THE CONDITIONS OF FORMATION OF THE MOST DANGEROUS CLEAR ICE DEPOSITS ON THE OKHOTSK SEA COAST

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Rain ice-hoarfrost deposits belong to weather phenomena which substantially influence mechanical solidity of building objects. First of all, on airline communications and electricity transmissions, various wind-energetic and hydraulic engineering facilities were erected near coasts.

The present work tries to generalize the results of research the climatic characteristics of rain-ice deposits, and synoptic conditions of their formation on coast of the Okhotsk Sea as well. The similar information is one of the basic means of preparing a miscellaneous kind of the methodical recommendations and manuals necessary for maintenance of research work on coast and near-shore area.

From all the kinds of the land ice accretion on the Okhotsk Sea coast the most loading are caused by clear ice deposits and iced sleet. Climatic and synoptical conditions, most favorable for depositing are frequently formed in transitional seasons. In spring months (March-May) they are more frequent at all the stations. On the north-east and south-west coast there is a great repetition of the most dangerous ice deposits in November-December.

The intensive ice deposits, as a rule, are formed under the influence of cyclonic activity. It is assigned five types of cyclone trajectory affecting the Okhotsk Sea coast during the icing season namely: north - western, western (two subtypes), south-western and southern ones. The average duration of the existence of different kinds of cyclone is about 3 days. Maximum value of on ice deposit (up to 1.0 kg/linear meter) is observed under western and south-western cyclones. Types of cyclone trajectory are represented in Fig. 1.

With reference to a problem of hydrometeorologic maintenance of building, the problem of research of ice-hoarfrost phenomena is of interest in two aspects. The first one is research of climatic characteristics in particular: spatial-temporal distribution, repeatability of deposits values, their intensity, and also meteorological mode accompanying them (air temperature, velocity and direction of wind, atmospheric phenomena). On the other hand, one of conditions of improving the quality and decreasing the cost of building is the application of the most rational norms.

On the whole characteristics of icing deposits (kind, weight, duration) are mainly determined by peculiarities of atmospheric processes development in a concrete specific winter and character of terrain relief. The analysis of repeatability of deposits values of various kinds of atmospheric ice has shown that in overwhelming majority of cases they do not exceed 0.08 kgs/linear meter (Table 1). The considerable deposits (more than 0.2 kgs), as a rule, were determined during emergency situations with electricity transmissions.

The average duration of ice incrustation varied within 8-10 hours and icing, *i.e.* ice intact on wires within 12-19 hours. Maximum duration of icing makes together 122 hours.

In the most of cases considerable clear ice deposits are formed under temperature from 0 to 2 °C minus while winds of eastern quarter of horizon are registered at all the stations.

About 70% of occurrences of the considerable ice deposits were observed under wind speed of up to 10 m/s (Table 2). There is a lot of repetitions of northern and north-western winds on the western and south-western coast (Fig. 2).

The special climatic characteristic, elaborated directly for building design, is the wall thickness of icing (в), which is reckoned by weight or deposit diameter /Methodical…/. During last years the above specification was repeatedly updated. Increasing number of observations, perfection of indirect methods of reckoning and account of micro- and meso-climatological conformities to natural laws of distribution of icing deposits were taken into consideration and scaling ratios of ice loading from a wire of the icing machine tool on working designs were updated.

The number of icing regions and values of reckoning walls of icing corresponding to them is shown in Table 3.

