

M > 51.463.8

< l. G: g^j_1 \. X. > \h j g b d k \. :. J y [q _ g , d X P i _ e \ ^ 1 , D = K f b j g h \ ^ 3 , 2013
¹ K \ _ j A n Z i Z ^ g h _ m i j Z \ e _ g b _ i h] b ^ j h f _ l _ h j h e h] b b b f h g ^ u l h j k Z g d l l _ h j [i j m] Z x s _
² K Z g d l _ l _ j [m j] k d b c r B o g e k t Z e m l Z h d _ Z g h e h] b b b f l l R b j r h \ Z J : G
³ = h k m ^ Z j k l \ _ g g u c h d _ Z g h] j Z n b q _ k d b c b g k Z g d l l _ b j [m G] K G h A _ m h h ^ Z e _ g b _
antony.spb@bk.ru

<HKIJHBA<?>?GB?RLHJ FH<UOG:=HGH<<G?<K DHC=M; ?
G:HKGHLODFGHC FHEBBDMEEB
MIKEHBOF:GBJ H:GBX:LHJFB
DHFEDK:A:SBLGUOK HHM@GBC

Lj_of_jgZy]b^jh^bgZfbq_kdZy fh^_evk l G g^khdh q Z]klbu Nzb gkdh]h
eb\Z bkihevah\ZgZ ^ey \hkijhba_^_gby rlhjf]h[u]o_g_Zg]hgh\ \
j_ ^_dZ[j_] dh]^Z ^ey ij_ ^h l \ j Z s _ g b y l _ g Z] [h m g] _ g b y l \ K Z g
[h\Zehkv aZdjulb_ kl\hjh\ Dhfie_dkZ aZsblguo khhj m`_gbc
jZkq_lh\ k ^Zggufb baf_j_gby mjh\gy \h^u gZ]b^jh_f_l_hjh
©DjhgrlZ^b ©=hjguc bgklblml^a b kdhjklb l_q_gbc gZ Z\lf
klZgpbb m fZydZ ©Lhe[mobg^a ihdZaZeh qlh fh^_evvZ^_d\Z
guo]b^jh_f_l_hjheh]bq_kdbo mkeh\byo

Dexq_u_ ~~kl~~ rlhjf]h_u_gZ]hgu fh^_ebjh\ZgZ sbl G kbirej_m]g_bbc KZgd l
l_l_j[m.j]Z

< gZklhys__ \j_fy \ N = ; A V Z i @ K g h _ j M = F K ^ a \ _ ^ m l k y j Z [h l u i
pbb b \g_ ^j_gbx \ hi_jZl b \ gh _ bkihevah\Zgb_ dhfie_dkZ]b^
^ey ijh]ghaZ]b^jheh]bq_kdh]h b wdheh]bq_kdh]h khk]hygby
aZeb\Z b G_ \kdhc]m[u >ey h[_ki_q_gby gZ^`ghc b wnn_c
aZsblguo khj m`_gbc -K Z l g d l [m j] Z h l g Z \ h ^ g _ g b c D A K j Z h j Z [h l Z
gbjm k d k l _ f i z h] g h a z ^ t _ f z h ^ u K I I < d h l h j Z y \ j _ ` b f _ j _ Z e v g h] l
h[_ki_qb\Z b l l f h b g g] b i j h] g h a m j h \ g y \ h ^ u k i _ j _ ^ Z q _ c i h e g h c
\ k b k l _ f i m ^ ^ _ j ` d j b g y l b j r _ g b c K I I J i h m i j Z \ e _ g b x D A K K I I <
dZd dhfie_dk \aZbfh^_ckl\mxsbo]b^jh^bgZfbq_kdbo fh^_e_c
h[t_f gZ[ex^_gbc h khklhkyjg b u v h Z g h c k n _ j u g Z ^ g _ c H k g h \ g h
gb_ K I I < h i _ j Z l b \ g Z y \ u ^ Z q Z i j h] g h k l b q _ k d b o i j h ^ m d l h \ \ > e y \
guo j_dhf_g^Zpbc ij_ ^mkfZljb\Z_lky jZkq_l ih gZ[hjm \hafh`
j_Zevguo kblmZpbc GZjy^m k K I I < l Z Z v g b j m g l k y b j Z a j Z i j h Z d l b
bgnhjfZpbg h k l x f w d h e h] b q _ k d k l] h y g b y B K W K d h l h j Z y \ [m ^ _ l
eylv MijZ\ e_gbx DAK b ^jm]bf xjb^bq_kdbf ebpZf bgnhjfZpbx
klhygbb G_ \kdhc]m[u b \hklhgg h c q Z k l b N b g k d h] h a Z e b \ Z
Y^jh_f h[_bo_k b K I I < b B K W K \ e y _ l h y f i e _ d f h j k d b f c h ^ _ e _ c
D F F < g Z k l h y s _ _ \ j _ f y k m s _ k l \ m x l ^ \ _ g Z p b h g Z e v g u _ f h ^
kdh]h fhjy b Nbgkdh]h aZeb\Z dhjhju_ fh]ml khklZ\blv hkgh\
- fh^_evvZ^_d\Z CARDINAL (Coastal Area Dynamics Investigation Algorithm) [1];
- dhfie_dk fh^_e_c ^ey hi_jZl b \ gh] h i j h] g h a Z k h k l h y g b y
j Z [h g u d k h j m ^ g b d Z f b J = = F M K I [K I P I P : F G X b
< ihke_ ^gbc dhfie_dk \dexq_gu Zlfhkn_jgZy Nhb^g_kedh]fhF
aZeb G U L F O O S (the G U L f of F i n l a n d O p e r a t i o n a l O c e a n o g r a p h i c S y s t e m > @ f h ^ _ e v

