



The b -value characterization of the critical sea-ice dynamics in the Arctic Ocean

A. Chmel (1), V.N. Smirnov (2), and S.M. Kovalev (2)

(1) Ioffe Physico-Technical Institute, Fracture Physics Department, St. Petersburg (chmel@mail.ioffe.ru), (2) Arctic and Antarctic Research Institute, 38 Bering str., 199397 St. Petersburg, Russia

A so-called b -value, which is generically derived from the Gutenberg-Richter law, is widely used for the energy release characterization in the earthquake [1] and rock fracture [2] studies. In the statistical interpretation, the energy distribution of geophysical events takes the form $N(> E) \propto E^{-b}$, where $N(> E)$ is the number of events with the energy greater than E . This approach is also applicable for the characterization of the large-scale sea-ice fragmentations occurring in the polar cap [3]. Since the sea-ice cover fragmentation in the Arctic Ocean is mainly determined by the sea-ice drift dynamics, the parameters of the energy exchange between moving sea-ice floes (including variations of the exponent b) in combination with the temporal fractal characteristics are potentially informative for estimation and, probably, prediction of the mechanical behavior of the ice-pack.

Here we present the results of the field observations and the remote sensing technique data related to the event of the multi-scale ice pack fragmentation occurred in the polar cap in February 2008 and registered (locally) at the Russian ice-research station North Pole 35 established on the pack, and (spatially) in the NOAA satellite images. The physical processes underlying the critical dynamics of the sea-ice motion prior to and during the sea-ice fragmentation of geophysical scale are discussed from the viewpoint of the energy conservation in the open system.

References

1. Enescu B. and Ito K. *Tectonophys.* 2001, 338, 297-314.
2. Zang, A., Wagner, F.C., Stanchits S., Dresen G., Andresen R. and Haidekker M.A. *Geophys. J. Intern.* 1998, 135, 1113-1130.
3. Chmel A. and Smirnov V.N. In: "The Pacific and Arctic Ocean: New Oceanographic Research" Ed. Kallen B. Tewles, Ch. 4. Nova Science Publishers, N.Y. 2008.