Geophysical Research Abstracts
Vol. 13, EGU2011-4567, 2011
EGU General Assembly 2011

Preliminary stratigraphy and first petrographic and geochemical results from the ICDP drill core from El′gygytgyn crater (Russia).

Ulli Raschke, Uwe Reimold, and Ralf-Thomas Schmitt
Germany (ulli.raschke@mfn-berlin.de)

Preliminary stratigraphy and first petrographic and geochemical results from the ICDP drill core from El′gygytgyn crater (Russia).

U. Raschke1, W.U. Reimold1, and R.T. Schmitt1 and the El′gygytgyn Scientific Party, 1Museum für Naturkunde – Leibniz Institute at Humboldt University Berlin, Invalidenstr. 43, D-10115 Ber-lin, Germany (ulli.raschke@mfn-berlin.de; uwe.reimold@mfn-berlin.de; ralf-thomas.schmitt@mfn-berlin.de)

El′gygytgyn (67°30'N and 17°05'E), a 3.6 Ma [1], 18-km-diameter impact structure, is located in the Late Meso-zoic Ochotsk-Chukotsky Volcanic Belt of Chukotka (Northeast Siberia). It is one of the best-preserved impact structures on Earth [2]. The complex crater structure was formed in a silicious volcanic target [3,4]. The volcanic rocks of the crater area were described as the Late Cretaceous Pykarvaam and Milguveem series with an age of 86-89 Ma [5-8]. In spring 2009 a drilling campaign by the "International Continental Drilling Project (ICDP)" recovered a complete (517 m) sequence of lake sediments and impactites (315 m of lacustrine, post-impact sediments, and a several m wide transition zone to the underlying impact rocks.
By now we have obtained some 70 polished thin sections of core samples and a further 20 from country rocks (representing samples from ca 60% of the crater rim). Optical microscopy was used for lithological classification and first shock deformation analysis. RAMAN spectrometry is used with optical identification of secondary miner-als and sulfides. We have also begun with detailed analysis of volcanic melt phases (in tuff and ignimbrite) and impact-generated melts.
In the strongly altereted impactite sequence between 316 and 517 m depth we can distinguish two different li-thologies. In the upper 100 m, polymict impact breccia with impact melt particles, glass, shocked minerals, and shatter cones has been sampled – classified as suevite. The shock pressure range from < 10 to 50 GPa. This sequence consists of clasts and matrix grains within a size range from mud to stones (0.002 mm to 20 cm). The parent lithologies identified are a range of volcanic rocks, some of which resemble the lithology of the bedrock sequence. We also identified some $\sim$100 μm sized glass spherules and small quartz grains with planar deformation features (PDF) in the clayey and fine-grained sediment which have been pressed into fractures in the uppermost suevite.
At the transition from unit 1 (suevite) to unit 2 (brecciated bedrock) occurs a 1.5 m wide zone of strong altered green schist. Detailed petrographic analysis suggests that this is a strongly altered volcanic zone that is transected by numerous thin calcite veins. The geochemistry is in terms of major elements more mafic (SiO2 < 50 wt%). This layer is also characterized by very high (in comparison to all other samples analysed so far) concentrations of Ti, Al, Fe, Mn, Mg, Ca, Ni, Co, Cr).
The lower unit is brecciated bedrock material with a general rhyodacitic composition. Besides feldspathic (pla-gioclase as well as albite and alkali feldspar), there also quartz and mafic (biotite, amphibole) phenocrysts. The groundmass is composed of the same minerals. The melt particles also contain some very fine-grained feldspar and quartz phenocrysts embedded in a brownish glassy matrix. The melt clasts are elongated (up to 1 cm in thickness and 2 to 6 cm in length). Their long axes have varied orientations of 15 to 75 ° to the core axis. Open and filled fractures occur abundantly throughout this core section and have a similar variation of orientations with respect to the core axis. The fracture fill includes calcite and zeolites (e.g., analcite). This sequence is only weakly shocked (quartz grains rarely show 1 or 2 sets of PDF; most quartz shows normal extinction). The intensity of shock metamorphism seems to rapidly decrease with depth, as indicated by almost unshocked material at the end of the drill core (517 m).

References: [1] Layer, P. (2000) Meteoritics & Planet. Sci, v. 35, p. 591–599; [2] Gurov, E.P. et al. (2007), Meteoritics & Planet. Sci. v. 42, Nr 3, p. 307–319; [3] Gurov, E.P. et al., (1979), LPS X, p. 479–481; [4] Gurov,

E.P. & Gurova, E.P. (1991), Nauk. Dumka Press, 160 p; [5] Beliy, V.F. (1969) Nauk. Dumka Press 138 p; [6] Beliy, V.F. (1982) Tichookean. Geol., no. 5, p. 85–92; [7] Feldman,V.I. et al., (1981), Marak., A.A., ed., Impactites: Moscow St. Univ. Press, p. 70–92; [8] Ispolatov,V.O. et al., (2004), The Journal of Geol., 2004, volume 112, p. 369–377;