SANCTUARY "TEMPLE OF TIME" IN NORTHERN KHAKASSIA: MODELING LIGHT-AND-SHADOW PICTURE

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The results of the study of the archaeological monument of Tagar culture (VIII-III centuries BC) "Temple of time", located in Northern Khakassia, are described. The main purpose of the study was to obtain natural scientific evidence of the monument calendar significance, as well as that its construction was performed in accordance with the light-and-dark picture during the sunrise and sunset at the equinoxes and winter solstice. To modeling the annual illumination of the monument by the Sun, azimuth orientation, geodesic measurements, and astronomical calculations were performed. In addition, in order to clarify the details, the simulation of a solar beam with a total station laser beam was applied. The modeling results were confirmed by direct observations during the autumnal equinox and winter solstice, when photographs were taken with recording of the shooting moments for subsequent astronomical calculations. As a result, the importance of astronomical research methods and direct observations on astronomically significant days of the year in the study of such archaeological objects is justified. Using astronomical calculations, it is proved that the light-and-shadow picture observed on the monument in modern times is almost identical to the light-and-shadow picture in the Tagar epoch. Suggestions have been made for using laser scanning to model a light-and-shadow picture. The monument "Temple of Time" is a unique object, it is a complex spatial structure in accordance with the illumination on astronomically significant days of the year. The direction of the main axis of the monument to the rising Sun at the winter solstice is made with an error of no more than 1^0, which indicates that the ancient organizers of the monument knew astronomical dates well and solved a direct problem by direct observations of the Sun. Measurements, calculations, modeling and field observations confirmed the assumptions about its calendar significance of the monument's discoverer, doctor of historical Sciences V. E. Larichev.

Keywords: astroarchaeology, calendaristics, solstices and equinoxes, astronomical and geodesic methods in archaeology, light-and-shadow picture, laser scanning, 3D modeling

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