

Tel avis iakob gogebaSvil is
saxel obis saxel mwifo universiteti

Eel izbar el izbaraSvil i

bunebis (amindis) saSiSi
movl enebi
(sal eqcio kursi)

Tbilisi
2010

haeris da niadagis temperaturiT ganpirobetul i amindis saSiSi movl enebi. maRal i da dabal i diskomfortul i temperaturebi

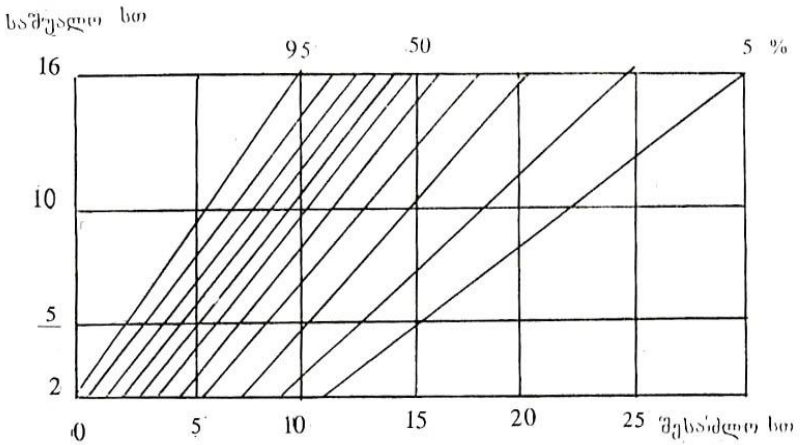
eqstremal urad maRal i da dabal i temperaturebi uaryofiT gavlenas axdens adamiანis organizmze teqnikis mraval saxebaze, samSeneblo masal ebze, rkinigzis transportze da sxv., xolo Tu haeris temperatura uaxlo vdeba adamiანis sxelis temperaturas, is mavne gavlenas axdens mis j anmrTel obaze. aseTi temperaturebis uaryofiT gavlenis efeqti miT metia, rac metia maTi uwyveti xangrZl ivoba.

maRal i temperaturebis xangrZl ivobis ganawil eba teritoriaze ganpirobetul ia radiaciul i reJimit, atmosferos cirkulaciis TaviseburebebiT da adgil obrivi orografiul i pirobetiT. SaviZRvispireTSi aseTi temperaturebis xangrZl ivoba ar aris didi, zRvidan daSorebisas xangrZl ivoba matul obs da maqsimums kol xetis baris Sida raionebSi aRwevs(cxril i 1, nax. 1).

cxril Si tire aRniSnavs, rom maRal i temperaturebi ar daikvirveba, an maTi xangrZl ivoba ar aRwevs 1 saatS. cxril idan gamomdinareobs, rom im periodebis horizontal uri gradienti, rodesac temperatura aRemateba 30⁰-s gacil ebiT metia, vidre im periodebisa, rodesac temperatura aRemateba 35 da 40⁰-s. es imiT aixsneba, rom 30⁰-ze maRal i temperaturebis xangrZl ivoba sanapiroze swrafad kl ebul obs, vidre zRvidan daSorebul adgil ebSi. 40⁰-ze maRal i temperaturebi ki sanapiroze praqtikul ad



nax.1. მაჩალი დისკომფორტი დ ტემპერატურის (30° დამეტი) უწყვეტი ხანგრძლივობა. საათი



nax.2. სხვადასხვა uzrunvel yofis maRal i diskomfortul i temperaturebis uwyveti xangrZl ivobis gamosaangari Sebel i nomograma

ar aRini Sneba, an wel iwadSi mxol od ramodenime saaTs gastans (e.el izbaraSvil i, z.WavWani Ze,1992). Tu ra fargl ebSi icvl eba 30⁰-ze maRal i temperaturebis xangrZl ivoba misi fiqsirebul i saSual o mniSvnel obis dros SeiZl eba vimsj el oT nomogramidan(nax.2). magal iTad, Tu faqtobrivi monacemebiT 30⁰-ze maRal i temperaturebis xangrZl ivoba icvl eba 2-dan 10saaTamde, nomogramidan gamomdinare aseTi periodebis mosal odnel i xangrZl ivoba icvl eba 0-dan 22saaTamde.

cxrili i.1. maRali temperaturebis (°C) saSualo
 uwyveti xangrZi ivobasaaTi

(Э.Ш.Элизбарашвили, Н.Ш.Гонгладзе, 1980)

punqti	ivnisi		ivlisi			agvisto		
	>30	>3 5	>30	>3 5	>4 0	>30	>3 5	>4 0
soxumi	4	2	5	3	-	5	3	-
baTumi	3	2	4	2	-	4	3	-
quTaisi	8	6	11	6	4	13	7	4
wyaltu bo	9	5	10	6	3	12	6	4
senaki	7	3	8	4	-	8	4	-
tyibuli	4	2	5	2	-	6	3	-
mestia	1	-	3	-	-	3	-	-
axalqa l aqi	1	-	2	-	-	3	-	-
Tbilisi	6	4	9	6	-	8	7	-
duSeti	4	-	5	-	-	5	-	-
Telavi	5	2	7	2	-	7	3	-

uaryofiti temperaturebis dros adamiანis
 organizmsi mravali fiziologiuri procesi
 irveva. aseTi pirobebis sitburi komfortis
 Sesafaseblad samedicino klimatologiaSi
 gamoiyeneba sxvadasxva macvenebeli, maT
 Soris yvelaze gavrcelebulia bodmanis
 "simkacris" indeqsi:

$$S=(1-0,04T)(1+0,272V), \quad (1)$$

sadac T-haeris temperaturaa, V-qარის სიყვარა.

bodmanis formula მირეულია
 eqსperimentulad, sadac adamiანis gamartivebul

model ad CaTvl il i iyo wyl iT gavsebul i WurWel i. cxadia, rom aseTi modeli ar iTval iswinebs adamianis fiziologiur Tvisebebs, ris gamoc man v.adamenkos(1979) samarTl iani kritika daimsaxura. v.adamenkom simkacris dasaxasiaTebI ad Semoitana dayvanil i temperatura, romel ic iTval iswinebs adamianis siTbur reJimze meteorologiuri faqtorebis gavl enas, adamianis metabol izms da siTboproduqcias:

$$Q=T-8,2\sqrt{V} \quad (2)$$

sadac Q-dayvanil i temperaturaa, T-haeris temperaturaa, V-qaris siCqarea.

man daasabuTa dayvanil i temperaturis sazRvrebi, rodesac xdeba diskomfortul i pirobebis intensivobis Seavl a:

$Q > -20^{\circ}$ **-komfortTan axl os;**

$-20^{\circ} > Q > -27^{\circ}$ **_susti diskomforti,**

SezRudul ia adamianis yofna Ria cis qveS;

$-27^{\circ} > Q > -33^{\circ}$ **_zomieri diskomforti,** irRveva

sisxl is mimoqceva sxelis qsovil is Ria nawil ebSi;

$-33^{\circ} > Q > -38^{\circ}$ **_Zl ieri diskomforti,** iwyeba

sisxl is mimoqcevis srul i Sewyveta da hipoTermia;

$-38^{\circ} > Q > -40^{\circ}$ **_mkacri diskomforti,** zRudavs

xanmokl ed yofnasac ki haerze special uri zomebis miRebis gareSe.

cxril Si 2 warmodgenil ia ianvris Tvis haeris temperaturis, qaris siCqaris da maT safuZvel ze gaangariSebul i dayvanil i temperaturebis mniSvnel obebi saqarTvel os

zogierTi punqtisaTvis. amave cxril Sia
motanil i bodmanis indeqsebi.

cxril is Tanaxmad jvris uRel texil ze,
sadac haeris temperatura minus 11⁰-ze nakl ebia,
iqmneba susti diskomfortis pirobebi, maSin
rodesac mTa-sabueTSi da cxrawyaroze, sadac
temperatura mniSvnel ovnad metia, iqmneba
zomieri diskomfortis pirobebi, rac

cxrili. 2. ianvris Tvis siTburi diskomfortis
maCvenebl ebi (m.el izbaraSvil i, 1999)

punqti	T^0	V_m/w_m	Q^0	Ddiskomfortis xarisxi	S
Mmamisoni s uRel texi li	-12,0	6,6	-32	zomieri	4,13
jvris uRel texi li	-11,4	2,2	-24	susti	2,32
Ggagris qedi	-3,9	4,2	-23	susti	2,46
gudauri	-6,7	1,5	-19	komfortTan axl os	1,79
kobi	-0,8	1,7	-20	susti	1,93
fasanaur i	-4,1	0,9	-11	komfortTan axl os	1,44
Sovi	-5,6	1,1	-13	komfortTan axl os	1,59

mestia	-6,0	0,6	-15	komfortTan axl os	1,44
Yyazbegi, maRal mTi ani	-15,0	7,0	-35	Zl ieri	4,64
omal o	-9,1	0,8	-18	komfortTan axl os	1,66
mTa- sabueTi	-3,9	8,8	-30	zomieri	3,90
baxmaro	-5,2	3,0	-21	susti	2,20
bakuriani	-7,2	2,2	-19	komfortTan axl os	2,06
cxrawyaro	-10,9	6,8	-32	zomieri	4,07
axal qal a qi	-7,2	3,7	-25	susti	3,52

gamowveul ia jvris urel texil ze qariz dabal i siCqariT.

diskomfortul i pirobebi maRal mTian zonaSi TiTqmis mTel i wl is ganmavl obaSi daikvirveba. ase magal iTad, maRal mTian yazbegSi Zl ieri diskomforti ianvris garda aRiniSneba dekemberSi, Teberval sa da martSi. oqtomberSi, noembersa da april Si diskomfortis intensivoba ramdenadme sustdeba da zomier xasiaTs Rebul obs. zomieri diskomfortul i pirobebi mamisonis uRel texil ze da cxrawyaroSi grZel deba dekembri dan martis CaTvl iT, Semdeg ki yal ibdeba susti diskomforti.