G_ \kdhc NEVAM (NEVA Model) fh^_ev _ljh\h]h SWAN (Simulating Waves Nearshore) > @ -KZlgd[mj]kdZy fh^_ev w\ljhnbZpbb ;Zelbckdh SPBEM (St.Petersburg Baltic Eutrophication Model) > @ < dhfie_dk lZd`_ \oh^yl ^Zgguo gZ[ex^_gbc [ehdb f`_fh^_evgh]h h[f_gZ bgnZjfZpb_c k pbb b Zjob\Zpbb j_amevlZih\ >ey aZ^Zgby Zlfhkn_jgbo \ha^_ck \bc gZ hldjulhc]jZgbp_ fhjy bkihev`gux_lkfh^_ebaZ hfkn_jgZy HIRLAM (HIgh Resolution Local Area Model) > @ b fh HIRLAM (HIgh Resolution Operational Model for the Baltic Sea) [8].

< gZklhys_c klZlv_ jZkkhZlfjh\Zkky bkihevah\Zgbyv\gmljb fh^ gh]h dhfie_dkZ lj_ofh]jghZfb^_kdhcNEVAMedZd bgkljmfhgIZ i a\heyxs_]h mlhqgbiv b ^_lZebabjh\Zlv ijh]gha]b^jh^bgZfbq_kdh lhqghc qZklb Nbgkdh]h aZeb\Z Z hkh[_ggh \ G_ \kdhc]m[_ b hdj >ey _jbnbdZpbbNEVAM gZjy^m k ^Z]gghh_hjheh]bq_kdbo i klh\ lZd`_ ijb\e_dZ_lky Zjob\ baf_j_gguo]b^jheh]bq_kdbo oZjZguc \ j_amevlZl_fhjZlhc Z\lhfZlbq_kdhc]b^jhf_l_hjheh]bq_kdhc F:=FK ©DjhgrlZ^I^a F:=FK ©DjhgrlZ^I^a [ueZ mklZgh\e_g l_l_j[mj]kdbf PJ=FgZ]em[b_g_ \ lhqd_ k dhhj^bgZIZfb f •k f •\ ^ gZoh^y sklkyg gZ jZdf d x]m hl fZydZ ©Lhe[mobg^ M Zjob\ kh^_j`bl ^Zgguo_ h iZjZf_ljZo \heg_gby mjh\g_ ih_joghklb q_gbc ijb^hgguo khe_gZkljb ljZkljhj_gghf dbkehjhaZ_b fmlghklb jbh^ k ghy[jy ih ^_dZ[jy]

HibkZgb_fh^eb NEVAM. Fh^_NEVAM y\ey_lky mkh_jr_gkl]h\Zgghc _ kb_c lj_of_jghc]b^jh^bgZfbq_kdhc fh^_eb G_ \kdhc]m[u b \hk]h aZeb\Z > @ b gZkgh\ZfgZghc fh^_eb h[s_c pbjdmeyppb hd_ZgZ lj mgb_jkb Princeton Ocean Model, POM > @ bkihevams_c \ dZq_kl_ _jl ghc-dhhj^bgZlm Hlebqbl_evghc q_ jdhb^bgZehc y\ey_lky]eZ^dh ij^klZ\le_gb_ lhih]jZnbb_kgZqbWZlhl re[mqr__ ih kjZ\g_gbx k mjh\ b bahibdgbq_kdbfb fh^_eyfb hibkZgb_ ^bgZfddb l_q_gbc \ ijb^ keh_ >hkIZlhqghfb_hjheh hibku\Zxl lZd`_ l_jfh^bgZfbqmkdb_ wnn_ keh\e_ggu_ g_ebg_cgghklvx mjZ\g_gbylkhfh^yegbyohljhwthifm^oh^yl ^ey fh^_ebjh\Zgby l_q_gbc \ r_evnh\hc ahg_ hd_Zgh\ f_edh\h \gmlj_ggbo fhjyo b wkImZjbyo j_d >hihegbl_evgh_ ij_bfms_kl\h kdh]h mgb_jkb_lZ khklhbl \ hibkZgbb _jlbDZe[rqb]hg]h]h]bahgl i_j_ghkZ gZ hkgh_ bkiulZgguo b gZ^`_guolkiZjZgghjFaZebqZk bh\ YfZ^u > @ ZfZdjbkgkdh]h > @

