

# LAKE BAIKAL





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# Air self-purification potential in Baikal trough

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# Lake BAIKAL



- ❑ Russian national treasure and UNESCO World Heritage Site
- ❑ a fifth of the world's unfrozen freshwater body
- ❑ Deepest (1,640m) and oldest (25 million years) freshwater lake
- ❑ 23.000 cubic kilometers of water volume (more than in the Baltic Sea)



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# Algae

*Cyclotella minuta* Ant.



«GOOD»

*Dinobryon bavaricum* Imh.



«BAD»

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# Baikalsk paper and pulp mill



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The following tasks were posed in the research:

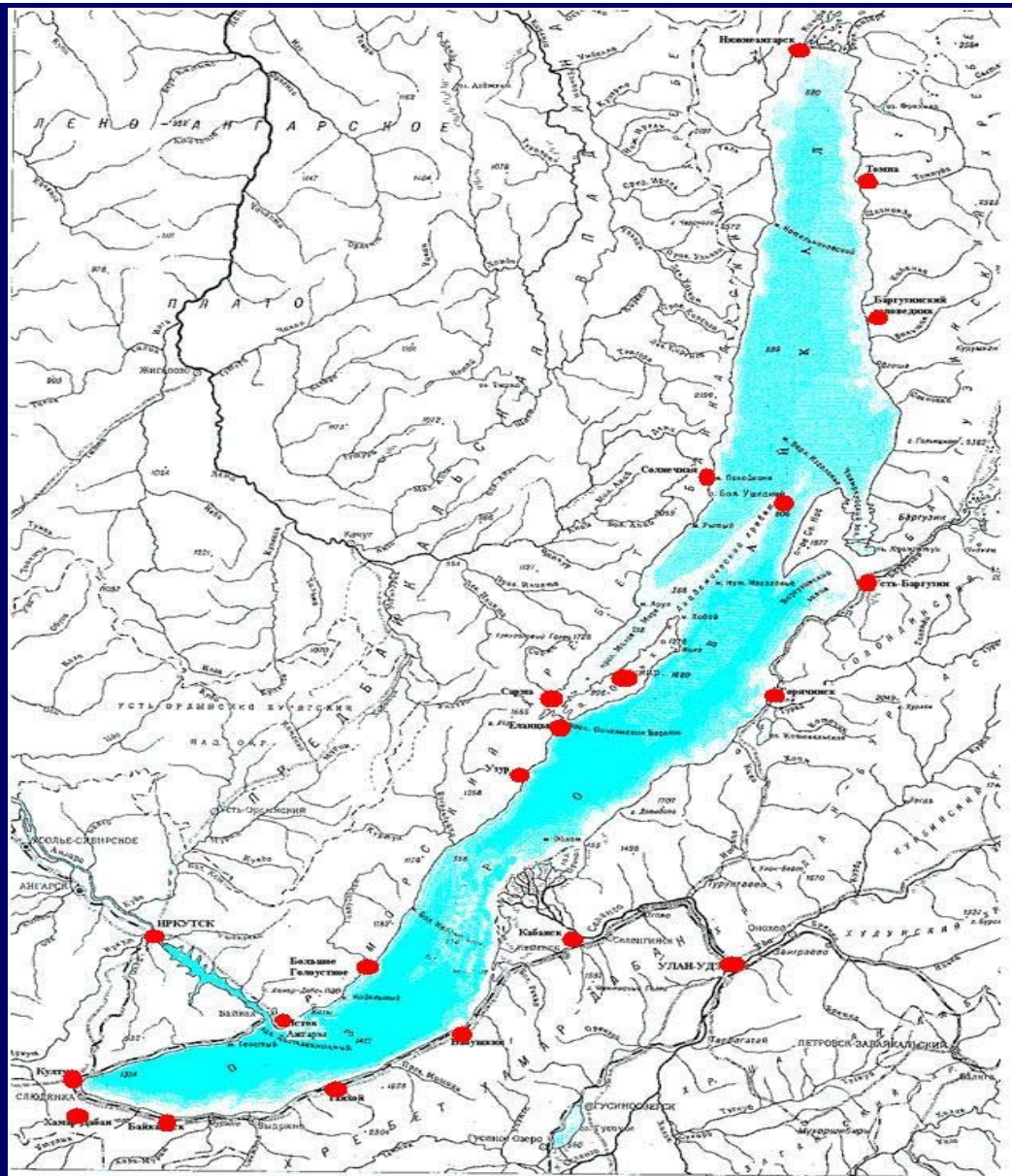
- to collect data of wind direction and velocity;
  - to analyze data obtained by methods of mathematical statistics;
  - to build climatic dispersion ellipses of wind flow to estimate air self-purification potential.
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Location of  
monitoring  
weather stations