unal eqo periodebi da gval va

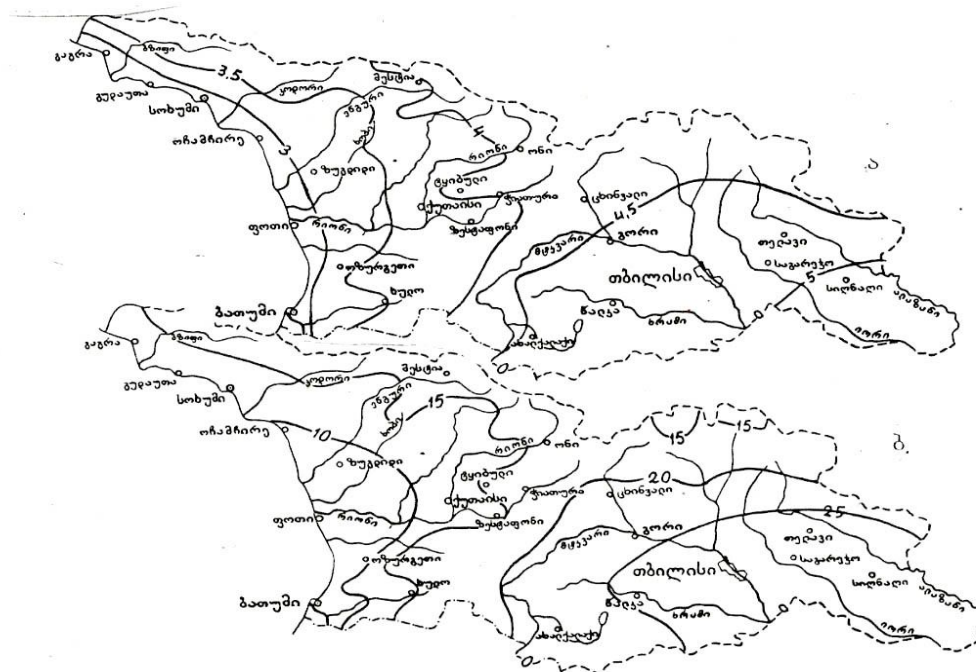
nax.3-ze warmodgenilia wl is Tbil i periodis ganmavl obaSi unal eqo periodebis ganawil ebis rukebi. uwyveti unal eqo periodi, rodesac dRe-Ramuri nal eqebis jami ar aRemateba 10mm-s saqarTvel os teritoriaze icvl eba 10-25 dRis fargl ebSi, minimumiT aWaraSi, xol o maqsimumiT aRmosavl eT saqarTvel oSi (gardabnis, dedofl iswyaros, gurj aanis, sagarejos, axal qal aqis raionebi). rodesac dRe-Ramuri nal eqebis jami ar aRemateba 0,1mm-s unal eqo periodis xangrZl ivoba mcirdeba, Tumca ZiriTadi eqstremumebis zonebi SenarCunebul ia.

cxril Si 3 warmodgenilia cxvadasxva xangrZl ivobis unal eqo periodis ganmeoradobebi saqarTvel os gansxvavebul fizikur-geografiul pirobebSi ganl agebul i punqtebi saTvis.

cxrili 3 sxvadasxva xangrZi ivobis unal eqo periodis ganmeoradoba.%. a)-nal eqebi 0,1mm-ze nakl ebi an toli; b)- nal eqebi 5mm-ze nakl ebi an toli; g)- nal eqebi 10mm-ze nakl ebi an toli

(e.el izbaraSvili, z.WavWaniZe,1992)

punqti	gradacia	unal eqo periodis xangrZi ivoba					
		1-3	4-5	6-10	11-15	16-20	21-25
Tbilisi	a	54	16	20	5	5	-
	b	36	8	20	20	10	6
	g	10	20	25	20	5	10
baTumi	a	69	14	10	5	2	-
	b	51	16	20	10	2	1
	g	40	16	20	15	6	3
Qqutaisi	a	62	16	15	5	1	1
	b	39	14	25	10	10	1
	g	35	16	16	16	10	2
axalqal aqi	a	69	10	15	6	-	-
	b	15	14	30	20	16	4
	g	10	10	10	15	15	20
Telavi	a	71	18	10	1	-	-
	b	35	20	3	5	10	-
	g	30	18	25	15	5	5
Yyazbegi, maRal mTiani	a	66	16	15	2	1	-
	b	45	12	30	10	3	-
	g	18	10	30	10	15	10



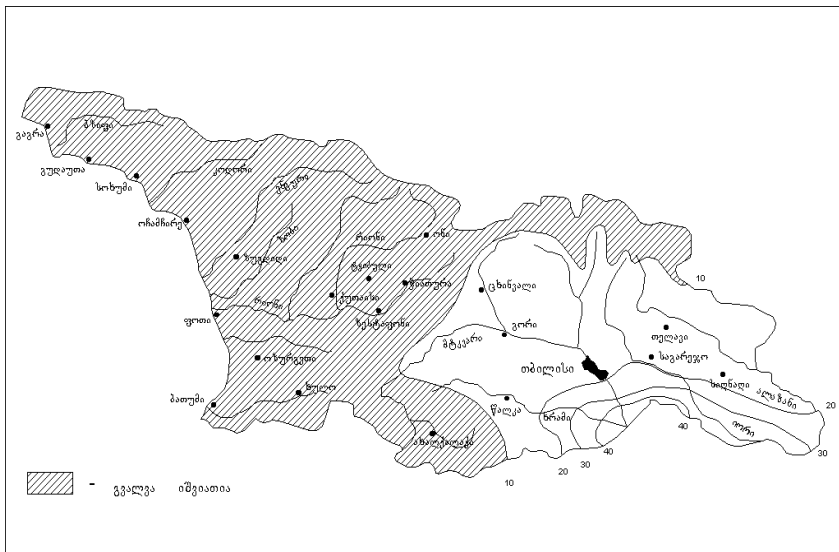
nax.3. unal ego periodebis uwyveti xangrZI ivoba. dRe: a)-nal eqebi 0,1mm-ze nakl ebia; b)-nal eqebi 10mm-ze nakl ebia

rogorc cxril i 3-dan Cans yvel aze ufro al baTuria 1-3 dRis xangrZI ivobis unal eqo periodis. aseTi periodis al baToba, rodesac nal eqebis raodenoba ar aRemateba 0,1mm-s Seadgens 50-70%-s, xol o Tu nal eqebis raodenoba ar aRemateba 5mm-s, Sesabamisi al baToba ikl ebs 15-50%-mde.

xangrZI ivi unal eqo periodebi ganapirobenen gval vis Camoyal ibebas. gval va warmoiqmneba nal eqebis ukmarisobisa da gazrdil i aorTql ebis iseTi Tanafardobis dros, rac iwvevs mkveTr Seusabamobas mcenaris tenis moTxovnil ebasa da niadagidan mis miwodebas Soris. gval va gansakuTrebiT saSiSia zafxul Si. maRal i temperatura, dabal i sinotive da ZI ieri aorTql eba aSrobs niadagis zeda fenebs, aferxebes vegetatiuri masis dagrovebas, amcirebs mcenaris kvirts da zrdis fesvebs, saerTo jamSi ki amcirebs yvel a sasofl o-sameurneo kul turis mosavl ianobas.

cnobil ia gval vis intensivobis Sefasebis sxvadasxva agrometeorol ogiuri maCvenebel i-g.sel ianinovis hidroTermul i koeficienti, v.popovis havis simSral is koeficienti, tornveitis tenianobis indeqsi da sxv. miuxedavad amisa gval vis yvel aze saimedo maCvenebel ia tenis maragi niadagis feswarmomqnel SreSi. teritoriis teniT uzrunvel yofis kritikul normad miRebul ia nal eqebis jami savegetacio periodSi 150-200mm-is fargl ebSi. aqedan gamomdinare mkacr gval vad miRebul ia periodi, rodesac nal eqebis jami savegetacio periodis ganmavl obaSi ar aRemateba 150mm-s. aseTi gval vebi sakmaod xSirad

aRini Sneba aRmosavl eT saqarTvel oSi (nax.4). aRmosavl eT saqarTvel os zogierT raionSi mkacri gval vis al baToba 40%-s aRemateba, rac imas niSnavs, rom aseTi gval va misal odnel ia yovel or-sam wel iwadSi erTxel .



nax.4. mkacri gval vebis ganmeoradoba. %.
(e.el izbaraSvil i,z.WavWani Ze,1992)

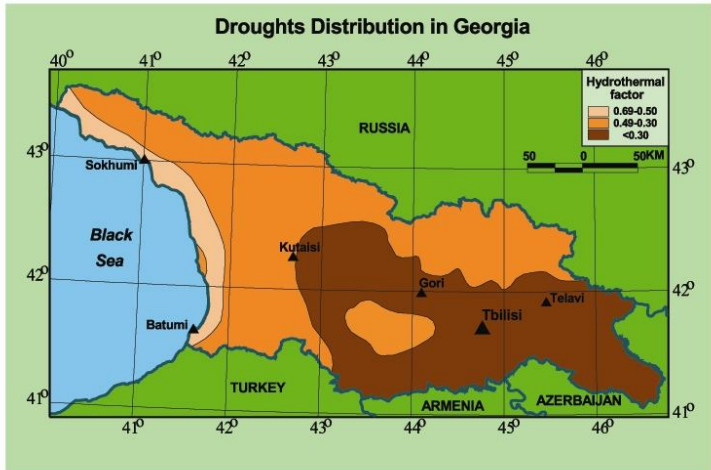
didi simkacriT gamoirCeoda 2006 wl is gval va, rodesac xangrZl ivi unal eqo periodis ganmavl obaSi SenarCunebul i iyo maRal i temperaturul i foni.

xSiri gval vianoba ganapi robebs gaudabnoebis procesebis gaqtiurebas, rasac safuZvl ianad monografiis me-12 TavSi ganvixil avT.

cxrili 4. gval vis intensivoba da Sesabamisi
mosal odneli dazianebebi

intensioba (balli)	hidroTermuli koeficienti, K*	efeqti	Sesazlo dazianebebisa da zaral is arwera
1	1.00-0,70	susti	xanmokle gval va: marcvleuli kul turebis da bal axeulis zrdis Senel eba; xanZarsaSiSroeba - saSual oze maRali
2	0,69-0,50	zomieri	marcvleuli kul turebis naTesebisa da saTibebis garkevleuli dazianeba; maRali xanZarsaSiSroeba; wylis donebi mdinareebSi, wyal sacavebSi da WebSi dabal ia; wylis naklebobai wvevs SezRudvebis moxmarebaze
3	0,49-0,30	mkacri	mosavli sa da saTibebis dakargva; xanZarsaSiSroeba; wylis ukmarisoba; SezRudvebi wylis moxmarebaze
4	< 0,30	zemkacri	mosavli sa / saTibebis sruli ganadgureba; gansakuTrebuli xanZarsaSiSroeba; mdinareebSi, wyal sacavebSi da WebSi wylis naklebobai, rac qmnis kritikul mdgomareobas wylis momaragebaSi

* $K = \text{nal eqebis Tviuri jami} \cdot 10 / \text{aqtiur temperaturaTa jami}$; aiReba aprilis-seqtembris periodi