< kh\j_f_gghcNEVAM b kke_ ^m_fZy h[eZklv \u[jZgZ lZd qh[u Z hibkZlv ijhp_kku \ G_ \kdhc]m[gZbliDAK hfmalemx qZklv \g_rg_] lmZjby j G_\Z hl h Dhlebg ijbf_jgh ^h f_jb^bZgZ R_i_e_\kdh]h]jZgbpZ kl\hj G_\u ijhoh^bl iZ f_ jv^bZgZiZ^ghZfy_jb^bZgm ž • •\ ^ Djb\hebg_cgZy d\Zabhjlm]hgZelZgZyf k]jZzhkl qh[u h[_ki_qblv fZdkbfZevgh_ jZaj_r_gb_ \ G_ \kdhc]m[_ \ ij^_eZo ^h DAK Qbkeh maeOdhhj^bgZih_ k aZiZ^Z gZ500hk]hd jZ\gh dhhj^bgZl_ k x]Z-gZ kqbkeh jZ\ghf_jgh jZbiheh\gggu >jm]b_ iZjZf_lju k_ldb ^Zgu \ lZ[e



Jbk Ko_fZ Dhfie_dkZ aZsblguo-ikHhj[m]i]zbbkGZg_d^g_gbc DAK
 < < < < ±h^kijhimkdgu_ \hjhZ DAKk^kijbimkdgu_ dZgZeu
 D1 D11 ±qZklb ^Zf[u

LZ pZ

IZjZf_lju jZkq_lghc k_ldb fh^_eb G_\kdhc]m[u

IZjZf_lju	Fbgbfmf	FZdkbfmf
RZ] ihdhj^bgZI_	47.4	368.5
RZ] ihdhj^bgZI_	38.6	556.9
=em[bgZ \h^h_fZ	0.2	34.0

LZ[ebpZ

IZjZf_lju hl_jklbc DAK kh\j_f_ggh_ khklhygb_

HI_jklb_	RbjbgZf	=em[bgZ	Qbkeh rZ]h\NRVAb
K	200	16.0	4
K	110	7.0	2
<	336	2.5	5
<	280	5.0	4
<	280	2.5	2
<	280	5.0	2
<	280	5.0	2
<	336	2.5	2

Kh\j_f_gggZy dhgnb]mjZpby DAK ihdZaZgZ gZ jbkI < IZ
 \mxsbo \h^hijhimkdgu\hjhbmkdguo khhj^_gbc DAK ih khklhy
 e_IZ] Fh^_evgh_ ij_^klZ\e_gb_ \h^hijhimkdguo b km^
 khhlk]m_l wlfm khklhygbx Fh^_ev iha\hey_l hidju\Zlv b a
 ijhp_kk_ jZkq_lh\

Fh^_ev pbjdmeypbG_\kclm[_ h[t^bg_gZZk_fgh]dgh^c
 evx fhjkdh]h ev^Z +(<Ow]bc @h^_eb e_^ ^_b b gk]ggZ_dZI_]hjbk
 g_^_nhjfbjh\Zgguc b ^_nhjfbjh\Zgguc e_^ < k\hxgguc_je^v g
 ^_ebiky gZ g_kdhev dh ih^dZI_]ZjggucZgZ_mjhfbjkluc th gZke
 _gguc GZkeh_gguc e_^ kms_kl]m_l ijb lhe k b g Z Zdeg Z Z u\Z_gfv