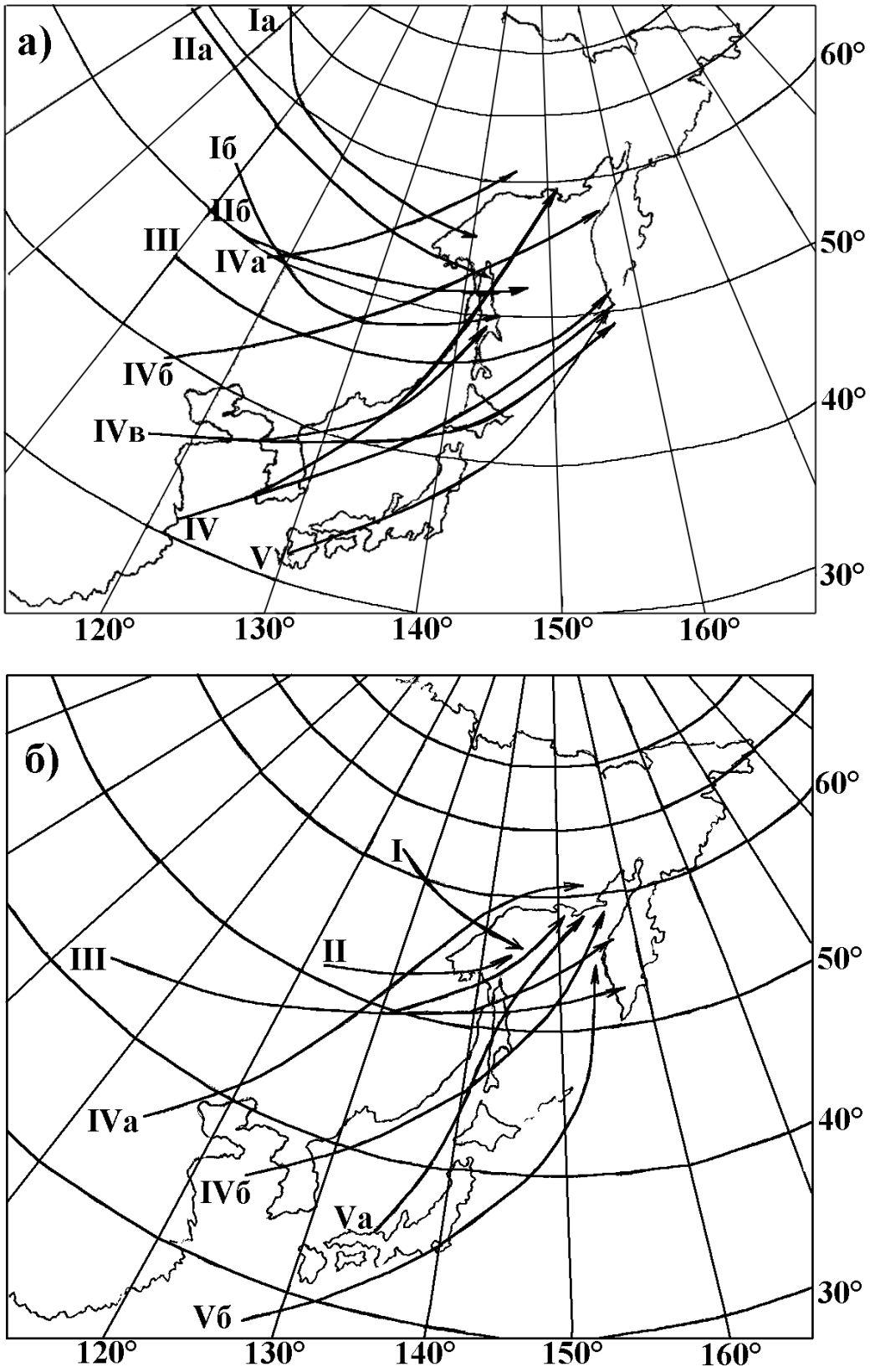

Fig. 1. Types of cyclone trajectory: (a) winter process (b) spring process

Table 1

Deposits repeatability (%) of different intensity

Station	Mass deposits, kgs/linear meter			
	0.02-0.08	0.081-0.2	0.2-0.4	> 0.4
Gizhiga	100			
Sobolevo	79	14	7	
Bolsheretsk	80	20		
Baydukov	70	10	10	10
Okha	67	17	8	8
Nogleek	50	25		25
Vladimirovo	50	10	20	20
Poronaysk	17	17	33	33
Makarov	50	28	11	11
Magadan	78	11	11	
Okhotsk	30	30	30	10
Ayan	40	7	33	20
Vzmorje	43	44	4	9
Starodubsk	55	19	13	13

Table 2

Repeatability of speed (%) and calms at the maximum value of deposits on wires

Station	1-5	6-10	11-15	> 15	Calm
Gizhiga	90				10
Sobolevo	43	13	25	6	13
Bolsheretsk	40	20	20	10	10
Baydukov	30	30	20	10	10
Okha	36	40	8	8	8
Nogleek	50	25			25
Vladimirovo	50	30	10		10
Poronaysk	34	34	16	12	4
Makarov	60	30	4	2	4
Magadan	40	30	15		15
Okhotsk	40	20	20	10	10
Ayan	24	24	26	13	13
Vzmorje	44	26	9	9	12
Starodubsk	40	39	14	7	

Table 3

Reckoning equivalent thickness icing wall with repetition once in 25 years ($\hat{a}_{25}$), mm

Areas	I	II	III	IV	V	VI	VII
$\hat{a}_{25}$	10	15	20	25	30	35	> 35

The reckoning of icing wall thickness on the Okhotsk Sea coast is made according to data of instrumental observations of 34 coastal and island stations, and also information about accident rate on EL. Large extent of researching region, differences in a thermal mode of washing waters, relief diversification and the peculiarities of atmosphere circulation's are the condition of complex character of icing-hoarfrost phenomena distribution.