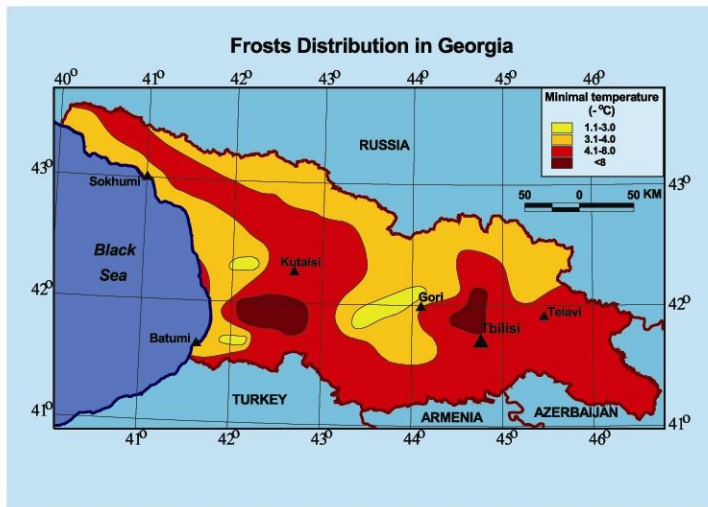


nax.5. gval vis sivrcobrivi struqtura

cxril i 5. wayinvis intensivoba da Sesabamisi mosal odnel i dazianebebi

intensioba (bal i)	minimal uri temperatura uyinvo periodis ganmavl obaS i (°C)	efeqti	SesaZl o dazianebebi sa da zaral is aRwera
1	> -1.1	susti	ziandeba wayinvis mimarT aramdgradi siTbomoyvarul i mcnareebi: l obio, brinj i, bamba, wiwibura, satacuri da sxv.
2	-1.1 - -3,0	zomieri	ziandeba wayinvis mimarT nakl ebad mdgradi mcnareebi: marcvl ovani kul turebi, simindi, kartofil i, sorgo da sxv. ferxdeba xorbl is aRmocenebis procesi.
3	-3.1 - -4,0	saSual o	ziandeba wayinvis mimarT saSual od mdgradi mcnareebi: soio da sxv.
4	-4.1 - -8.0	Zl ieri	ziandeba wayinvis mimarT mdgradi mcnareebi: kul turul xe-mcnareTa didi nawil i, zeTovani kul turebi, kanafi da sxv. ferxdeba xorbl is

			vegetაციური ზრდა
5	< -8.0	ზალიან ზიერი	ზიანდება წყნარ ზამთარში განსაკუთრებით მაღალი მცენარეები: საძრეო საგაზაფხულო ხორბალი, მარცვლიანი პარკოსანი, საძრეო ზეთის ხეები, ჭერი და სხვ.



ნახ.6. წყნარების სივრცობრივი სტრუქტურა

ზიერი გარეუბანი

ზიერი ადგილები გარეუბანი, როდესაც მისი სიღრმე უმცირესად 15 მეტრს აღემატება. ასეთი გარეუბანი სასიამოვნოა მეტეოროლოგიური მონაცემების და მას დიდი მატერიალი უზარალი მოაქვს, მზის სხივების, კარგად მოწყობილი ტექნიკური ნაგებობები, კარგად მოწყობილი და ელექტროგადამცემი ხაზები, ავტობუსების სანაგებები, ავტომობილების ტრანსპორტის მოწყობა, დიდი ზიანი მოაქვს სოფლის მეურნეობისათვის.

Zl ieri qarebis saSual o wliuri dReTa ricxvi zemo svaneTSi ar awarbebs 4-s, xol o maqsimal uri dReTa ricxvi aRwevs 16-s. samegrel os teritoriaze ki maTi saSual o wliuri dReTa ricxvi aRwevs foTSi_40-s, wal enjixaSi_49-s, xol o jvarSi_66-s. aseTi qarebis udides dReTa ricxvi Sesabamisad tolia 78, 77 da 108-is. Zl ieri qarebi ufroxSiria wli is civ periodSi. maTi qarebis uwyveti xangrZl ivoba am periodSi saSual od 7-8 saatS aRwevs, maSin rodesac zafxul Si is 4sT-s ar aRemateba.

Zl ieri qarebis siCqare xsirad 15 m/wm-s aRemateba (cxr. 6).

cxril i 6. qaris udidesi siCqare. m.wm.
(samegrel o,zugdidi, 1999)

punqti	yovel - wliurad	mosal odnel i erTxel mainc wel iwadSi			
		5	10	15	20
l ebarde	15	19	21	21	22
martvili	33	42	46	48	50
jvari	27	31	32	33	34
wal enjixa	20	23	24	24	25
zugdidi	21	24	25	26	27
senaki	30	38	41	43	44
foTi	27	33	35	36	38

magaliad, cxrilidan 6
gamomdinareobs, rom l ebardeSi, sadac qaris

udidesi siCqare yovel wl iurad Seadgens 15 m/wm, 5 wel iwadSi erTxel aRiniSneba qari 19 m/wm siZl ierIT, 10 wel iwadSi erTxel _21 m/wm siCqariT, xol o 20 wel iwadSi erTxel _22 m/wm siCqariT. marTvil Si, sadac qaris udidesi siCqare 33m/wm-ia, yovel 5 wel ieadSi erTxel siCqare aRwevs 42 m/wm-s, 10 wel iwadSi erTxel _46 m/wm-s, 15 wel iwadSi erTxel _48 m/wm-s, xol o 20 wel iwadSi erTxel _50 m/wm-s, da a. S.

Stormul i xasiaTis qars kol xetis dabl obze adgil i hqonda 1969 wl is 4-7 ianvars. arsebul i monacemebis Tanaxmad, foTSi aRmosavl eTis qaris siCqare 4 ianvars gaizarda 16-dan 28 m/wm-mde, 5 ianvars dRe-Ramis ganmavl obaSi qaris siCqare seadgenda 24-28 m/wm-s. 6 ianvars qaris siCqarem miaRwia 34 m/wm-s, xol o 7 ianvars daikl o 16 m/wm-mde. am movl enam mniSvnel ovani material uri zaral i miayena regionis mosaxl eobas da ekonomikas.

samegrel os teritoriaze, iseve rogorc mTI ianad kol xetis barsi, Zl ieri qarebi ZiriTadad aRmosavl eTis mxridan hqrian, sxva mimarTul ebis Zl ieri qarebi iSviaTia. aRmosavl eTis Zl ieri qarebis ganvitarebis ZiriTadi pirobebia aRmosavl eT evropis vakis Crdil o da Crdil o-aRmosavl eT raionebze, an dasavl eT cimbirze aqtiurad moqmedi anticikl onal uri warmonaqmni, romel ic vrcel deba aRmosavl eT evropis vakis samxreT raionebze, xmel TaSua da Sav zRVaze, kavkasiasa da mcire aziaSi, agreTve frontal uri gamyofis arsebobas miTiTebul i moqmedebis centrebiT kavkasiis zo naSi.

aRniSnul Tan dakavSi rebi T hipokrate
(460-377 wel s Zv. w. aRr.)

sagangebod miuTiTebda kol xeTSi
`zal ian Zl ier, arasiasimovno da mcxunvare
qarebze~, rasac is `kenkrons- uwodenda.

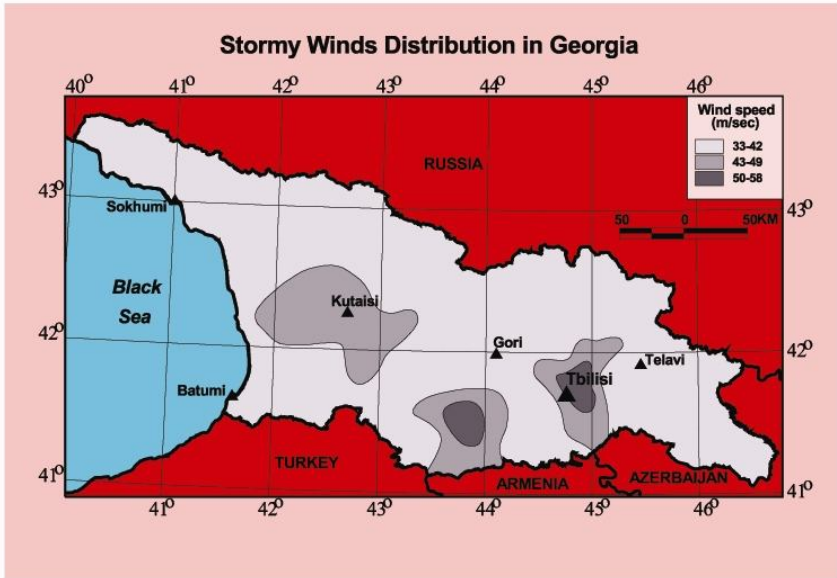
cxrili 7. grigal uri qaris intensivoba da
Sesabamisi mosal odnel i

dazianebebi

grigal uri qarebis safir-simpsonis Skala
(avtorebi: h. safiri da b. simpsoni, 1969 w.)

katgoriis nomeri (intensioba, bali)	grigal uri qaris siCqare (m/wm)	efeqti	SesaZl o dazianebebisazal is aRwera
1	33-42	minimaluri	xeebi da buCqnari dazianebul ia, pirsebis mcire dazianeba. zogierTi patara gemi sadgomze mowyvetil ia Ruzidan
2	43-49	zomieri	xeebisa da buCqnaris mniSvnel ovani dazianeba, zogierTi xe waqceul ia, awyobil i saxl ebi Zl ier aris dazianebul i. pirsebis da iaxtebis navmi sadgomebis mniSvnel ovani dazianeba, patara gemebi sadgomze mowyvetil ia Ruzidan
3	50-58	mniSvnel o	didi xeebi waqceul ia,

		vani	awyobil i saxl ebi dangreul ia, cl keul patara saxl s dazianebul i aqvs fanj rebi, karebebi da saxuravi. sanapiros gaswrviv Zl ieri wyal didoba; sanapiroze mdgari ptara saxl ebi dangreul ia
4	59-69	Zal ian didi	xeebi, buCqnari da sarekl mo farebi waqceul ia, awyobil i saxl ebi safuZvl mde aris dangreul i, Zl ieraa dazianebul i fnj rebi, karebebi da saxurvebi. datboril iazRvis donidan 3 m simaRl eze myofi nakveTebi; wyal didoba vrcel deba xmel eTze 30 km-is siRrmeSi; aRini Sneba zaral i gamowveul i tal RebiT da maT mier gadatanil i namtvrebebiT
5	≥ 70	katastrofa	yvel a xe, buCqi da sarekl mo fari waqceul ia, bevri saxl i seriozul ad aris dazianebul i; zogierTi Senoba srul iad dangreul ia; asawyobi saxl ebi dangreul ia. Zl ieri zaral ia miyenebul i Senobebis qveda sarTul ebisaTvis 4.5 m-mde simRl eze 500 m xmel eTis siRrmeSi; aucil ebel ia sanapiro zol idan mosaxl eobis masiuri evakuacia



nax.7. grigal uri qarebis sivrcobrivi
struqtura

**Tavsxma nal eqebi, setyva
genetikuri Tval sazrisiT** nal eqebis
agretve sam tips ganaxsvaveben:

1. JinJRI i. yal ibdeba fena da fena-grova Rrubl ebSi, roml ebic xasiaTdeba mcire vertikal uri simZI avriT da wveTis damsxvil eba ver xerxdeba. JinJI i nal eqebis intensivoba Zal ze umniSvnel oa.

2. gabmul i nal eqi. damaxasiaTebel ia Tbil i frontis Rrubl ebisaTvis. moicavs did farTobs, xangrZI ivi da erTnairi saSual o intensivobisaa.

