INFLUENCE OF FRICTION ON ICE FORCES ACTING AGAINST SLOPED SURFACES

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Abstract. On the basis of crushing and flexural failure theories, in conjunction with the assumption that ice–structure interface friction conforms to classical Coulomb friction laws, it is shown that effects of friction can be significant. Generally, the resultant force on the structure will increase very rapidly due to increases in the coefficient of interface friction. This increase in force is attributable to two analytically tractable phenomena; namely, that involving the resistance to sliding caused by the generation of tangential force at the interface, referred to as the primary effect, and that involving propagation of this primary-effect force into the ice failure zone increasing resistance to failure, referred to as the secondary effect.

Next, a non-classical theory of friction is reviewed. It admits the possibility of the coefficient of friction being a function of the normal force, velocity, and temperature for certain materials while still admitting Coulomb-type behaviour for other materials. Effects of replacing the classical theory with the non-classical one are considered, but it is concluded that further work is necessary before they can be realistically evaluated.

Finally, it is concluded that current design practice of neglecting the effects of friction on a certain class of structures is likely to lead to conservative results. Future work necessary to better predict the actual margin of safety resulting from current design practice is identified.

DISCUSSION

A. Frolov: What is your opinion about the role of a quasi-liquid layer (film) at the contact zone (friction boundary).

J. V. Danys: The main goal of the paper is to show that friction has significant influence on ice forces acting against sloped surfaces. Attention is being drawn to the fact that we do not have adequate knowledge of the effective friction coefficients. I do not feel that I can make, at least at the present time, a statement as to which theory of friction applies in this case. Actual laboratory and especially, field tests of friction on sloped surfaces are required. However, our conclusions are based on the "customary" Coulomb theory.

BREAKAGE OF ICE SHEETS BY UNDERWATER EXPLOSIONS

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Abstract. We have attempted to develop a theoretical understanding of the field experience on the destruction of floating ice sheets by explosives, by performing small-scale laboratory explosions and developing a theory based on the elastic plate. Glass spheres