lhesbgZ i_j_[jhkdb ijb [hevrbo lhesbgZo e_^ hlgkkl]lky d dZl
W\hexpby dZ`^hc dZl_]hjbb ev^Z hibku\Zd hgy mjjZgby ebs^ey
^b b fZkku ev^Z ijbq_f wlb mjZ\g_gby j_rZxlky \ eZjjZg` \hf i
gu ev^Z < dZ`^hc dZl_]hjbb ijbq_f lky \ j_amevlZl_ Z^ \ dpjb ^_nhjfZ
fh^bgZfbq_kdbo ijhp_kkh\ lj_^iheZ]Z_lky qlh ijb[ieZ]glu e_^ km
]^_]em[bgZ \h^h_fZ f_gvr_ aZ^Zggh]h djblbq_kdh]h agZq_gby
imevkZ l_ieZ b \eZ]b gZ]jZg\hpaZmgZha h^ZiZejZf mjkka lZd
`_ dZd \ > @
lehsZ^v \h^hh[f_gZ f_`^m G_\kdhc]m[hc b Nbgkdbkf aZeb\hf
_jghc qZkl_c DAK khklZ\ey_l khhl\blkl\fggZdbf h[jZahf ie
sZ^v \h^hh[f_gZ ^ey k_jghc qZklb ^Zf[u aZf_lgh f_gvr_ hdheh
fZjgh]h \h^hh[f_gZ q_f iehsZ^v \h^hh[f_gZ \ __ x`ghc qZklb D
qbkeZ]h\ k_ldb ijboh^ys__ky gZ hl_jklby ^Zf[u ^dZdqiljZ\beh g
iha\hey_l ^hklZlhqgh ohjhrh hibku\Zlv l_q_gby \ hl_jklbyo \h^h
b khijhimkdguo dZgZeZo DAK
IhklZghdZqbke_ggh]hwdki_jbf_glZ >ey bkiulZgby NEVAMEpue u
[jZg i_jbh^ \j_f_gb k wdklj_fZevgufb]b^jhf_l_hjheh]bZ_kdbfb m
\beh lZdb_ mkeh\b]m[_G\hkgkbcZxl hk_gvx b \ gZqZe_ abfu
< ghy[j_f_dZ[j_] gZ[ex^Zebkv ljb rihjfh\uo gZ]hm gZ \h^u \
[_ dh]^Z ^ey ij_gby\jZs\h^g_gbyl \lKjZgd] ihlj_[h\Zehkv aZdjulb
kl\hj\ DAK l_j\uc gZ]hg ijhgahyr]je Kl\hju khhjm`_gbc [ueb aZ
lu k q fhkdh\kdh]h \j_f_gb ghy[jy ^h q ghy[jy <lhjhc
ijhke_^h\Zeb \ klyad_ h^bg aZ_dZ]jybfjb ijhoh`_^gbb b[rbjgh]h p
dehgZ Kl\hju khhjm`_gbc [ueb aZdjulu k q ^h q ^_dZ[jy
khhjm`_gbc [ueb aZdjulu k q ^h q ^_dZ[jy LZdbf h[jZa
fhf i_jbh^_ [ueb hlf_q_gu ljbZgZ\GkgfZobkbfZevgufb mjh\gyfb \
^u ih]b^jheh]bq_kdhfm ihklm =hjguc bgklblml g b kf \
rlZ^lkdh]h nmlrlhdZ
K mq_lhf]b^jhf_l_hjheh]bq_kdhc h[klZgh\db \ mdZaZgguc ijh
lZd`_ \ i_jbh^ gZdhie_gguo ^Zgguc gZ limj giuh hgZ [NEVAMB
[ue \uiheg_g j_ljhki_dlb\gudk mzkq_ggyZjy ih ^_dZ[jy]
< dZq_kl_ gZqZevguo mkeh\bc [ueb \aylu ihey l_gi_jZlmju b
guf fh^_eb +,520% > @ GZ hldjuluo [hdh\uo]jZgghcZj aZ^Z\Zeb
gbp__`_qZkgu_agZq_gby mjh\gy l_fi_jZlmju b khe_gkklb ih ^Z
\hklhqqghc]jZghkl_hyggZy \h \j_f_gb l_fiKjZdmjZkij_^_e_gguc ih
jmdZ\Zf kkd >ey]hZkq_QZ bkihevah\ZeZkv wfaZ]bq_bklZly
k\yau\Zx@Zy^3f k k mjh\g_f \h^u \ EZ^h`kdhf ha_j_

$$Q = 0.6321 \eta^2 + 39.86 \eta + 1138.4, \tag{1}$$

]^_n - mjh_gv \hKfu \imgdl_ l_ljhdj_ihklv \ bklhd_ G_\u
GZ]jZggbk Zlfhkn_jhc [ueb aZ^Zgu _`_qZkgu_ ihey hkgh\guo
kdbo iZjZf_ljh\ ^Z\e_gb_ l_fi_jZlmjZ hlgkkl_evgy \eZ`ghklv
e_gb_ _ljZ h[eZqghklv dhebq_kl\h hkZ^dhHIRLAKK]qblZggu_ ih
J_amevlZlu jZkq_lh\b kjZg_ gb_k Zggufb gZ[ex^gbc Hkh[uc bgl_j_k
ij_^klZ\ey_l \hkijhba_^_gb_ fh^_evx]b^jheh]bq_kdbb iZjZf_ljh\
q_kdbo ihklh\ DjhgrlZ^l b =hjguc bgklblml \ jZchg_ fZydZ Lhe[r
]h gZ jZkklhygbb df d aZiZ^m hl DAFK = Fkq @ZjihgrlZg^h^d Z
lZd`_ g_ikhj_^kl_ggh hdheh kl\hj\ DAK