3. Tavsxma nal eqi. modis mZl avri grova-
wimis Rrubl ebidan. xSirad is dakavSirebul ia
civi frontis gavl asTan. misi intensivoba
dida, xangrZl ivoba ki mcire.

dasavl eT saqarTvel osaTvis ZiriTadad
damaxasiaTebel ia wvriT wveTovani gabmul i da
Tavsxma nal eqebi, xolo aRmosavl eT
saqarTvel osaTvis-Tavsxma nal eqebi (cxril i
5.4.1.).

cxril i 8. nal eqTa tipebis
ganmeoradoba.%.

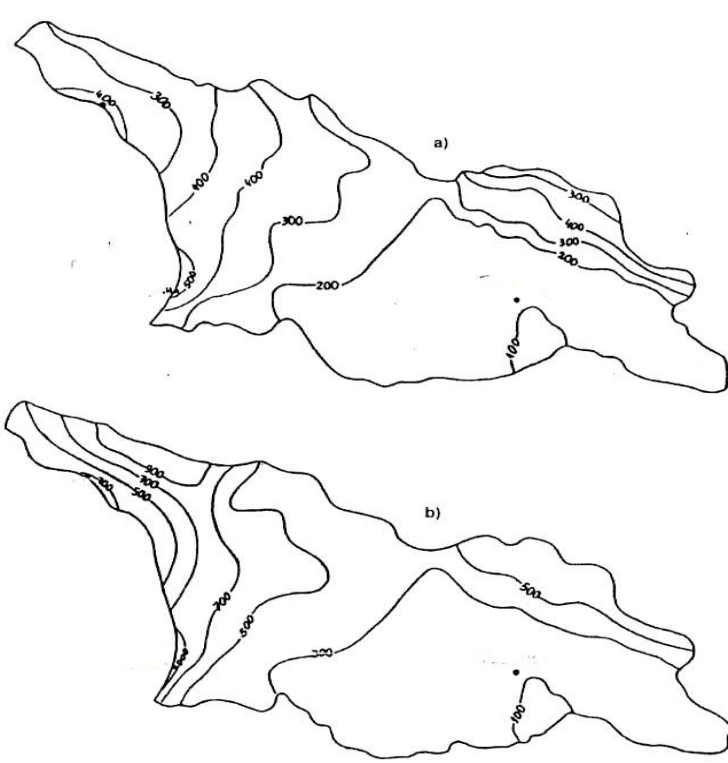
(Ж.Д.Алибегова, Э.Ш.Элизбаршвили, 1980)

ol qi	JinJR li	wvriT wv eTovani gabmul i	msxvil w veTovan i gabmul i	Tavsxm a
dasavl eT saqarTve lo	11	34	24	31
aRmosavl eT saqarTve lo	7	28	24	41

Tavsxma nal eqebis xvedriti wili
nal eqebis saerTo jamSi 40-80%-s Seadgens.
yvel aze didi wili modis axmetaSi (80%),
baTumSi (77%) da axal qal aqSi (74%). tyibul Si,
foTSi, Tel avsa da gal Si Tavsxma nal eqebi
Seadgens nal eqebis saerTo raodenobis 65-66%-s,
gagraSi, samtrediaSi, wyal tuboSi, gurj aanSi,

Tbil isSi-daaxl oebiT 60%-s, bol nisSi da bakurianSi -50%-s, xaiSSi, mTa-sabueTSi, abasTumanSi, mangl isSi da goderZis uRel texil ze-50%-ze nakl ebs. yovel ive es raodenobrivad naCvenebia nax.8-ze.

Tavsxma nal eqebis xangrZI ivoba nal eqebis saerTo xangrZI ivobis 35%-ze nakl ebia. amasTanave Tavsxma nal eqebi yvel aze xangrZI ivia axal qal aqSi-35%, axmetasa da cxinval Si xangrZI ivoba 20-25%-ia, teritoriis umetes nawil ze- 20%-ze nakl ebia, xol o



ნახ. 8. ღლი ს ტბილი პერიოდის განმავლობაში მოსული გამული (ა) და ტავსხმა (ბ) ნალექების რაოდენობა

(*ჟ.შ. ელიზბარაშვილი, ზ.ბ. ჭავჭავაძე, მ.ს. იანიკიძე, 1994*)
 ხაი სსი, საგარა სი, მტა-საბუე ტსი, ბილი სი, ხული ოსი და გოდერჯის გადასავლიელზე-10%-ზე ნაკლებია.

უხვი ატმოსფერული ნალექები (როდესაც მთიანეთში რამდენიმე ადგილზე 30მმ-ს) გურიის ტერიტორიაზე ხშირია. ისინი ზირითად გამოვლენილია ფრONTALური პროცესებით და ხშირად კატასტროფული ხასიათს ატარებენ, იშვიათად რეგულარული მოვლენები.

გენეტიკური ტალღის სიჩქარე უხვი ნალექები შეიქმნება იმდენი რამდენი ფრONTALური, ისე კონვექციური ხასიათის. შესაბამისად ფრONTALური უარყოფითი ნალექები უფრო ხანგრძლივია, ვიდრე კონვექციური უარყოფითი ნალექები.

ტერიტორიაზე უხვი ნალექიანი დროებითი რეჟიმი ღლი ს განმავლობაში შეადგენს 6-20 დღეს (ნახ. 9). უხვი ნალექები განსაკუთრებით ხშირია სანაპირო ზონაში, სადაც მერყეობს 15-20 დღის სიხშირით, ხოლო ატმოსფერული და მთბის კლები ობს.

ცხრილი 9. დროებითი რეჟიმი უხვი ნალექების

პუნქტი	ტალღე												შედეგი
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
ლიანჯუტი	1.2	1.0	0.9	0.3	0.3	0.9	1.2	1.3	2.6	2.3	1.7	1.5	15

baxmaro	0.9	0.9	0.8	0.2	0.1	0.4	0.4	0.6	1.1	1.9	1.6	1.3	10
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wl is ganmavl obaSi uxvna eqian dReTa ricxvi maqsimums Semodgomaze aRwevs, misi minimumi ki gvian gazafxul ze, maisSi dgeba (cxr. 9.)

nal eqebis dRe-ramuri jami regionSi xSirad aRemateba 30 mm-s da Sesazl oa gadaaWarbos 100-200 mm-s.

Tbil i periodis nal eqebi barSi da mTasi gansxvavebul xasiaTs atareben, rac gamoixateba maT intensivobaSi, nal eqian dReTa ricxvSi da nal eqebis raodenobaSi. aRniSnul i macvnebl ebi guriis barSi da mTisaTvis warmodgenilia cxril Si 10.

cxril i 10. Tbil i periodis (april i-oqtomberi) nal eqebis
maxasiaTebli ebi
(Ж.Д. Алибава, Э.Ш. Элизбарашвили, 1980)

raioni	saSual o intensivoba mm/wT	dReTa ricxvi nal eqebi T	nal eqebis raodenoba nal eqian dRes mm	nal eqebis xangrZl ivoba nal eqian dRes sT.
bari	0.026	82	11	7.0
mTa	0.016	93	6.4	6.6

cxril idan Cans, rom barSi SedarebiT naklebi nal eqebi modis vidre mTasi, xolo nal eqebis raodenoba barSi TiTqmis orjer

metia vidre mTaSi. swored amis gamo nal eqebis saSual o intensivoba barSi mniSvnel ovnad aRemateba intensivobas mTaSi.

setyva

setyva saSiS atmosferul movl enaTa ricxvs miekuTvneba. is xSiria saqarTvel oSic da ganpirobepul ia, rogorc frontal uri, ise adgil obrivi procesebiT. misi mosvl a xorciel deba haeris masebis SemoWris Sedegad dasavl eTidan, aRmosavl eTidan an amierkavkasiis samxreTSi tal Ruri aRrebebis gamo. aRmosavl eT saqarTvel oSi setyvis mosvl a 44% SemTxvevaSi ganpirobepul ia civi frontis SemoWrit, 24% SemTxvevaSi-tal Ruri aRrevis gamo, 17% SemTxvevaSi-Sidamasiuri procesebis, xol o 15% SemTxvevaSi-frontal uri okl uziis Sedegad (B.M. Гигинейшвили , 1960).

setyva yvel aze xSiria j avaxeTis zeganze, mesxeTis da Trial eTis qedis samxreT ferdobebze, kaxeTis qedis Crdil oeT nawil Si da central uri kavkasionis maRal mTianeTSi, sadac setyvis procesebis ganmeoradoba maqsimums aRwevs da wel iwadSi saSual od 9-10 setyviani dRea, Tumca cal keul wl ebSi aWarbebs 20 dRes. mesxeTis da Trial eTis qedis Crdil oeTis ferdobebze, gomboris qedze da kavkasionis central ur nawil Si saSual od 2-4 setyvian dReTa ricxvia, cal keul wl ebSi ki aRemateba 10 dRes. I ixis qedze, aRmosavl eT saqarTvel os dabl ob raionebsa da mTiswineTSi, agreTve Savi zRvis sanapiroza da kol xeTis

baris cal keul raionebSi wel iwadSi 1-2 setyviani dRea. kol xeTis baris samxreT da Sida raionebSi setyva iSviaTi movl enaa.

setyvis movl enebis ZiriTadi traektoriebi gadis bakurianze, abasTumanze, gudaurre da civ-gomborze (B.M. Гигинейшвили, 1960). swored am mimarTul ebas Seesabameba aviaciisaTvis gansakuTrebiT saSiSi el Weqebis procesebis ganviTareba.

setyvis mosvl is xangrZl ivoba erT punqtSi amierkavkasiisaTvis Seadgens 3-5 wuTs (Я.Г.Сулаквелидзе, 1988). setyvis matarebel i Rrubel i gadaadgil deba saSual od siCqariT 20-30km/sT-Si. Tu CavTvl iT, rom erTi Rrubl idan setyvis mosvl is xangrZl ivoba daaxl oebiT 1 saaTia, dedamiwis zedapirze setyva aRiniSneba 25-30km sigrZis da 1-2km siganis teritoriaze.

setyvis mosvl is xasiaTis mixedviT i.sul aqvel iZem(1988) saqarTvel o dahyo 5 raionad:

1.Savi zRvis sanapiro zol i. maqsimal uri dReTa ricxvi setyviT Seadgens 8-s. maqsimumi Seesabameba Semodgomas(oqtomberi) da zamTars(Teberval i), xol o minimumi-gazafxul sa da zafxul s. setyvis marcvl ebi ver aswreben damsxvil ebas, radganac nul ovani izoTerma sakmaod maRl aa ganl agebul i. amitom raioni araa setyvasaSiSi.

2.dasavl eT kavkasionis mTiswineTi, zemo imereTi da rionis xeoba. setyvian dReTa ricxvis maqsimumi 16-ia, xol o saSual o mniSvnel oba-2,5. zamTarSi setyva praqtikul ad ar aRiniSneba, yvel aze xSirad ki maisSi icis.

3. aWara-Trial eTis mTebi. setyvian dReTa maqsimumi 14-ia, xol o saSual o mniSvnel oba-1,7-ia. setyvis procesebi yvel aze aqtiuria ivnisSi, xol o yvel aze nakl ebad aqtiuri-Teberval sa da martSi.

