Gorky reservoir slope stability assessment

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Hydrogeology assessment

The Upper Volga, 5 reservoirs:

1. Ivankovskoe,
2. Uglich resercoir,
3. **Rybinsk reservoir,**
4. **Gorky reservoir,**
5. **Cheboksary reservoir**

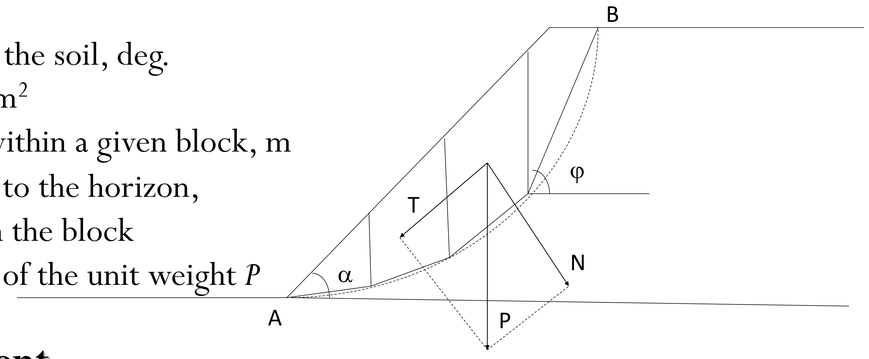
Reservoir	Gorky	Rybinsk	Cheboksary
Square, km2	1590	4580	2190
Volume, km3	8,71	25,5	13,85
Mean depth, m	3,65	5,5	6
Relief	low-lying, slightly hilly plains	low-lying areas, moorland	elevated right bank and lowly left bank
Height above sea level, m	84	102	63
Climate	temperate continental	temperate continental	temperate continental
Mean January temperature	(-15,9) ° – (-8,2) ° C	(-15,8) ° – (-8,2) ° C	(-10) ° – (-12) ° C
Mean July temperature	(+12,5) ° – (+23,7) ° C	(+12,5) ° – (+23,5) ° C	(+18) ° – (+21) ° C
Annual rainfall, mm	550-600	550-620	530-580
Soils	Sod-podzolic	sandy, marshy	predominantly sandy
Intensity of an erosion processes	weak	very mild to moderate	weak to very intense
Activation of accompanying processes (on a 5-point scale, 5 - the highest possible rating)	swamping (3), planar washout (2), linear erosion (2)	swamping (5), planar washout (2), linear erosion (2)	planar washout (4), linear erosion (4), gravity processes
The displacement of beach scarp edge on the active sites of processing, m/year	0,5-0,8	insignificant	Less than 0,5
The volume of eroded rocks, m3 / m	5-6	insignificant	0,5-2

The most probable time of exogenous geological processes activation in the reservoirs basins is the spring snowmelt (April-May) and autumn rainfall peak (July-September). These periods are usually expected to be low activity of shoreline collapse and retreat, wave and wind erosion .