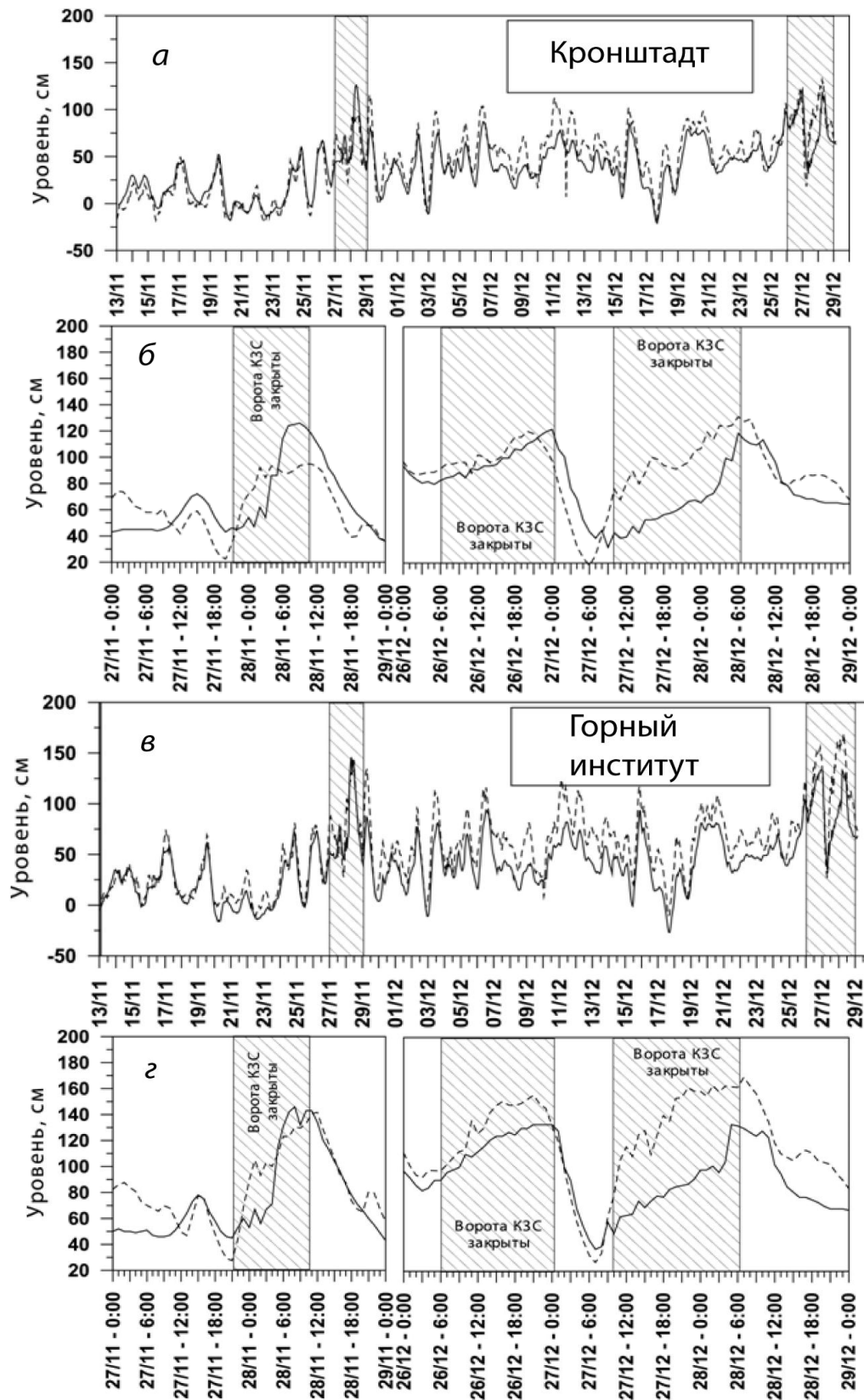
GZ jbk kf p\ \de ic dmk lZ\ e_gu ijhkljZgkl\ _ggu_ jZkij_ ^_e_g
 kdhjhkl_c l_q_gbc ^ey kemqZy aZdjuluo b hldjuluo kl\hjZo
 \hjhlZ\ mkeh\byo rihjfh\hgjZu ghZ lfg_gmkbe_gb_ l_q_gbc ^h
 ^hev ^Zf[u kh klhjhg Nbgkdh]h aZeb\Z Z lZd`_kfh\mrkgb
 _jghc qZklb ^Zf[~~Z~~ ljbkihgb`_grjbg\ygZ aZiZ^ghc jZgbbp b hld
 \hjhlZba[ulhqguc h[t_f \h^u gZdh\k d h g u]m[_G mklj_fey_lky q
 ^hijhimkdgu_B4-Bh lZ[jZlgh \ aZeb\ \ gZijZ\ e_gbb ijhlb\hiheh
 e_gbx \(\j b Z D) ljb wlhf bgl_gkb\ghklv l_q_gbc \ G_kdhc]m[
 \Z_l Ke_^m_l hlf_lblv- qlh_dZ[jy f_gy]ekyZk de Zh kbe_ ZZd b i
 ijZ\ e_gbx

