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Variability of scaling time series in the wind-forced sea ice drift in the Arctic Ocean

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A motion of an individual ice field in the Arctic Ocean was monitored at the Russian research station North Pole 35 established on the ice pack in 2008. The ice field velocity (V) was found to be correlated with wind velocity (v) in main features, such as the positions of maxima and minima of V and v. However, the fine structure of the V-variation cannot be explained by the wind forcing only. There were periods of time when the field drift was highly affected either by the tidal activity or by the interactions of ice sheets between each other. These data were put in comparison with the "waiting times" statistics that is with the distributions of lengths of time intervals between subsequent important local accelerations of the ice field, which were measured in several time windows differing in the average wind velocity and/or the mechanical state of the ice pack. The distribution functions $N(> \tau)$ (N is the number of successive events of accelerations separated by the time interval that exceeds τ) constructed in different time windows demonstrated predominantly fractal or multifractal nature but were truly random in the case of highly fragmented sea-ice. The latter result evidences the existence of a relationship between the long-range mechanical interactions in the pack and long-term memory (time scaling behavior) of wind-forced sea ice motion.