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Investigation of the Jupiter’s Galilean Moons

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Abstract : The purpose of the research is to investigate the surfaces of Jupiter's Galilean moons, namely which moon has the most uniform surface among them, what is the difference between the front (in the direction of motion) and the back sides of each moon's surface, as well as the temporal variations of the moons. Since 1981, the E. Kharadze National Astrophysical Observatory of Georgia has been conducting polarimetric (P) and photometric (M) observations of Jupiter's Galilean moons with telescopes of different diameters (40 cm and 125 cm) and the polarimeter ASEP-78 in combination with them and the latest generation photometer with a polarimeter and modern light receiver SBIG. As it turns out from the analysis of the observed material, the parameters P and M depend on α-the phase angle of the moon (satellite), L- the orbital latitude of the moon (satellite), λ- the wavelength, and t - the period of observation, i.e., P = P (α, L, λ , t), and similarly M = M (α, L, λ. , t). Based on the analysis of the observed material, the following was studied: Jupiter's Galilean moons: dependence of the magnitude and phase angle of the degree of linear polarization for different wavelengths; Dependence of the degree of polarization and the orbital longitude; dependence between the magnitude of the degree of polarization and the wavelength; time dependence of the degree of polarization and the dependence between photometric and polarimetric characteristics (including establishing correlation). From the analysis of the obtained results, we get: The magnitude of the degree of polarization of Jupiter's Galilean moons near the opposition significantly differs from zero. Europa appears to have the most uniform surface, and Callisto the least uniform. Time variations are most characteristic of Io, which confirms the presence of volcanic activity on its surface. Based on the observed material, it can be seen that the intensity of light reflected from the front hemisphere of the first three moons: Io, Europa, and Ganymede, is less than the intensity of light reflected from the rear hemisphere, and in the case of the Callisto it is the opposite. The paper provides a convincing (natural, real) explanation of this fact.

Keywords : Galilean moons, polarization, degree of polarization, photometry, front and rear hemispheres
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