KjZ\g_gb_ jZkkqblZgguo b baf_j_gguo G Z gjZk_gbjc ^nkjZ\ey g
 gZ[ex^Z_fu_ b jZkkqblZggu_ ih fh^_eb agZq_gby mjhl\ghy \[eb
 DjhgrlZ^l b =hjguc bgklblml Ke_^m_l hlf_jlbalmevllZlthh h jhrghu
]eZkmxiky ih nZa_k ^Zggufb gZlmjguo gZ[ex^_gbc \ l_q_gb_
 jbh^Z ghy[\y_dZ[jy] Z \ ghy[j_ kms_kl\m_l g_hieho_h_
 exlguf agZq_gbyf mjh\gy H^gZdh \ ^_dZ[j_ ih g e u f g h b g h k Z a Z
 l_evgh gZ[ex^_gguo ijbq_f g^_hhp_gdb \ h[hbo imgdlZo ijb
 k\b^_l_evkl\m_l h aZgb`_gguo agZq_gbyo mjh\gy gZ hldjulho
 aZ^Z\Zebkv gZ hkgh\Zgbb j_amevl ZHIROMZ kq_lh\ ih fh^_eb

< p_ehf fh^h_eZ aZeZ ohjhrmx kh]eZkh\Zgghklv fh^_evgh]
 mjh\g_c \ kblmZpbb gZ\h^g_gbc ijb aZdjulby kl^hjhZ[Dya Klif < l
 qZ_lky aZgb`_gb_ fh^_evgh]h mjh\gy ijb lj_lv_f rihjfh\hf gZ
 dehg_gb_ khklZ\beh b kjfhZ h e h \ FKjD \ img
 guc bgklblml Ke_^m_l hlf_lblv qlh bgnhjZpby h \j_f_gb aZ
 i_jbh^ g_lhqgZ NZah\uc k^b] \ gZqZe_]krk dhq_ _ ^k d]Z[jly[mjlb
 e_g g_lhqguf aZ^Zgb_f gbf agZjZu] jbfy_kl\hj\ DAK \ fh^_evghf j

H dZq_kl\ _ jZkq_lZ mjh\gy ihj^h_e y g l k k Z i b k l v q_kdb_ oZjZ
 jbkldb lZ[e DZd \b^gh ba lZ[ebpu nZdlbq_kdb_ b ijh]gh
 \h^u ohjhrh dhjj_ebjmxl ^jm] k ^mjgd hZ o\ H[hj b p Zil_evghk agZq
 l_fZl b q_kdhc hrb[db] h\hjbl h lhf qlh fh^_ev \ kj_Ygy_f aZgb`

KjZ\g_gb_ jZkkqblZgguo b baf_j_gguo kdhjhkl_c lqg_gbc
 rIZ^l^a >ey ZgZebaZ kdhjhkl_c l_q_gbc bkihevah\Zgwo\j_b_f_gg
 f_j_gguo b jZkkqblZgguo agZq_gbc kdhjhklb l_qgrgZcl^ l hqc
 GZ jbk kf p\ \de ic d m ^_gu]jZnbdb khikhklZ\ey]hg boyh^Z_ffhgney
 gZijZ\ e_gby jZkkqblZgghc b gZ[ex^Z_f Fc`^k dh jhklb k m s _g_b\m
 aZf_lgu_e h Z b y dZd ih fh^mex lZd b ih gZijZ\ e_gbx ;he__ ij
 gb_ h kl_i_gb khhl_lkl\by jZkkqblZgguo b gZ[ex^Z_fZio kdh
 lbk b q_kdb_ hp_gdb _jhy lghklguo oZjZdl_jbkldb ^Zgguo gZ[
 jZkq_lZ kh]eZkghZ dh ghjfu_fj gh klb baf_gqb\hklb gZlmjgguo b fl
 guo ^h\hevgh [ebadb LZd ijb \k^ pgvude g e Z h g k l b jZkij_ ^_e
 gb_f(V, 3f kdhjhklb lV_qh g^Zyguf baf_j_gbc b jZkq_lZ ihdZau\
 kh\iZ^_gb_ ih gZijZ\ e_gbx e f Z g h k k f l h f h d h i l y i j b w l h f a g Z a _ g b y
 f_j_gghc kdhjhklb ^ey \k_o fZdkbfmfh\ jZkij_ i_j_eu r g z y l _ g Z q
 gby fh^mey jZkkqbjhZg g hc kd



Jbk GZ[ex^_ggu_ b jZkkqblZggu_ agZq_gby mjh\gy \ imgdIZo Djhgr
 k ghy[jy ih ^_dZ[j\ ^ejy kemqZ_gZ\h^g_b\jyk ih g
 b k ih ^_dZ[j\].]
 KiehrGZy ebgLamevlZI gZ[ex^_gbc±jZkqBMAZY

