyk[2] and A. Brauer[3], [1]Institute of Geology, Adam Mickiewicz University in Poznań, Maków Polnych 16, 61-606 Poznań, Poland (email: witek@amu.edu.pl, krzypl@amu.edu.pl, karinaap@amu.edu.pl), [2]Institute of Geoecology and Geoinformation, Adam Mickiewicz University in Poznań, Dzięgielowa 27, 61-680 Poznań, Poland (email: makoho@ame.edu.pl, lutynska@amu.edu.pl, woszczyk@amu.edu.pl), [3]Section 5.2 Climate Dynamics and Landscape Evolution, GFZ German Research Centre for Geosciences, Telegrafenberg 14473 Potsdam, Germany (email: rik.tjallingii@gfz-potsdam.de, norbert.nowaczyk@gfz-potsdam.de, brau@gfz-potsdam.de), [4]Department of Hydrobiology, Adam Mickiewicz University in Poznan, Umultowska 89, 61-614 Poznań, Poland (email: cerbins@amu.edu.pl), [5]Poznań Radiocarbon Laboratory, Foundation of the Adam Mickiewicz University, Poznań, Poland (email: tomasz.goslar@radiocarbon.pl), [6]Department of Environmental Resources and Geohazards, Institute of Geography and Spatial Organization, Polish Academy of Sciences, Kopernika 19, 87-100 Toruń, Poland (email: michal.slowinski@geopan.torun.pl).

Introduction: About 5,000 years ago a largest known iron meteorite shower in Central Europe took place nearby contemporary Morasko district of the city of Poznań, western Poland. The so far documented evidences of that impact include thousands of iron meteorite pieces distributed over an area of approximately 3 x 1 km and at least 7 meteorite impact craters with maximum diameter of about 100 m. The aim of the present study is to extend the previous investigations and to assess environmental consequences of small meteorite impact in unconsolidated sediments on example of the Morasko meteorite impact. Our investigations are based on sedimentological archives of lakes and peat bogs located in the vicinity of the craters. Particular research questions focus on identification of sedimentological and geochemical signatures of the impact and assessment of the ecosystem consequences and their duration and extent.

Study Area and Methods: Morasko crater field is located in Poznań Lake District. In its vicinity (< 8 km) there are several lakes and peatbogs from which three lakes were selected for the investigations, namely: Glinnowieckie Lake, Strzeszyńskie Lake and Kierskie Lake. The preliminary studies of peatbogs showed that they have accumulated during Late Holocene and do not host the record of the time of the meteorite impact. All of the investigated lakes are of glacial origin and have been formed after Poznań (Frankfurt) phase of the last glaciation (~18.5 ka BP). The analyses of the lake sediments are focused on middle Holocene (ca. 4.5 – 6.5 ka BP), i.e. in a range of supposed age of the impact. From each lake from 2 to 4 sediment cores up to 14 m long were collected. Selected cores were analyzed in terms of their sedimentology (grain size distribution, sedimentary structures), magnetic susceptibility, geochemistry (XRF scanning, TC, TOC, TN, $\delta^{15}N$, $\delta^{13}C$, trace elements), diatom, cladocera and pollen analysis. The age control was by AMS ^{14}C dating.

Results and Discussion: The extensive analyses have not revealed a clear signal of environmental change or meteorite impact in the Kierskie Lake, which is located app. 8 km from the craters. The sediments from Strzeszyńskie Lake (located 6 km from the crater field) are composed of massive, calcareous gyttja locally interbedded with laminated layers. They revealed a major disturbance likely related to increased soil erosion, lake eutrophication and higher water level in catchment of the lake around 6 ka BP, i.e. several hundred years before the meteorite impact. The disturbance is marked by reversal of ^{14}C ages, higher content of diatomaceous Si and Ca, as well as by preserved sediment laminations. Pollen analysis of aforementioned layer shows significant shift in plant composition. The presence of plantain (*Plantago Lanceolaata*) suggests that these disturbances may be triggered by human activity. These changes in sediment composition are terminated by sharp transition to previously measured values. The termination took place between 5.5 and 5 ka BP and coincides with distinct and narrow peak in magnetic susceptibility, which is likely related to the meteorite impact. It would suggest that the effects of the event in the catchment of Strzeszyńskie Lake were minor but might be one of possible reasons of men activity cessation in the region. The sediment of Glinnowieckie Lake (app. 2 km from the craters) have revealed small gyttja intraclasts in mid-Holocene horizon which may be interpreted as the effect of sediment disturbance triggered by impact-related earthquake-generated seiche. However, possibly due to sediment mixing, there are no other indicators of the impact (e.g. magnetic susceptibility) and it shows that the generally limited record of the event in lake sediments is site-specific.

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