

ANALYSIS OF THE BRIGHT FIREBALL OVER KOLA PENINSULA ON APRIL 19, 2014 FOLLOWED BY SUCCESSFUL METEORITE RECOVERY CAMPAIGN.

M. Gritsevich^{1,2,3}, E. Lyytinen¹, T. Kohout^{1,4,5}, J. Moilanen¹, S. Midtskogen⁶, N. Kruglikov⁷, A. Ischenko³, G. Yakovlev³, V. Grokhovsky³, J. Haloda^{8,9}, P. Halodova⁸, V. Lupovka¹⁰, V. Dmitriev¹⁰, J. Peltoniemi^{4,2}, A. Aikkila¹, A. Taavitsainen¹, J. Lauanne¹, M. Pekkola¹, P. Kokko¹, and P. Lahtinen^{1,11}

¹Finnish Fireball Working Group, Helsinki, Finland. ²Finnish Geodetic Institute. E-mail: maria.gritsevich@fgi.fi. ³Ural Federal University, Ekaterinburg, Russia. ⁴University of Helsinki, Finland. ⁵Institute of Geology, Academy of Sciences of the Czech Republic. ⁶Norwegian Meteor Network. ⁷Institute of Metal Physics RAS, Ekaterinburg, Russia. ⁸Czech Geological Survey, Prague, Czech Republic. ⁹Oxford Instruments NanoAnalysis, Bucks, UK. ¹⁰Moscow State University for Geodesy and Cartography, Russia. ¹¹Finnish Meteorological Institute.

We present results on the trajectory reconstruction, dark flight simulations and pre-impact orbit determination for the bright fireball which appeared in the night sky over Kola Peninsula, close to Finnish border, on April 19, 2014. The fireball was instrumentally recorded in Finland from Kuusamo, Mikkeli and Muhos observing sites belonging to the Finnish Fireball Working Group. Additionally, a publicly available video made by Alexandr Nesterov in Snezhnogorsk, Russia, from the opposite side of the fireball track, was carefully calibrated and taken into account in trajectory reconstruction. The fireball reached a magnitude of at least -18 during its peak brightness, and it was reported by many eye-witnesses in Finland, Russia, and Norway.

Deceleration analysis revealed that the pre-atmospheric mass of the meteoroid was about 500 kg. Furthermore, based on the analysis of fireball observations [1], it was predicted that part of the meteoroid survived the atmospheric entry and reached the ground. The derived physical parameters responsible for the meteoroid drag and mass loss rate in the atmosphere matched a meteorite-production criteria described in [2]. It was decided to conduct detailed dark flight simulations for survived fragments with account for the wind effects, and organize a meteorite recovery expedition in the calculated landing area. The 5-day expedition with 4 participants from Russia and Finland took place at the end of May following snow melt and preceding vegetation growth. On May 29, 2014, first 120.35 g meteorite fragment was found on a local forest road within the predicted impact area. Second 47.54 g meteorite fragment fully covered with fusion crust was recovered nearby on the following day.

Mineralogical and physical analysis of the main mass was done at the Czech Geological Survey and at the University of Helsinki, respectively, using methods and instruments described in [3]. The meteorite was classified as H5 ordinary chondrite (S2, W0). Bulk density is 3.5 g/cm³, grain density is 3.8 g/cm³. Resulting porosity is 5%. Magnetic susceptibility logarithm (in 10⁹ Am²/kg) is 5.4. The expedition and laboratory research were supported by Academy of Finland and Ural Federal University.

References: [1] Lyytinen E. and Gritsevich M. 2013. *Proceedings of the International Meteor Conference 2012*, pp. 155-167. [2] Gritsevich M. et al. 2012. *Cosmic Research* 50:56-64. [3] Kohout T. et al. 2014. *Icarus* 228:78-85.