LZ[ebpZ

KlZlbbklbq_kdb_ oZjZdl_jbklbdb mjh\gy \h^u
 imgdllgZxb cDjrlRgucbk blml

O ZjZdl_jbk	=hjguc bgklblm	DjhgrlZ^l
(G _i ±G _n)min	-74.6	-53.4
(G _i ±G _n)max	19.2	49.0
δ̂	-15.3	-6.4
δ	16.6	12.4
σ	20.6	15.6
r	0.93	0.91
N	1026	1058

Ijbf_qZgb_Hrb[db ijh]ghakZ_ %gyy Z[kheixhZy^gyy d\Z^jZlδq±kjdzgyynZjb
 f_lbq_kdZy kbkl_fZl_bq_hkchZyppb_gl dhjj_eypbb f_`^m ijh]ghklbq_kdbfb
 agZq_gbyfb _pZagp[h]ghklbq_bdhZdlbq_kdh]h agZq_nmb efbgbfZezg
 (G_i ±G_n)max ±fZdkbfZzWg±jZaf_j \u[hjdb

LZ[ebpZ

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 jWguifh@

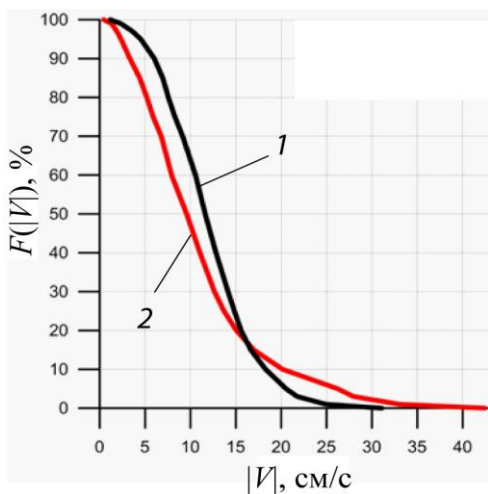
Bklhqqg ^Zgguc	Kj_ ^gb_ agZc				V _{fzo}	Kj_ ^g_ dZzbqgu_ hldehg_ g					r _{baf}
	V ₁	V ₂	V	3		I ₁	1	2	\$. f	
	kf k					kf k					
Fh^_ev	3.58	1.10	3.8	17	42.4	12.4	9.6	7.8	0.806	91	3.3
GZ[ex^_	5.32	5.29	7.5	45	31.1	10.4	8.6	5.9	0.682	129	1.4

Ijbf_qZgb_ V₁ bV₂ ±ijh_dpbb _dlhjZ kdhjhZyfgjb^bZg b iZkZle_ekl\vggh_3
 ±fh^mev b gZijZ\le_gb_ kdhjhZkbfZlbbZegbh_agZq_gb_ fh^mey kdhjhklb l_
 d\Z^jZlguc dhj_gv ba fZl_fZl_bq_kZhy]ghh^hZpax_Kdgby p_gljdhjVZgguo
 ZgZebabjm_fhc kdhjhklb l_q_gby ebφ_cgukpghZjZgldpbc _dlhjZ kdhjh
 l_q_gpελ₂/λ₁ ±m]he ih\hjHZ hij_ ^_eyZpox]hevrhc hkb weebikZ±^bki_jh
 dhwnnbpb_gl baf_gqb\hklb

DZd \b^gh bajlZ[geb_ agZq_gb_ kdZjZdl_d]hjZ kdhjhklb l_q_ghc
 fh^_evguf ^Zgguf aZf_lgh f_gvr_ q_f ih ^Zgguf baf_h_gbc
 jhklb l_q_gby [hevr_ ^ey fh^_evguo ^Zgguo WeebikiKDH w
 ke_ ^gfb_og_ \ulygml q_f ^ey_jZgguo]brafkemqZ_ _]h [hevrZy
 hjb_glbjh\ZgZ k \hklhdZ gZ aZiZ^ Ih]^Z dZd-\kke]hZkZ h^Zgg
 gZ k_ \aZhiZ^