4. aRmosavl eT saqarTvel os umetesi nawil i (mtkvris marj vena sanapiro). setyvian dReTa maqsimal uri ricxvi 23-ia, saSual o-3,6. setyva umTavresad april idan seqtembris CaTvl iT modis.

5. mtkvris marcxena sanapiro, gare da Sida kaxeTi, ioris da al aznis zemo dinebebi, aragvis da liaxvis auzebi. setyvian dReTa ricxvis maqsimal uri mniSvnel obaa 21, xol o saSual o-3,4. setyvis procesebis naxevarze meti modis maissa da ivnisze. xSiria agreTve setyva april idan agvistos CaTvl iT, amitomac is did saSi Sroebas warmoadgens sofl is meurneobisaTvis.

nisl i l ipyinul i, wyal didoba, wyal movardna

atmosferos gansakuTrebul movl enebis miekuTvneba el Weqi, setyva, nisl i da qarbuqi. isini saSiS meteorol ogiur movl enebis warmoadgenen da xSirad uaryofiT gavl enas axdenen mosaxl eobaze, mis j amrTel obaze, ekonomikaze. el weqs Tan axl avs ZI ieri el eqtrul i ganmuxtvebi, roml ebic azianeben kavSirgabmul obisa da el eqtro gadamcem xazebs. setyva mniSvnel ovan zians ayenebs sofl is meurneobas. qarbuqi da nisl i gansakuTrebiT saSiSia transportis funcioni rebisaTvis.

regionSi atmosferul movl enebS Soris yvel aze saSiSi el Weqia (cxril i 11).

cxril i 11. atmosferos gansakuTrebul i movl enebis dReTa ricxvi wl is ganmavl obaSi

punqti	movl ena			
	el Weqi	setyva	nisl i	qarbuqi
l ebarde	32	3	101	5
j nari	36	1	8	*
wal ebj ixa	32	2	55	2
zugdi di	36	2	14	*
senaki	26	3	14	*
foati	40	2	24	0
mestia	40	2	6	3

cxril idan Cans, rom samegrel o-zemo svaneTis mxareSi wl is ganmavl obaSi 25-40 el Weqiani dRea. wl Weqi yvel aze xSiria wl is Tbil periodSi, gansakuTrebIT zafxul Si. zamTarSi el Weqi iSviaTia.

regionistvis iSviaTi movl enaa setyva. wl is ganmavl obaSi daikvirveba saSual od 1-3 dRe setyviT. misi mosvl is al baToba Tanabaria wl is nebsmieri droisaTvis.

iSviaTia agreTve qarebi. gamonakl isia l ebarde, sadac qarbuqian dreTa saSual o ricxvi wel iwadis ganmavl obaSi 50ia. wal enj ixaSi es movl ena wel iwadSi saSual od 2-j er aRiniSneba.

nisl ian dReTa ricxvi teritoriaze did diapazonSi icvl eba_6-dan (mestia), 101-mde

(I ebarde). j varsi Seadgens 8-s, zugdi dsa da senakSi_14-s, foTSi_24-s, xol o wal enj ixaSi_55 dRes.

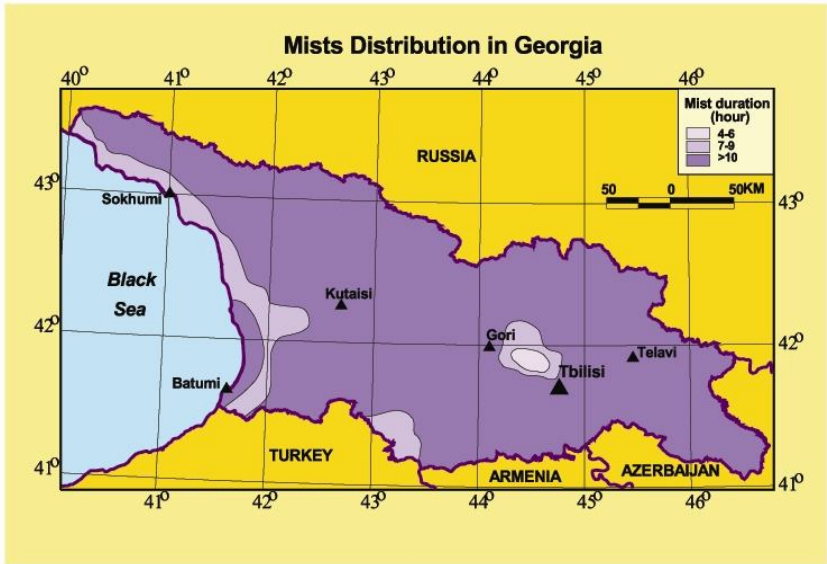
cxrili 12. mkvrivi nisl is intensivoba da Sesabamisi mosal odnel i dazianebebi

intensioba (bal i)	Mkvrivi nisl is * xangrZl i voba (sT)	efeqti	SesaZl o dazianebebi sa da zaral is aRwera
1	≤ 3	xanmokl e	Tvi Tmfri navebis Camovardna, saSi Sroeba gzebze moZraobisas, yvel a saxis transportis msxvrev a da msxverpl i
2	4-6	saSual o xangrZl ivobis	
3	7-9	xangrZl ivi	
4	≥ 10	Zal ian xangrZl ivi	

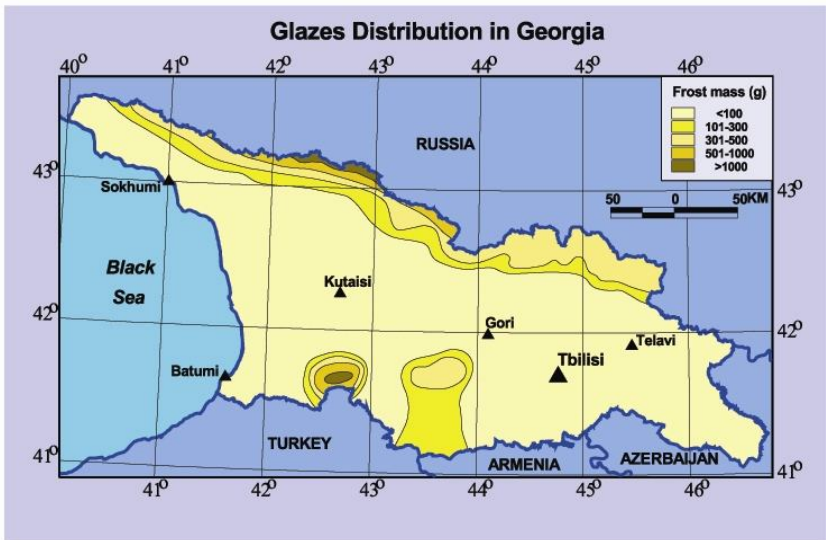
* xil vadoba < 50 m

cxrili 13. lipynul is intensivoba da Sesabamisi mosal odnel i dazianebebi

intensioba (bal i)	ynul is nadebis wona (g)	efeqti	SesaZl o dazianebebi sa da zaral is aRwera
1	≤ 100	susti	uaryofiTi gavl ena sxvadasxva sawarmoo procesebze
2	101-300	zomieri	uaryofiTi gavl ena sofl isa da tyis meurneobaze
3	301-500	saSual o	el eqtrogadamcemi da kavSirgabmul obis xazebis eqspl uataciis Seferxeba
4	501-1000	Zl ieri	sarkinigzo da avtotransportis funqcionirebis Seferxeba
5	> 1000	Zal ian Zl ieri	el eqtrogadamcemi da kavSirgabmul obis xazebis masobrivi moSl a, saqonl is daRupva, naTesebi sa da mcnareul obis ganadgureba



nax.10. mkvrivi nisl is sivrcobrivi struqtura



nax.11. I ipynul is sivrcobrivi struqtura

Tovl is zvavebi

mTiani regionebs zvasaSi Sroeba damokidebul ia bunebrivi komponentebis, ZiriTadad, reliefis, klimatisa da mcnareuli safaris Taviseburebbeze.

afxazeTis teritoriis reliefi sakmaod rTul ia da didi horizontal uri da vertikal uri danawevrebiT gamoirCeva. danawevrebis siRme saSual omTian zonaSi aRwevs 400-800 m-s, xol o maRal mTian zonaSi _ 100-1500 m-s; gansakuTrebiT didi danawevreba md. bzifis da md. kodoris auzebisaTvisaa damaxasiaTebel i. dabal mTian zonas md. bzifis auzSi uWiravs mTiani farTobis 36%, saSual omTian zonas _ 37%, maRal mTian zonas _ 27%; md. kodoris auzSi ki am zonebs, Sesabamisad, 34%, 37% da 29% ukavia. saerTod, afxazeTis teritoriis

51% mdebareobs dabal mTian zonaSi, 33% _ saSual omTian zonaSi da 16% _ maRal mTian zonaSi. sakvl evi regionis mTiani farTobis 70%-ze zedapiris daxril oba metia 15⁰-ze, xol o kavkasionis ZiriTadi ganStoebebis cal keul i ferdobebis daxril oba 35-40⁰-ia. afxazeTis teritoriis naxevarze meti dafarul ia tyis safariT. saSual omTian zonaSi ki tye xarobs mTl iani farTobis 60-70%-ze.

saqarTvel os teritoriaze Tovl ianobis mixedviT gamoiyofa gansakuTrebiT uxvTovl iani, uxvTovl iani, saSual oTovl iani da mcireTovl iani raionebi (I . qal dani, m. sal uqvaZe, 2001). afxazeTi, aWaris teritoriis dasavl eT nawil Tan erTad, gansakuTrebiT uxvTovl ian raions miekuTvneba, sadac myari nal eqebis saSual o raodenobisa da Tovl is safaris saSual o simaRl is adgil is absol utur simaRl esTan damokidebul eba gamoisaxeba Semdegi gantol ebebiT:

$$X = 0.68 + 8,$$

$$h = 2.359H - 0.005H^2 - 0.092,$$

sadac X aris myari nal eqebis wl iuri raodenoba mm-Si, H _ adgil is absol uturi simaRl e m-Si (myari nal eqebis gamoTvl is dros) da km-Si (Tovl is simaRl is gamoTvl is dros), h _ Tovl is safaris simaRl e m-Si. gantol ebaTa korel aciis koeficienti metia 0.85-ze, xol o cdomil eba ar aRemateba 10-s, gantol ebebi Sedgenilia zRvis donidan 1900 m-mde mdebare meteosadgurebis monacemebiT.

sakvl ev teritoriaze myari nal eqebis maqsimal uri wl iuri raodenoba izrdeba 350-400 mm-dan (zRvis donidan 5-50 m) 1900-2000 mm-mde (1800-1900 m), saSual o raodenoba _ 10-60 mm-dan 1250-1300 mm-mde (vertikal uri gradienti 65-70 mm/100 m), minimal uri

raodenoba _ 0-10 mm-dan 600-650 mm-mde; Tovl is safaris maqsimal uri simaRI e icvl eba 100-120 sm-dan 700-750 sm-mde, saSual o simaRI e 30-36 sm-dan 450-500 sm-mde (gradienti tol ia 20-25 sm/100 m), minimal uri simaRI e 0-5 sm-dan 200-250 sm-mde.