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The following parameters were obtained for each item of observations:

- average values of scalar components of wind velocity vector determining the ellipse center;
- standard deviations characterizing the degree of scattering;





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The following parameters were obtained for each item of observations:

- correlation coefficient between components of wind velocity vector;
- wind resistance coefficient;
- ellipticity of dispersion.

# Formulae used in the research:

Standard deviations:

$$\sigma_u = \sqrt{\frac{1}{n} \sum_{i=1}^n (u_i - \bar{u})^2}$$

$$\sigma_v = \sqrt{\frac{1}{n} \sum_{i=1}^n (v_i - \bar{v})^2}$$

Wind resistance coefficient :

$$q = \frac{V_r}{V_s}$$

$V_r$  – a module of average resultant wind velocity vector;

$V_s$  - average scalar wind velocity

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Ellipticity of dispersion:

$$L = 2\sigma_u\sigma_v\sqrt{\frac{1-r^2}{\sigma_u^2 + \sigma_v^2}}$$

Correlation coefficient:

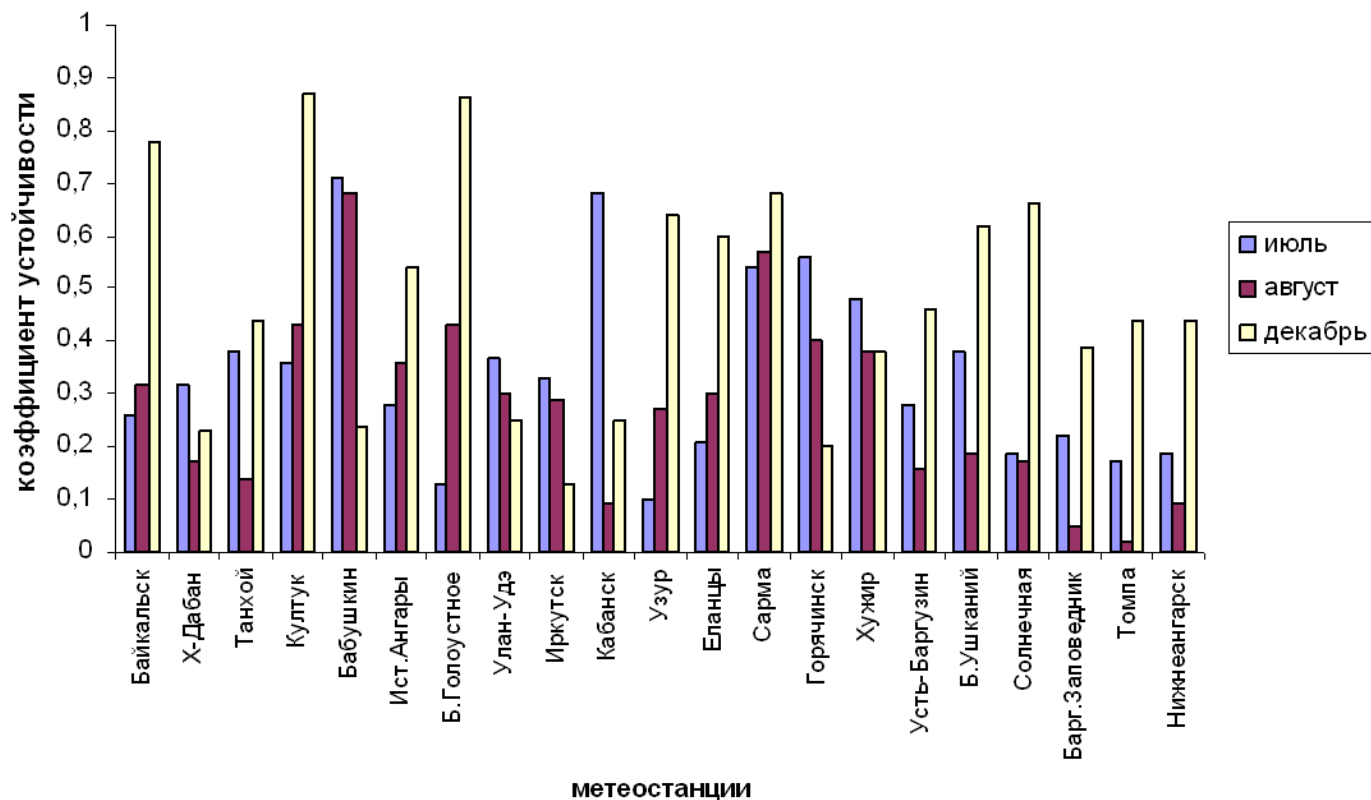
$$r = \frac{1}{n\sigma_u\sigma_v} \sum_{i=1}^n (u_i - \bar{u})(v_i - \bar{v})$$



