

**ANNAMA H5 METEORITE FALL: ORBIT, TRAJECTORY, RECOVERY, PETROLOGY, NOBLE GASES AND COSMOGENIC RADIONUCLIDES.**

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A bright fireball appeared in the night sky over Kola Peninsula, close to Finnish border, on April 19, 2014. The strewnfield was computed from the observations by the Finnish Fireball Network and a calibrated video (Alexandr Nesterov in Snezhnogorsk, Russia). Two meteorites (120 g Annama I and 48 g Annama II) were found only about 100 meters from the predicted fall line on May 29 and May 30, 2014.

The accuracy of the observations allowed a precise geocentric radiant to be obtained, and the heliocentric orbit for the progenitor meteoroid to be calculated [1]. Analysis of the heliocentric orbit of the meteoroid suggests that the delivery of Annama onto an Earth-crossing Apollo type orbit occurred via the 4:1 mean motion resonance with Jupiter or the nu6 secular resonance, dynamic mechanisms that are responsible for delivering most meteorites studied so far. The pre-entry mass of the meteoroid was about 500 kg and corresponding radius around 32 cm.

Mineralogical and physical analysis of the main mass was done at the Czech Geological Survey and at the University of Helsinki, respectively. The meteorite was classified as H5 ordinary chondrite (S2, W0) [2]. Bulk density is 3.5 g/cm<sup>3</sup>, grain density is 3.8 g/cm<sup>3</sup>. Porosity is 5%. Magnetic susceptibility logarithm (in 10<sup>-9</sup> m<sup>3</sup>/kg) is 5.4 typical for fresh H chondrites.

Noble gas isotope analyses were done at the ETH from small chips of the Annama I meteorite. Annama is an H chondrite with a complex exposure history. The cosmic-ray exposure ages around 32, 41 and 52 Ma were determined from <sup>3</sup>He, <sup>21</sup>Ne and <sup>38</sup>Ar, respectively. U, Th-He age is 2.7-3.0 Ga and a K-Ar age corresponds to the age of the Solar System. Annama does not belong to the ~50% of H chondrites with 7-8 Ma cosmic-ray exposure age.

Short and medium-lived cosmogenic radionuclides were determined in the Laboratori Nazionali del Gran Sasso from Annama II meteorite. <sup>7</sup>Be, <sup>58</sup>Co, <sup>56</sup>Co, <sup>46</sup>Sc, <sup>57</sup>Co, <sup>54</sup>Mn, <sup>22</sup>Na, <sup>60</sup>Co, <sup>44</sup>Ti, and <sup>26</sup>Al cosmogenic radionuclides were detected. From <sup>60</sup>Co, <sup>54</sup>Mn and <sup>22</sup>Na ratios it was determined that Annama II is of shallow origin from the Annama asteroid.

**References:** [1] Trigo-Rodríguez J. M. et al. 2015. *MNRAS* 449: 2119-2127. [2] *MB* 104, 2015.