afxazeTis teritoriaze didia Tovl is safaris simaRI is namati, rogorc erTi Tovis dros, ise dRe-RameSi. erTi Tovis dros mosul i Tovl is safaris simaRI is namatma l aTaSi Seadgina 96 sm (5 - 13.02.1975 w.), fsxuSi 164 sm (12 - 19.01.1976 w.), riwaSi _ 155 sm (4 - 7.01.1976 w.), avadxaraSi 212 sm (19 - 31.01.1953 w.), gagris qedze _ 174 sm (26.12.1986 w. _ 9.01.1987 w.). Tovl is safaris simaRI is maqsimal uri dRe-Ramuri namati l aTaSi iyo 55 sm (22 - 23.02.1956 w.), fsxuSi - 96 sm (3 - 4.03.1943 w.), gagris qedze 76 sm (12 - 13.01. 1976 w.).

amrigad, afxazeTis teritoriaze zvaWarmomqmnel i faqtorebis Tavisebureba (kerZod is, rom: rel iefisaTvis damaxasiaTebel ia didi horizontal uri da vertikal uri danawevreba, farTobis 70%-ze, ferdobebis daxril oba metia 15⁰-ze, teritoriis 49% saSual o da maRal mTian zonebSi mdebareobs, Tovl is safaris maqsimal uri simaRI e aRwevs 650-750 sm-s, Tovl is safaris simaRI is namati erTi Tovisas 96-212 sm-s, xol o maqsimal uri dRe-Ramuri namati _ 55-113 sm-s) zvavebis warmomqnisa da farTo gavrcelebis xel Semwyob faqtora d gvevl ineba.

mTiani regionebis zvasaSi Sroebas gansazRvavs geografiul i pirobebis Taviseburebi T ganpirobebul i zvasaSi Sroebis ZiriTadi raodenobrivi maxasiaTebel ebi (l . qal dani, 2000) (teritoriis zvaqtiuroba, zvaqtiuri ferdobebis wil i saerto farTobSi), zvaSemkrebebis gavrcelebis sixSire (maTi raodenoba farTobis erTeul ze), zvavebis Camosvl is sixSire (zvaSemkrebi dan zvavebis Camosvl is raodenoba erT

zamTarSi) da zvavsaSiSi periodis xangrZl ivoba (zvavsaSiS dReTa raodenoba erT zamTarSi) da zavsaSiSi periodis xangrZl ivoba (zvavsaSiS dReTa raodenoba erT zamTarSi).

afxazeTSi teritoriis zvavaqtiuroba did fargl ebSi icvl eba. raions, sadac teritoriie zvavaqtiuroba nul is tolia afxazeTis mTl iani farTobis 28%-s uWiravs da, ZiriTadad, kol xeTis dabl obs, agreTve zRvispira da mTispira dabal mTian zonas moicavs.

raions, sadac teritoriis zvavaqtiuroba 20%-ze nakl ebia (zvavaqtiuria ferTa 20%-ze nakl ebi) ukavia afxazeTis mTl iani farTobis 32%; is gansakuTreb iT farTo gavr cel ebiT xasiaTdeba dabal mTian da saSual omTian zonebSi, rac ganpirobetul ia am zonebSi Sereul i da wiwvovani tyeebis farTo gavr cel ebiT. sakvl evi teritoriis 15% modis raionze, sadac teritoriis zvavaqtiuroba aris 20-49%, is ZiriTadad moicavs foTl ovani tyiT dafarul saSual omTian zonas. ubal pur zonaSi teritoriis zvavaqtiuribaa 40-60%, xol o al puri zonis cicabo ferdobebze teritoriis zvavaqtiuroba aRwevs 60-80%-s; aRniSnul raionebs Sesabamisad 12 da 13% ukaviaT.

dabal mTiani zonis umetes nawil ze (afxazeTis farTobis 17%) zvavSemkrebebis gavr cel ebis sixSire 1km²-ze 5-ze nakl ebia; gagris, bzifis, afxazeTisa da kodirebis qedebis saSual omTian zonaSi mdebare ferdobebze zvavSemkrebebis sixSirea 5-10 (31%), xol o amave qedebis maRal mTian zonaSi- 10-15 (17%). kavkaionis qedis mimdebare, al puri zonis zlier danawevrebul cicabo ferdobebze zvavSemkrebebis raodenoba 1km²-ze aRwevs 15-20-s (7%).

zvavebis ZiriTadi maxasiaTeb l ebi zvavebis Camosvl is sixSire da zvavsaSiSi periodis xangrZl ivoba afxazeTis teritoriaze did

fargl ebSi icvl eba rogorc sivrceSi, ise droSi (cxr. 14. da 15).

cxრი i 14. zvavebis Camosvl is sixSire afxazeTis teritoriaze

zvavebis Camosvl is raodenoba	zvavebis Camosvl is sxvadasxva sixSiris raionebi (% mTI iani farTobidan)		
	maqsimal uri	saSual o	minimal uri
0	28	28	59
≤5	12	25	24
6-10	13	25	17
11-15	14	22	
>15	33		

uxvTovl ian zamTarSi, sakvl evi teritoriis maRal mTian cicabo ferdobebze, zvavebis Camosvl is maqsimal uri sixSire aRemateba 15 SemTxvevas da zvavsaSiSi periodis maqsimal uri xangrZl ivoba _ 150 dRes. mcireTovl ian zamTarSi ki maTi mniSvnel obebi nakl ebia 9-10 SemTxvevaze da 10-100 dReze. uxvTovl ian zamTarSi zvavsaSiSia afxazeTis mTI iani farTobis 28%, xol o mcireTovl ian zamTarSi _ 59%.

*cxril i 15. zvasaSiSi periodis xangrZl ivoba
afxazeTis
teritoriaze*

zvavebis Camosvl is raodenoba	zvavebis Camosvl is sxvadasxva sixSiris raionebi (% mTl iani farTobidan)		
	maqsimal uri	saSual o	minimal uri
0	28	28	59
≤50	9	37	31
51-100	13	22	10
101-150	20	13	
>150	30		

afxazeTis teritoriis darai onebas zvasaSiSroebis mixedviT safuZvl ad daedo 4 ZiriTadi raodenobrivi maxasiaTebel i: teritoriis zvavaqtiuroba, zvavSemkrebebis gavrcel ebis sixSire, agreTve, zvavebis Camosvl is maqsimal uri sixSire da zvasaSiSi periodis maqsimal uri xangrZl ivoba erT zamTarSi.

arazvasaSiSia afxazeTis mTl iani farTobis 28%, ZiriTadad, kol xeTis dabl obi da 15⁰-ze nakl ebi daxril obis mqone Savi zRvisa da kol xeTis dabl obis mimdebare teritoria.

zvasaSiS teritoriaze, roml is qveda sazRvari zRvis donidan 50-410 m-ze gadis, zvasaSiSroebis xarixis mixedviT gamoiyofa susti (afxazeTis mTl iani farTobis 9%), saSual o (44%), Zl ieri (11%) da gansakuTrebiT Zl ieri (8%) zvasaSiSroebis raionebi.

gansakuTrebiT Zl ieri saSiSroebis raions miekuTvneba teritoria, sadac teritoriis zvavaqtiuroba metia 60%-ze, zvavSemkrebebis gavrcel ebis sixSire _ 15 zvavSemkrebze 1 km²-ze, zvavebis Camosvl is maqsimal uri sixSire _ 15

SemTxvevaze da zvasaSiSi periodis maqsimal uri xangrZl ivoba _ 150 dReze erT zamTarSi; Zl ieri zvasaSiSroebis raioni: zvasaSiSroebis raodenobrivi maxasiaTebI ebi metia 40%-ze, 10 zvavSemkrebze 1 km²-ze, 10 SemTxvevaze 100 dReze erT zamTarSi, Sesabamisad. saSual o zvasaSiSroebis raionSi erTi zvavSemkrebebis raodenobrivi maxasiaTebI ebi mainc metia Semdeg sidi deebze: teritoriis zvavaqtiuroba 2%-ze, zvavSemkrebebis gavrcel ebis sixSire _ 5 zvavSemkrebze 1 km²-ze, zvavebis Camosvl is maqsimal uri sixSire _ 5 SemTxvevaze da zvasaSiSi periodis maqsimal uri xangrZl ivoba _ 50 dReze erT zamTarSi; susti zvasaSiSroebis raionSi zvasaSiSroebis yvel a maxasiaTebel i nakl ebia zemoT moyvanil sidi deebze.

gansakuTrebiT Zl ier zvasaSiSroebis raions, ZiriTadad, ukavia maRal mTiani utyeo ferdobebi, Zl ieri zvasaSiSroebis raions _ subal puri zona, saSual o zvasaSiSroebis raions _ tyiT dafarul i saSual omTiani da dabal mTiani ferdobebi, susti zvasaSiSroebis raions _ arazvasaSiSi raionis mimdebare SedarebiT damreci mTiani ferdobebi.

afxazeTSi zvasaSiSia cal keul i dasaxl ebul i punqtebi, saavtomobil o gzebi, mTian regionebsi mdebare sameurneo, rekreaciul i da sxva daniSnul ebis obieqtebi (l . qal dani, 2002). Cvens mier gamovl enil ia mosaxl eobis, sameurneo da sxva daniSnul ebis obieqtebisatvis saSiSi 525 zvavSemkrebi. dadgenil ia am zvavSemkrebebis morfometriul i da maTSi warmoqmnili zvavebis dinamikuri maxasiaTebI ebi.

zvavSemkrebebis dasawyisis absol uturi simaRI e icvl eba 670 m-dan (md, kodoris xeoba) 3985 m-mde (md. sakenis saTave), dasasrul is simaRI e _ 365 m-dan (md. kodoris xeoba) 2820 m-mde (md. sakenis xeoba), umokl esia (350 m) iufSaras xeobaSi mdebare

zvavSemkrebi, xol o ugrZesi (7600 m) _ md. kodoris xeobaSi mdebare zvavSemkrebi (cxr. 16).

cxrili 16. zvavSemkrebebis ganawil eba dasawyisisa da dasarul is absol uturi simaRI is da sigrZis mixedvi T

dasawyisis simaRI e, m	% saerTo raodenobi dan	dasarul is simaRI e, m	% saerTo raodenobi dan
≤1000	2	≤500	3
1001-1500	5	501-1000	15
1501-2000	11	10001-1500	20
2001-3000	28	1501-2000	35
>3000	35	>2000	27
	19		

zvavis keris farTobi icvl eba 0.1 ha-dan (md. kodoris xeoba) 450 ha-mde (md. sakenis xeoba), zvavis keris zedapiris daxril oba _ 21⁰-dan (md. l aSifses xeoba) 60⁰-mde (md. kl iCis xeoba), xol o zvavis moZraobis maqsimal uri siCqare _ 12 m/wm-dan (md. l aSifses xeoba) 67 m/wm-mde (md. Cxal Tas xeoba) icvl eba (cxr. 17).