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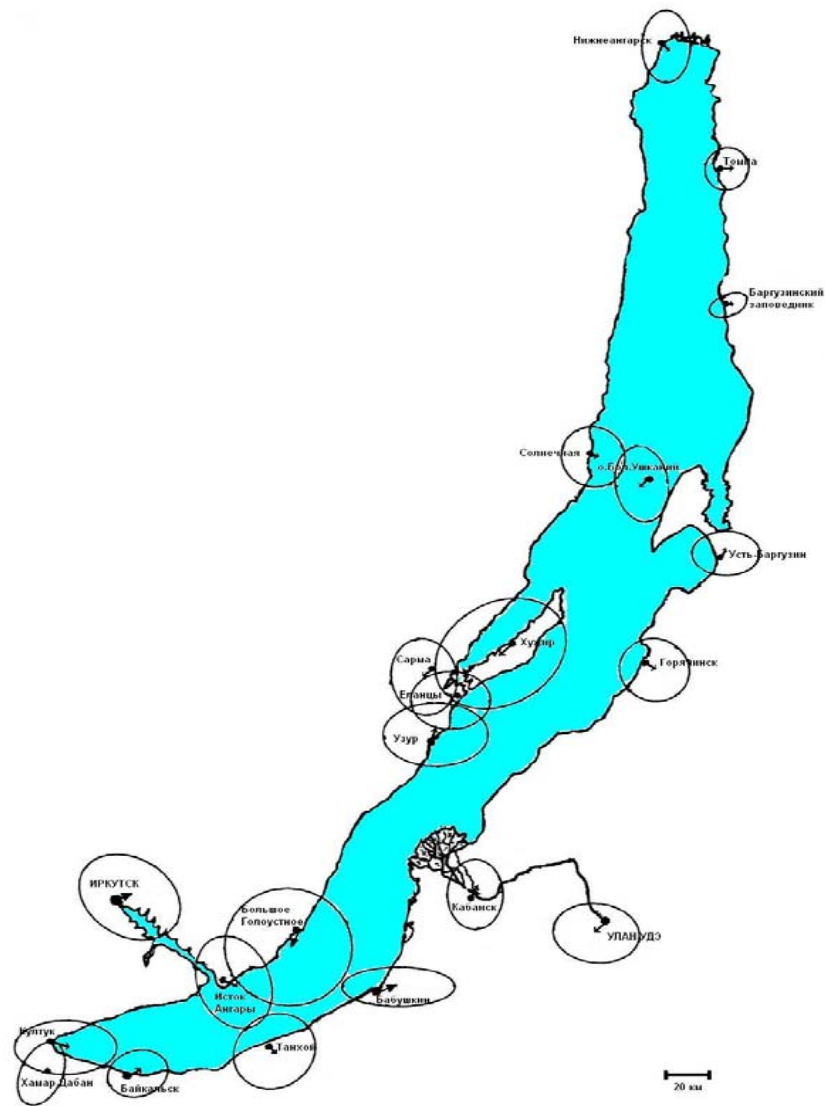
## Distribution of wind resistance coefficient at stations on Lake Baikal from south to north