On the whole there were registered considerable clear ice on the coast corresponding to IV-VII areas of ice accretion reckoning to equivalence of icing wall thickness to the repetition once in 25 years.

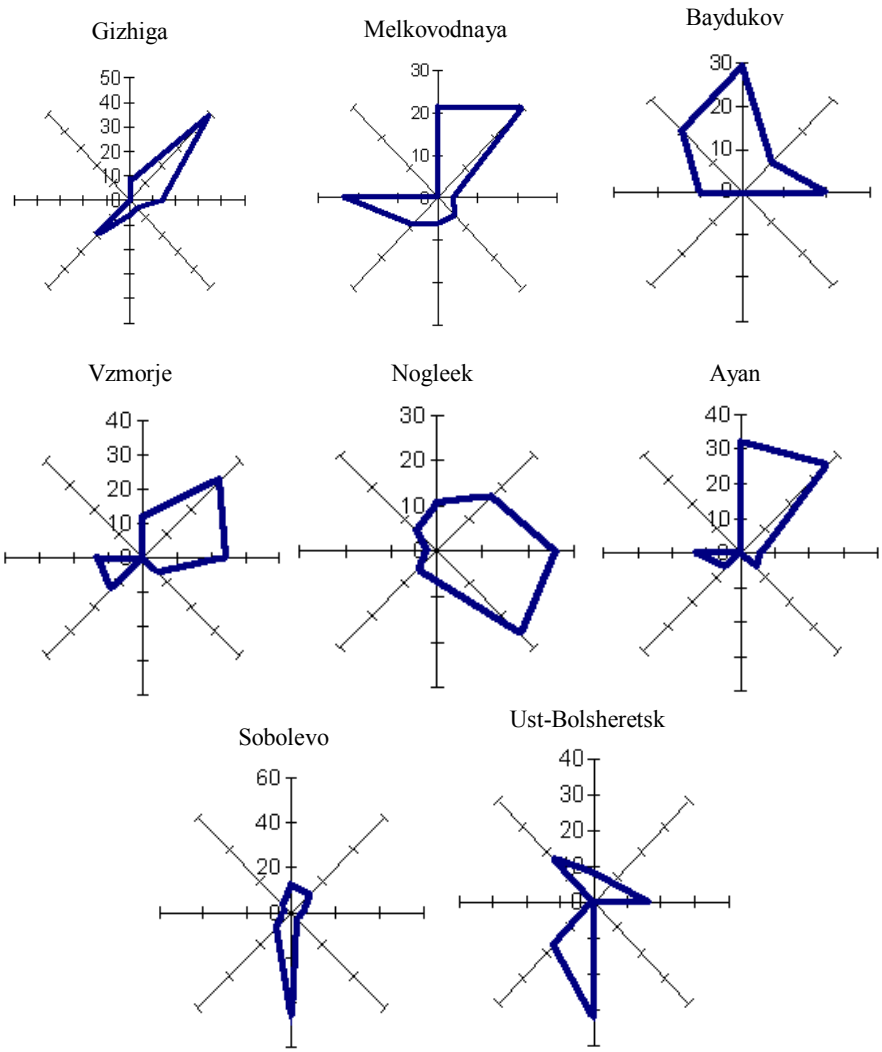

Fig. 2. Repeatability direction of wind (%) of the maximum value of deposits on wires

The fourth normative region ($â_{25}$ =25 mm), including extensive area of coast, is divided in – the north-eastern one located on the northern coast of the Okhotsk Sea from Gorka Cape (Magadan area) and further on all the western coast of Kamchatskiy Peninsula; and the southwestern one covering area of Khabarovsk Territory from Tchoomikan settlement up to Lazarev settlement, and also north-eastern, northern and northwestern (up to Lunskiy Bay) coast of Sakhalin.

The fifth icing region ($â_{25}$ =30 mm) is distinguished on a narrow coastal line from Lunskiy Bay up to Belinsgauzen Cape.

The ice loads corresponding to the sixth region ($в_{25}$ =35 mm) are observed on the Shantarskie islands, on the eastern coast of Sakhalin: from Belinsgauzen Cape up to Vzmorje settlement.

Two segments of coast are referred to as the seventh region, with maximum observed values of deposit (more than 35 mm): the western one – from Gorka Cape (Magadan area) up to Tchoomikan settlement (Khabarovsk Territory) and the southwestern one - coast of Sakhalin from Vzmorje settlement up to Krilion Cape.

References

1. Methodical information on construction of regional map of reckoning icing loading. 1985 / Moscow: Glavtechupravlenie Minenergo. 49 pp.