cxrili 17. zvavebis kerebis ganawil eba farTobisa da zedapiris daxril obis, zvavebis ganawil eba maqsimal uri siCqaris mixedvi T

farTobi, ha	% saerTo raodenobi dan	daxril oba, gradusi	% saerTo raodenobi dan	siCqare, m/v
≤0.5	18	≤25	7	≤20
0.6-1.0	14	26-30	14	21-25
1.1-5.0	30	31-35	13	26-30
5.1-10.0	8	36-40	22	31-35
10.1-50.0	16	>40	44	36-40

50.1-100.0	5			41-45
>100.0	9			>45

zvavis maqsimal uri dartyms Zal a meryeobs 4 t/m²-dan (md. l aSifses xeoba) 205 t/m²-mde (md. sakenis xeoba), konusis maqsimal uri mocul oba _ 1700 m³-dan (md. kodoris xeoba) 13500 aTas m³-mde (md. sakenis xeoba), xol o zvavis simaRI e 21 m-dan (md. kodoris xeoba) 38 m-mde (mdinareebis Cxal Tis, kl iCis, gvandrisa da sakenis xeobebi) icvl eba (cxr. 18).

cxrili 18. zavebis ganawil eba maqsimal uri dartyms Zal is, konusis mocul obisa da simaRI is mixedvit

dartyms Zal a, t/m ²	% saerTo raodenobidan	konusis mocul oba, aTasi m ³	% saerTo raodenobidan	simaRI e, m	% saerTo raodenon
≤25	11	≤10	14	≤25	2
26-50	34	11-50	25	26-30	6
51-75	27	51-100	12	31-35	14
76-100	18	101-500	18	>35	78
>100	10	501-1000	16		
		>1000	15		

guriis mTiani nawili sakmaod didi zvasaSiSroebiT gamoirCeva; xSiria zvavebis CamosvliT gamowveuli zaralic. zvavebma daangries sacxovrebeli saxlebi da damxmare nagebobebi 1957-58 ww. zamTarSi sof. zemo surebsa da sof. zotSi; 1958-59 ww. zamTarSi sof. nabeRI avsa da sof. CxakauraSi; 1970-71 ww. zamTarSi_sof. nabeRI avSi, sof. CxakauraSi da sof. qvabRaSi. 1970-71 ww. zamTarSi zvavebma sof.

zotSi imsxverpl es 6 adamiani, daangries 6 sacxovrebel i saxl i damxmare nagebobebiT, gawvyites saqonel i da gaanadgures savargul ebi. zvavebma didi material uri zaral i miayenes kurort baxmaros 1963-64 ww. 1970-71 ww., 1986-87 ww., 2000-2001 ww. da 2006-2007 ww. zamTarSi.

guriis mTian nawil Si zvavebis farTo gavrcel ebas xel s uwyobs ZiriTadad zvavwarmomqmnel i faqtorebis reliefis, kl imatisa da mcnareul i safaris Tavisebureba.

mdinareebis sufs is, gubazeul is, baxviswyl isa da maTi Senakadebis auzebis mTian nawil Si didia zedapis ris rogorc vertikal uri, ise horizontal uri danawevreba. danawevrebis siRrme saSual omTian zonaSi 200-500 m-ia, xol o maRal mTian zonaSi 300-600 m. sakmaod didi farTobi uWiravs cicabo ferdobeb s; saSual omTian zonaSi ferdobebis umetesi nawil is zedapis ris daxril oba, ZiriTadad, Seadgens 15030⁰-s, xol o maRal mTian zonaSi_25035⁰-s. tyis gavrcel ebis zonaSi xSiria meCxertyiani da utyeo cicabo ferdobebis gavrcel eba. ZiriTadi mdinareebisa da maTi Senakadebis auzebis maRal mTian nawil Si (subal puri da al puri zona) sakmaod didi farTobi uWiravs utyeo cicabo ferdobeb s.

sakvl evi teritoria saqarTvel os gansakuTrebiT uxvTovl ian raions miekuTvneba. aq, myari nal eqebis saSual o wl iuri raodenoba icvl eba 10-50 mm-dan (zRvis donidan 50-150 m) 700-800-mde (1800-1900). kurort baxmaroSi (1928w) myari nal eqebis maqsimal uri wl iuri raodenoba aRwevs 1100-1200mm-s, xol o minimal uri raodenoba

metia 300 mm-ze. Tovl is safaris maqsimal uri simaRI e aRwevs dabal mTian zobaSi 200-400 sm-s, xol o saSual omTian zonaSi 400-610 sm-s. didia Tovl is safaris simaRI is cvl il eba droSi; 1900-2000 m-ze Tovl is safaris maqsimal uri simaRI e aris 600-700 sm, saSual o simaRI e_290-300 sm, xol o minimal uri simaRI e_110-120 sm. ms baxmaros monacemebiT erTi Tovis dros mosul i Tovl is safaris simaRI is maqsimal urma namatma Seadgina 315 sm, xol o dRe-Ramura namatma_139 sm.

guriis teritoriaze zvavwarmomqmnel i faqtorebis Tavisebureba, kerZod, utyeo cicabo ferdobebis farTo gavrcel eba da uxvi Tovl i xel s uwyobs zvavebis farTo gavrcel ebas.

teritoriis zvavsaSiSroebis ganmsazRvrel i zvavsaSiSroebis raodenobrivi maxasiaTebI ebi sakvl ev regionSi did fargl ebSi icvl eba. maRal mTian zonaSi teritoriis zvavaqtiuroba (zvavaqtiuri ferdobebis wil i saerTo farTobSi) aRwevs 60-70%-s, zvavSemkrebebis gavrcel ebis sixSire (zvavSemkrebebis raodenoba 1 km²-ze)_15-17-s, zvavebis Camosvl is sixSire (maTi Camosvl is raodenoba erT zamTarSi)_15-17 SemTxvevas, xol o zvavsaSiSi periodis maqsimal uri xangrZI ivoba (zvavsaSiS dReTa raodenoba erT zamTarSi)_150-160 dRe-Rames.

guriis teritoriis darai onebas zvavsaSiSroebis xarixis mixedviT safuZvl ad daedo 4 ziriTadi raodenobrivi maxasiaTebel i: teritoriis zvavaqtiu- roba, zvavSemkrebebis gavrcel ebis sixSire, zvavebis Camosvl is

maqsimal uri sixSire da zvasaSiSi periois maqsimal uri xangrZl ivoba erT zamTarSi.

arazvasaSiSia guriis mTI iani farTobis 53%, zriTadad, zedapiris 15⁰-ze nakl ebi daxril obis mqone Savi zRvisa da kol xetis dabl obis mimdebare teritoria.

zvasaSiS teritoriaze, roml is qveda sazRvari zRvis donidan 120-300 m-ze gadis, zvasaSiSroebis xarixis mixedviT gamoiyofa susti (guriis mTI iani farTobis 17%), saSual o (23%), Zl ieri (5%) da gansakuTrebiT Zl ieri (2%) zvasaSiSroebis raionebi.

susti zvasaSiSroebis raions miekuTvneba teritoria, sadac zvasaSiSroebis raodenobrivi maxasiaTebI ebi nakl ebia Semdeg sidi debze: teritoriis zvavaqtiuroba_29%-ze, zvavSemkrebebis gavrcel ebis sixSire_5 zvavSemkrebze 1km²-ze, zvavebis Camosvl is maqsimal uri sixSire_5 SemTxvevaze da zvasaSiSi periodis maqsimal uri xangrZl ivoba_50 dReze erT zamTarSi. susti zvasaSiSroebis raions, ZiriTadad, ukavia dabal mTiani, SedarebiT damreci, arazvasaSiSi teritoriis mimdebare ferdobebi, agreTve gorak-borcviანი teritoriis is nawil i, roml is zedapiris daxril oba metia 15⁰-ze.

saSual o zvasaSiSroebis raions miekuTvneba teritoria, sadac zvasaSi- Sroebis erTi raodenobrivi maxasiaTebel i mainc aRemateba Semdeg sidi des: teritoriis zvavaqtiuroba 20%-s, zvavSemkrebebis gavrcel ebis sixSire_5 zvavSemkrebze 1km²-ze, zvavebis Camosvl is maqsimal uri sixSire_5 SemTxvevas da zvasaSiSi periodis maqsimal uri

xangrZl ivoba_50 dRes erT zamTarSi. saSual o zvasasisroebis raions ukavia sakmaod didi farTobi da is, ZiriTadad, moicavs 15⁰-ze meti daxril obis mqone meCxertyian, agreTve mcire farTobis mqone utyeo dabal mTian da saSual omTian zonaSi mdebare ferdobebs.

Zl ieri zvasaSiSroebis raionSi teritoriis zvavaqtiuroba metia 49%-ze, zvavSemkrebebis gavr cel ebis sixSire_10 zvavSemkrebze 1km²-ze, zvavebis Camosvl is maqsimal uri sixSire_10 SemTxvevaze, xol o zvasaSiSi periodis maqsimal uri xangrZl ivoba_100 dReze erT zamTarSi. raions ukavia subal puri zona da al puri zonis nawil i.

gansakuTrebiT Zl ieri zvasaSiSroebis raions miekuTvneba teritoria, sadac zvasaSiSroebis raodenobrivi maxasiaTebi ebim etia Semdeg sidi deebze: teritoriis zvavaqtiuroba_60%-ze, zvavSemkrebebis gavr cel ebis sixSire_15 zvavSemkrebze 1km²-ze, zvavebis Camosvl is maqsimal uri sixSire_15 SemTxvevaze da zvasaSiSi periodis maqsimal uri xangrZl ivoba-150 dReze erT zamTarSi. raions ukavia Zal ian mcire farTobi da moicavs maRal mTian uteo cicabo ferdobebs.

guriaSi zvasaSiSi cal keul i punqtebi (zemo surebi, qvabRa, boti, xakaura da sxva), kurortebi (baxmaro, nabeRl avi da sxva), saavtomobil o gzebi (Coxatauri-baxmaro da sxva). marto erT Coxatauri-baxmaros saavtomobil o gzas emuqreba 67 zvavSemkrebSi warmoqmnili zvavebi. Cvens mier gamovl enilia mosaxl eobis, sameurneo da sxva daniSnul ebis

obi eqtebi saTvis saSiSi zvavSemkrebebi. dadgenilia am zvavSemkrebebis morfometriuli da maTsi warmoqmnili zvavebis dinamikuri maxasiaTebeli.

zvavSemkrebebis dasawyisis absoluturi simaRle icvl eba 475 m-dan (md. gubazeulis xeoba) 2500 m-mde (md. saSvalas xeoba). dasasrul is simaRle_290 m-dan (md. gubazeulis xeoba) 2170 m-mde (md. baxviswyalis xeoba), umoklesia (250 m) md. gubazeulis xeobaSi mdebare zvavSemkrebi, xolo ugrZesi (2100 m)_md. saSvalas xeobaSi mdebare zvavSemkrebi, sakvl evi teritoriisaTvis damaxasiaTebelia zvavSemkrebebi romlebic iwyeba maRal mTian zonaSi (2000-2500 m-ze) da mTavrdeba saSualomTian zonaSi (1500-2000 m-ze), agreTve zvavSemkrebebi, romelTa sigrZe 500-1000 m-ia. (nax. 19).