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# Climatic dispersion ellipses of wind flow, August

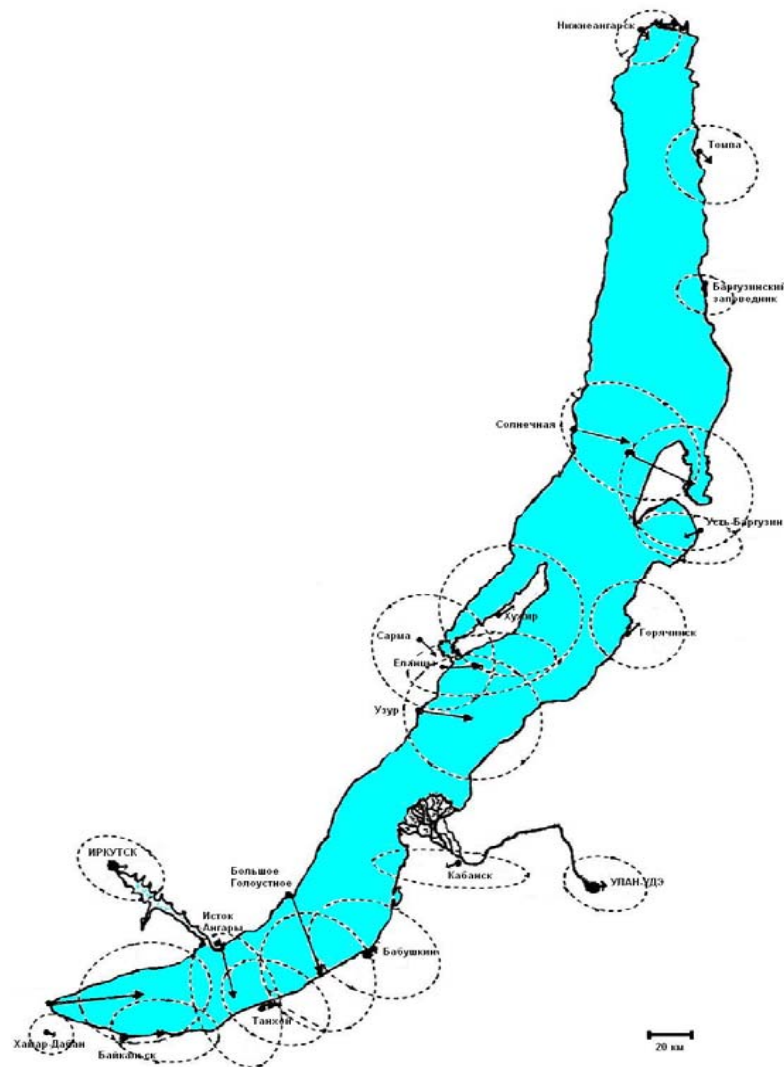




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# Climatic dispersion ellipses of wind flow, December



