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Kuiper-belt objects and 26Al

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The Kuiper-belt object (KBO) thermal regime is studied during the process of object formation from the protoplanet cloud fringe region material at the early stage of the solar system creation. The formation process is divided into two different phases. At the first phase an “embryo” is formed by collision of planetesimals and adhesion. At the second stage a celestial body of current size and density is formed by the accretion of planetesimals. The matter of planetesimals is assumed to be primary raw material of the protoplanet cloud consisting of water ice and aluminosilicate solid particles. These particles carry atoms of long-lived radioactive isotopes 238U, 232Th, 40K, as well as short-lived isotope 26Al. At the initial time of the body’s formation its temperature is defined first of all by the radiation intensity of isotope 26Al, which depends on the isotope “age” and the KBO formation time. It is assumed the formation time may exceed several times the half-life of isotope 26Al. The thermal regime was studied for different KBO models either with water ice ("ice model") or without it ("dry model") by the example of KBO (20000) Varuna. It has been shown that if the body’s formation starts directly after the last nucleosynthesis event previous to the isolation of the protosolar nebular (the “age” of isotope 26Al is zero) the temperature in the KBO centre may reach 2500 Ê for the "dry model" and 600 Ê for the "ice model". If by the starting time of the KBO formation the “age” of isotope 26Al exceeds 3.5 times its half-life (3 million years), the temperature of body internal layers does not exceed 273 Ê during all the time of its formation for any model.