cxrili 19. zvavSemkrebebis ganawileba dasawyisisa da dasasrul is absoluturi simaRlisa da sigrZis mixedvit

dasawyisis simaRle, m	% saerto raodenobidan	dasasrul is simaRle, m	% saerto raodenobidan	sigane , m	% saerto raodenobi
≤1000	27	≤500	24	≤500	11
1001-1500	19	501-1000	21	501- 1000	49
1501-2000	12	1001-1500	9	1001- 1500	26
>2000	42	>1500	46	>1500	14

guriis teritoriaze mosaxleobisa da sameurneo obieqtebi saTvis saSiSi zvais kerebis farTobi icvl eba 0,1 pa-dan (md.

gubazeul is, md. saSval as, md. baxviswyal is da md. Cxakauras xeobebi) 22 ha-mde (md. saSval as xeoba), zvavis kerebis zedapiris daxril oba₁₈⁰-dan (md. saSval as xeoba) 45⁰-mde (md. gubazeul is xeoba), xol o maqsimal uri siCqare 10 m/wm-dan (md. baxviswyal is xeoba) 44 m/wm-mde (md. gubazeul is xeoba) icvl eba. (cxr. 20.)

cxril i 20. zvavis kerebis ganawil eba farTobisa da zedapiris daxril obis, zvavebis ganawil eba maqsimal uri siCqaris mixedviT

farTobi, ha	% saerTo farTobi dan	daxril oba, gradusi	% saerTo raodenobi dan	siCqare, m/wm	% saerTo raodenobi dan
≤0,5	70	≤25	12	≤20	29
0,5-1,0	1	26-30	45	21-30	47
1,1-5,0	11	31-35	29	51-40	22
>5,0	7	>35	14	>40	2

guriaSi SedarebiT farTod aris gavr cel ebul i zvavis kerebi, romel Ta farTobebi nakl ebia 0,5 ha-ze, xol o zedapiris daxril oba Seadgens 26-30⁰-s, agreTve 21-30 m/wm maqsimal uri siCqaris mqone zvavebi.

sakvl ev regionSi zvavis maqsimal uri darty mis Zal a meryeobs 5 t/m²-dan (md. baxviswyl is xeoba) 89 t/m²-mde (md. gubazeul is xeoba), zvavis konusis maqsimal uri mocul oba-1000 m³-dan (md. gubazeul is xeoba) 280000 m³-mde (md. baxviswyl is xeoba), xol o moZravi zvavis simaRI e 9 m-dan (md. gubazeul is xeoba) 26 m-mde (md. saSval as xeoba). sakvl evi regionisaTvis iseTi zvavebia damaxasiaTebel i, romel Ta

maqsimal uri dartyimis Zal a nakl ebia 25 t/m-ze, konusis mocul oba _ 5000 m³-ze, xol o simaRI e ki Seadgens 16-20 m-s.

cxril i 21. zvavebis ganawil eba maqsimal uri dartyimis Zal is, konusis mocul obisa da simaRI is mixedviT

dartyimis l a, t/sm ²	% saerTo raodeno bidan	konusis mocul oba, aTasi m ³	% saerTo raodenobidan	zvavis simaRI e, m	% saerTo raodenobida
≤25	49	≤5	50	≤10	9
26-50	38	6-10	22	11-15	33
51-75	11	11-100	17	15-20	46
>75	2	>100	11	>20	12

Rvarcoful i procesebi

Rvarcofi ewodeba zogierTi mTis mdinaris uecar da Zal ian swraf adidebas, rac warmoiSoba gansakuTrebul geomorfol ogiur, geol ogiur da hidrokl imatur pirobebSi. upiratesad Tavsxma wvimebis dros, zogjer Tovl isa da yinul is swrafad dnobis an Segubebul i xeobis zRudis gangreviT. Rvarcofi Seicavs didi raodenobiT myar masal as, zogjer 90 %-mde. mas aqvs didi siswrafe da ngreviT Zal a. Rvarcofebi warmoqmnian maTTvis damaxasiaTebel gamonatans. igi saxal xo meurneobas da mosaxl eobas did zians ayenebs. arsebobs ori tipis Rvarcofi _ struqturuli, anu Sekruli da turbulenturi, anu denadi. ZiriTadi ganmasxvavebeli niSani

Rvarcoful nakadebs Soris maTSi myari masal is %-ul i Sedgenil obaa. struqturul i Rvarcofi, romel ic Seicavs 70-80 % myar masal as, warmoiSveba gazafxul zafxulis sazRvarze 5-15 wel iwadSi erTxel an ufro gvian. igi viTardeba gansakuTrebulo geomorfol ogiur, liTol ogiur da klimatur pirobebSi. swored amitom struqturul i Rvarcofi gvixvdeba mxol od zogierTi mdinaris zemo wel Si an SemdinareSi. am tipis Rvarcofi gamozidvis konusamde iSviaTad aRwevs da wyal movardnis nakadis Serevis gamo saxesac icvl is.

turbulenturi Rvarcofi romel Sic 20-30 %-ze meti myari Rvarcoful i masal aa didad gavrcelebul ia. igi warmoiqmneba SigniT kaxeTis umTavres mdinareebSi da xSirad gamozidvis konusamde da mis periferiebamde aRwevs. maTi dacxroma umetesad gamozidvis konusze xdeba. Rvarcofis es tipi warmoiSveba sam wel iwadSi erTxel, gazafxul obiT da Semodgomaze, xandaxan ki zafxul Si. RvarcofebSi gamoiyofa ramodenime saxis nakadi. esenia: tal axiani nakadi, tal ax-qviSiani, qviSian-tal axiani, tal ax-qviani, qviSian-qviani, qva-tal axiani, qva-qviSiani da wyal -qviani.

SigniT kaxeTSi, gansakuTreb iT kavkasionisa da gomboris qedebis mTis Zirobebze, Rvarcofebs Zvel Taganve qonda adgili. adamiansa da Rvarcofebs Soris mudmivi brZola arsebobda. adreul periodSi Rvarcofebi imarjvebdnen da adamians axal axal savargulebs arTmevdnen, xolo ukanasknel periodSi SedarebiT ukeT Seswavl aSi da RvarcofsawinaaRmdego RonisZiebebis, teqniki gamoyenebis Sedegad, Rvarcofis sakmaod didi nawili al agmulian Sesustebul ia. RvarcofebiT

dakavebul i aTasobiT heqtari, kerZod gamozidvis konusebi aTvissebul ia da adamianis sasikeTod aris gamoyenebul i. kaxeTSi Rvarcofebis Seswavi a da maT winaaRmdeg brZol is RonisZiebebis dasaxva me-19-e sk-is dasawyisamde primitiul xasiaTs atarebda. pirvel i didi samamul o omis Semdgom kvl evam gegmazomieri, magram cal mxrivi xasiaTi miiRo. stiqiur-damangrevel i geomorfol ogiuri procesebi, maT Soris Rvarcofebi, bunebis mraval i faqtoriT ganpirobebul i Zal ian rTul i movl enebia, romel Tanac faqtorebis saxiT genetur kavSirSia geografiis, nawil obriv geol ogiis, geofizikisa da biol ogiis iseTi dargebi, rogorebic aris geomorfol ogia, kl imatol ogia, hidrol ogia, l iTol ogia, Tanamedrove teqtonikuri moZraoba, botanika da sxva. Rvarcofebis winaaRmdeg saqarTvel oSi dRemde Catarebul i RonisZiebebi saTanado doneze ar idga. mag., kaxeTSi zemo al aznis sistemis mSenebl obisas al aznis vakis marjvena mxaris Rvarcoful xevebs TiTqmis yvel a mdinaris gaswvri v orive mxareze gaukeTda al uviol yril ebi. magram igi vargisi gamodga mxol od wyal mcirobis periodSi. mZl avri Rvarcofebis dros nakadi TiTqmis yvel a mdinaris kal apotidan gadavarda da sofl ebi da savargul ebi wal eka. Semdeg kvl av ganmeorda napirebis am meTodiT dacva da Rvarcofebisgan maTi wal ekva. am meTodma ar gaamarTI a. Rvarcofi warmoiqmneba RvarcofwarmomSobi mTavari faqtorebis: rel iefis, l iTol ogiisa da havis zegavl eniT. Tu romel ime maTgani, rogorc RvarcofwarmomSobi faqtori, monawil eobas ar iRebs Rvarcofi ar warmoiqmneba. mdinaris xeobaSi Tavs iCens, rogorc geomorfol ogiuri, agreTve

hidrol oġiuri movl enebi. mdinareebSi mimdinare
proceseġi Semdegnairad warmogvidgeba, mdinaris
Rvarcoful tipeġi geomorfol oġiuri proceseġis
Sedegad vRebul obT struġturul anu Sekrul
Rvarcofeġs da turbul entur anu denad
Rvarcofeġs.

mdinaris hidrol oġiuri reġimis tipeġi,
hidrol oġiuri proceseġis Sedegad, viTardeba 1)
wyal didoba da 2) wyal movardna.

wyal movardna, romel Sic myari masal a
mxol od 3-4 %-ia, Rvarcofidan wyal didobaze
gardamaval movl enas warmoadġens. Tu
wyal movardna gaZl ierda da maTSi myari masal is
raodenoba gairarda igi miiReġs Rvarcofis saxes,
xol o Tu Sesustda da procesi gaxangrZl ivda igi
Rebul obs wyal didobis saxes. Rvarcoful i
proceseġis winaaRmdeg brZol is mTavari
sazrunavia garantirebul i RonisZieġebis dasaxva
da Sesrul eba. SigniT kaxeTSi adre Catarebul ma
RonisZieġebma, roml ebic saproeqto organizacieġma
SeimuSaves, ver aRmofxvres Rvarcoful i
proceseġi, amitom isini j er kidev did zaral s
ayeneben saxal xo meurneobas. es faġti
ganpiroġebul ia imiT, rom Rvarcofeġisadmi
miZRvniI saproeqto angariSeġSi mocemul i ar aris
proceġis arc sistemuri kvl eva da arc
garantirebul i prognozul i SefaseġiT sinTezi.

Rvarcofeġis kvl evisas didi mniSvnel oba
eniWeba Rvarcofwarmomqmnel faġtoġeġs, anu
garemos, romel ic Rvarcofis warmoSobas, sivrciT
gavrcobas da intensivobas gansazRvrvs.
Rvarcofeġis warmoSobas gansazRvrvs 3 umTavresi
faġtori. esenia, I _ morfol oġiuri, II _

I i Tol ogiur-teqtonikuri, III _ kl imatur-
hidrol ogiuri faqtori.

am sami faqtoridan Tu erTerTi faqtori xel s
ar uwyobs, Rvarcofi ar warmoiqmneba. garda amisa,
Rvarcofebze did gavl enas axdenen agreTve
niadaguri, mcenareul i, anTropogenul i da
geomorfol ogiuri faqtorebi.

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