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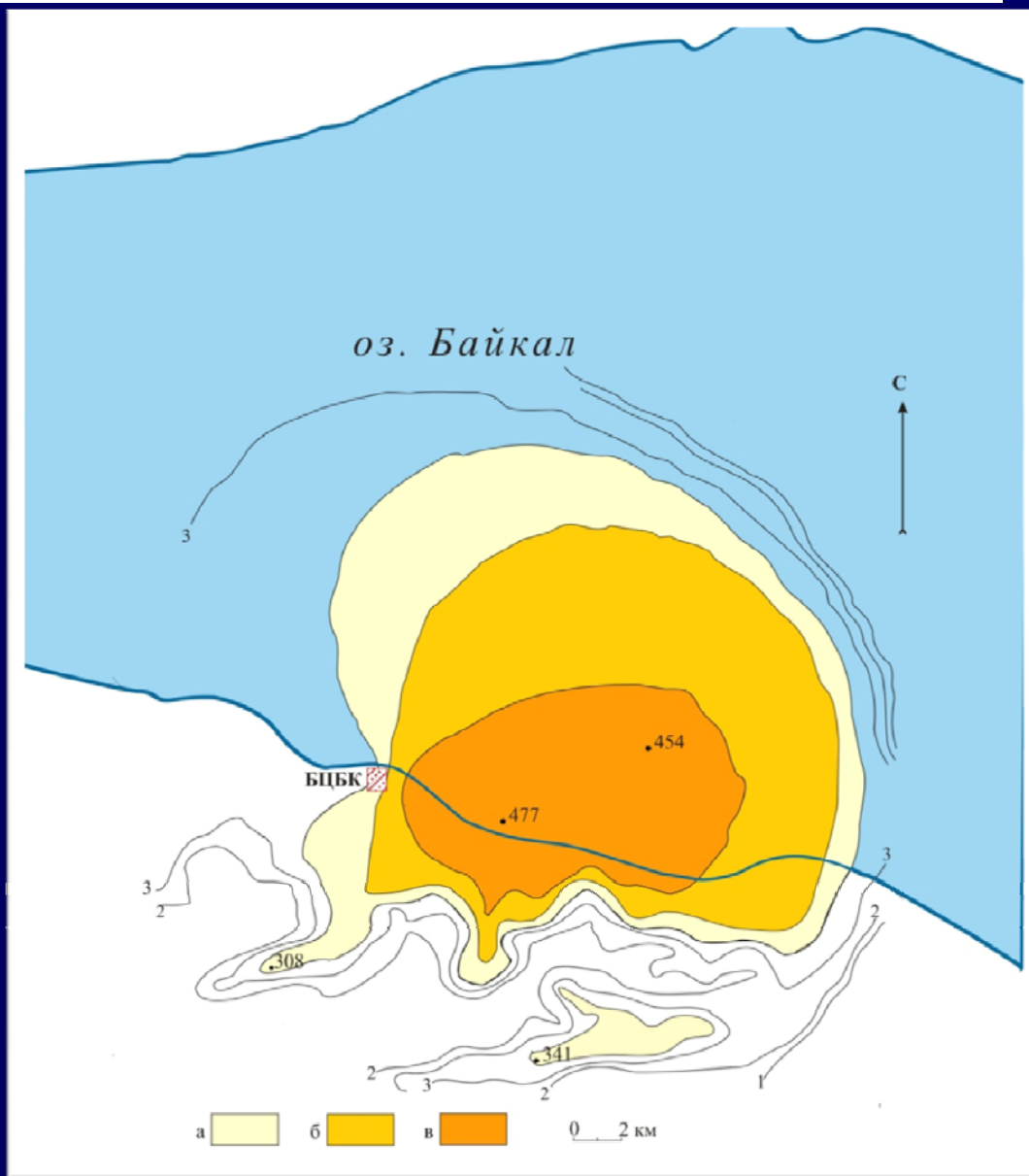
**Climatic dispersion ellipses of wind flow give a qualitative picture of the potential of air self-purification and reasonably help consider some variants in calculations.**



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Excess frequency of 20  
maximum permissible  
concentration of  
methylmercaptan in area  
Baikalsk paper and pulp  
mill in July.  
The probability of excess  
not less:  
а – 0.4, б – 0.5, в – 0.6.



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**Thank you for your attention!**

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