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On detection and identification of marine films using optical images

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The importance of detection and identification of films on the ocean surface is connected with oil spills cased by oil mining and transportation. A method of film detection can be based on the analysis of the surface radiance reflected from slicks since the latter is varied due to strong damping of short gravity-capillary waves. The sea surface radiance is calculated using an optical model of wave imaging due to sky/sun light reflected from the sea surface and the radiance backscattered by subsurface water layers and real optical parameters of water and atmosphere for different optical wavelength. A model of damping of gravity-capillary waves on the water surface covered by an oil film of finite thickness is used to calculate the wave slope variations. Oil film characteristics are retrieved when comparing results of theoretical calculation and lab experiments. Model results on the relative variations of surface radiance as functions of optical wavelength, geometry of observation, wind velocity and film parameters are discussed. It is shown that the most favourable conditions for discrimination between biogenic and oil thin (the thickness less than 0.1 mm) and thick (1-1.5 mm) films correspond to the case when the sun light reflected from the sea surface is dominated. The work has been supported by RFBR (Project 07-05-00125a).