Slope stability estimation

Round cylindrical surfaces method

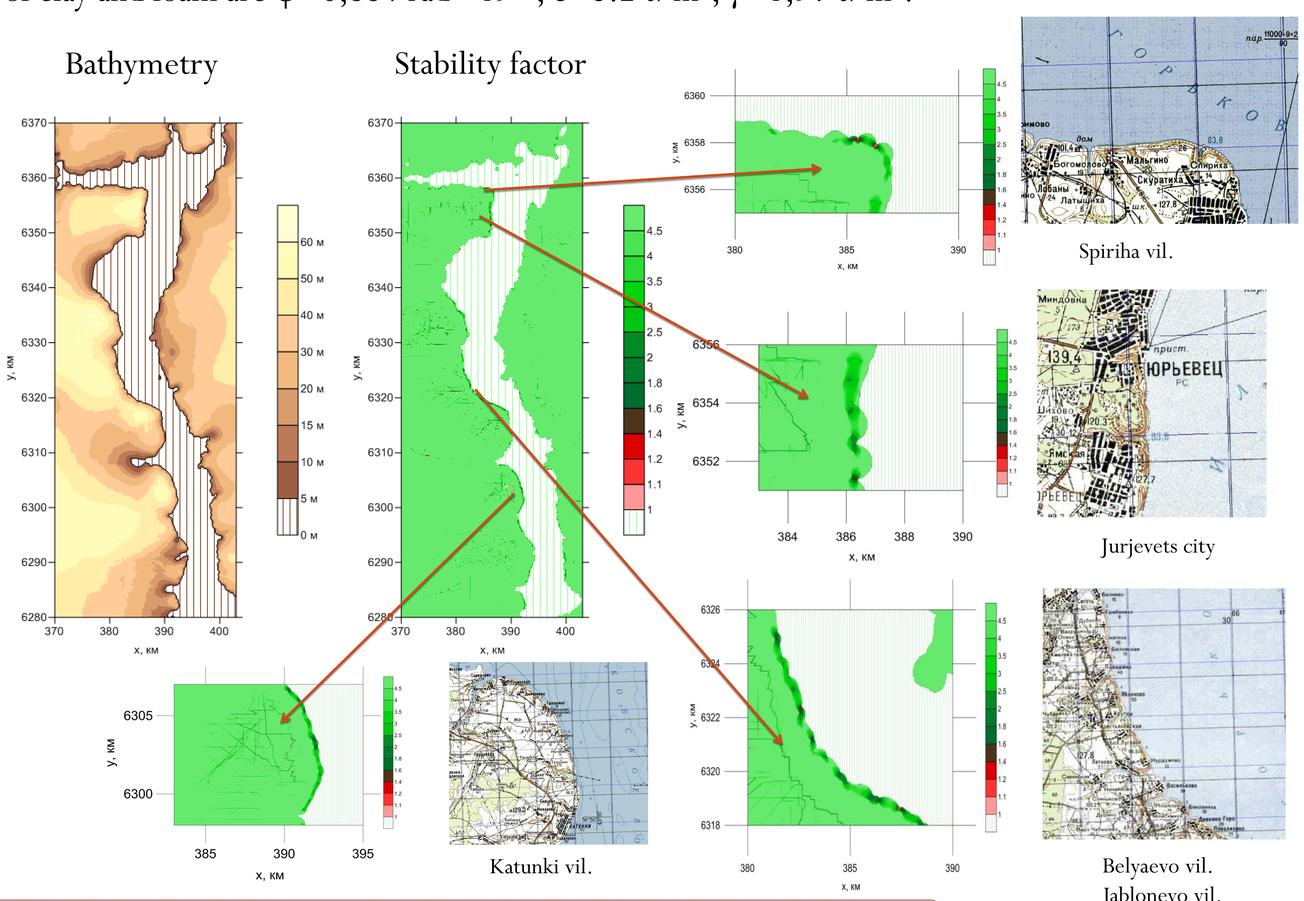
φ - angle of internal friction of the soil, deg.
C - specific cohesion of soil, t/m^2
l - the length of an arc sliding within a given block, m
α - the block slip surface angle to the horizon,
$T=P\sin\alpha$ - shear force acting on the block
$N=P\cos\alpha$ - normal component of the unit weight *P*



Stability factor coefficient

$$n = \frac{M_{specific}}{M_{shear}} \qquad n = \frac{\sum N_i \operatorname{tg}\varphi_i + \sum C_i L_i}{\sum T_i} = \frac{\sum P_i \cos\alpha_i \operatorname{tg}\varphi_i + \sum C_i L_i}{\sum P_i \sin\alpha_i}$$

The average values typical for the region, the values for medium-grained sands with thin layers of clay and loam are φ=0,334 rad ≈19 °, c=5.2 t/m^2, γ=1,97 t/m^3.



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