GZ jbkjb_^_gu]jZnbdb nmgdpebgjZk ifh^mey kdhjhklb fh^
 b gZlmjguo ^Zgguo <b^ghg_qlhkf ^kbZiZlajy_fhklv fh^_evguo ^
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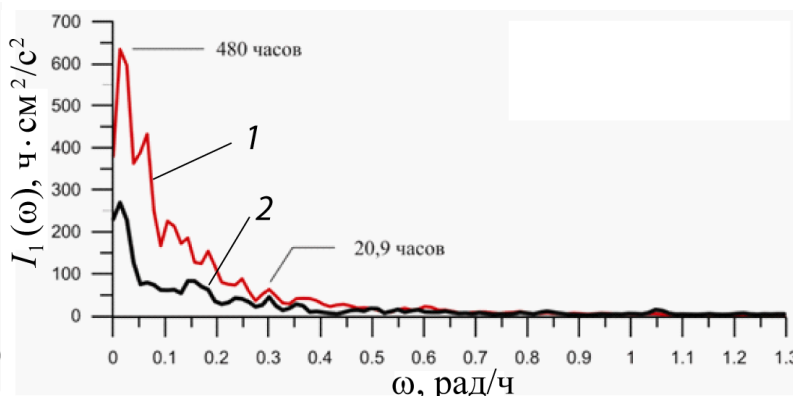
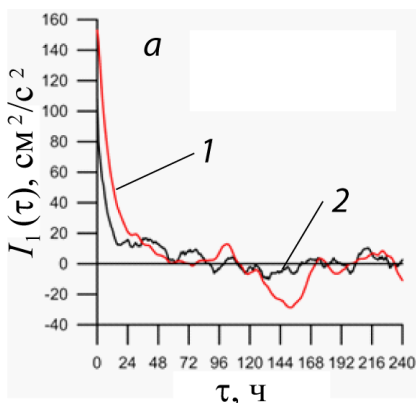
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 fh^_evghc kdhjhklb l_q_gpε ihZhuaggghc bgl_gkb\ghklb fh^_c
 dhe_[Zgbc kdhjhklb kljmdlmjZ ijhp_kkZ ijb[ebabl_evgh h^b
 lmjguo ^Zgguo gZ[ex^Zxlky \ukhdhqZklhgu_ dhe_[Zghy fZe
 ju_ iheghklvx hlkmlkl\mxi \ kemqZ_ jZ^benkgwdhjZegypub \ h
 kemqZyo ijbj_jgh, hdbZZdghbadhi_jbh^bq_kdhc khklZ\eyxs_c
 g_kdhevdh \ur_ ^ey fh^_evguo ^Zgguo



Jbk Nmgdpby jZkij_m_ey kdhjhklb l_q_gbc \\f_db F:=FK ©DjhgrIZ^Ia ih baf_j_gbc gbyb fh^_evg ^Zgguf e)gby

=jZnbdb ebg_cgh]h bg\ZjbZglZ l_g ki_dljZevghc ieh^gghk]b ihZaU xl qlh baf_j_ggu_ b fh^_evgu_ ^Zggu ^_j`ZI [hevrhc gZ[hj dhe_[Zgbc jZaeb pbdebqghklb ba dhlhjuo lhqgh kh\iz lhevdh ^j\Z qZkl�.013 jZ/q i_jbh^ hdhehkmbeb & b jZ^ i_jbh^ hdheh q ljb wlhf \kx^m bngl_gkb\ghk ^_evguo dhe_[Zgbc \ur_ q_f ^Zgguo b gbc kZebq_gb_f dhe_[Zgby k i_jbh^hf (& jZ^ dhlhjh_ \ fh^_evghf jy kmkl\m_l iheghklvx

K^_eZggu_ \u\h^u h dZq_kl\ \hkijhl ^_gby ihey kdhjhklb l_q_gbc gghkyl h]jZ guc oZjZdl_j ih ke^mxsbf -ijbqbgZf i_j\uo klZgpby baf_j_gbc kdhjhklb l_q_kh\iz^Z_l k maehf k_bdb\hfhj^ueb ^Zggu_ baf_j_gbc jZk fgh]h ijhimkdh\ jZaebqghc ijh^he`bl_evghklbZ \k_]h d [hld_ ijb]h^gh _`qZkguohlkq_lh\ ij jZ ijb h[s_c ^ebg_ jy^Z q



Jbk Ebg_cguc bg\ZjbZgl dhjj_eZp bh^gghd]ZevghcZieh]ghklb kd l_q_gby \ f_kl_Zghklb F:=FK ©DjhgrIZ^Ia ih fh^_evguf ^Zgguf ebg b ih gZ f baf_j_gbc 2)ebgby




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kh\iZ^_gb_ ih gZijZ\e_gbx fZdkbfmfh\ iehlgkklb jZkij_^_e_ ohly ijb wlhf agZq_gby fh^mey baf_j_gghc kdhjhklb ^ey \k_c gby gZ kf k ij_\urZxl agZq_gby fh^mey jZkkqblZggghc kdhjhkl

JZ[hZ\i heg_gZjZfdZoijh_dIZJNNB

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14.  b ^j<hkijhba_^_gb_ debfZlbq_kdbo baf_g_gb_ccg_:jgZbbqkghhf fh^_eb pbjdmeyppb hd_ZgZ b ev^Z [_a ijb\yadb d debfZlbq_kdhc khe Lj ::GBTB Bkk_e_g_h_ baf_g_g_ZZ d e i f i p_kkh\ \aZbfh^_ckl\by hd_ZgZ b \ iheyjguo h[eZklye^hk\[_hba^Zl -82. K
15.  <_jhylghklguc ZgZeba fhjkdbo l_qhgbc E ba^Zl F

KIZlvy lirk beZ \ j_^03.04.2013]

