TEMPORAL CHANGES OF SEISMIC STRUCTURES BENEATH ACTIVE VOLCANOES INFERRED FROM REPEATED SEISMIC TOMOGRAPHY STUDIES (CASES OF NEVADO DEL RUIZ, GALERAS AND MT. SPURR)

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Cevkxg"xqrecpqgu"ctg"uqo g"qh"iy g"o quv"f {pco ke"u{uvgo u"co qpi "i gqrqi kecniunt wewtgu0F wtkpi "cevkxkk{" gr kuqf gu."r j {ukecni'r tqr gt vkgu"dgpgcvj "xqrecpqgu"o c{"eqpukf gtcdn{"ej cpi g"hqt"{gctu."o qpvj u"cpf "gxgp"f c{u0'} Ugkuo ke"vqo qi tcr j {"ku"qpg"qhii gqr j {ukecni'vqqnu"vj cv"j grr u"tgxgcnkpi "uwej "vgo r qtcniej cpi gu0J qy gxgt."cu"vj g" tguwnv"qh"vqo qi tcr j {"kpxgtukqpu"ctg"ugpukkxg"vq"vj g"gzkunkpi "tc{"eqxgtci g."kv"ku"pqv"cny c{u"r quukdng"vq"ugr ctcvg" vj g"cewcni'xctkcvkqpu"qh"ugkuo ke"r ctco gvgtu"htqo "ej cpi gu"ecwugf "d{"f khhgtgpv"f cvc"f kuntkdwkqpu"kp"f khhgtgpv" vko g"r gtkqf u0"Vq"qxgteqo g"vj ku"r tqdngo ."y g"j cxg"f gxgrqr gf "cp"cni qtkxj o "qh"tgr gcvgf "vqo qi tcr j {"vj cv"ku" dcugf "qp"ugrgevkqp"qh"f cvc"y kxj "uko krct"f kuntkdwkqpu"*Mqwrcmqx"gv"cn0"4238+0"Vj g"cni qtkxj o "y qtmhrqy" r tguwo gu"c"ugtkgu"qh"u{pvj gvke"vgunu"vj cv"xgtkh{"vj g"uxcdkrkx{"qh"tgxgcrhpi "vj g"vgo r qtcn"xctkcvkqpu"qh"cewcni ugkuo ke"r ctco gvgtu0Vvj ku'uej go g"j cu'dggp"ko r ngo gpvgf "hqt"ugxgtcn'cevkxg"xqnecpqgu0""

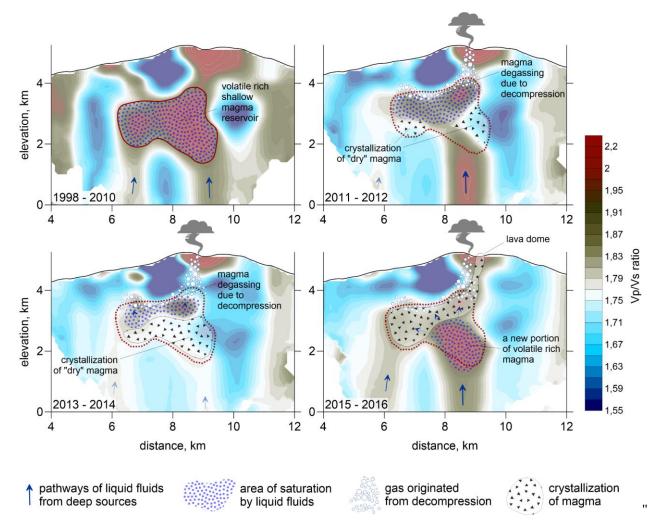


Figure 1. "Uci gu'qh'o ci o c'tgugtxqkt'f gxgrqr o gpv'dgpgcyj ''yj g'P gxcf q'F grlTwkl ''xqrecpq'dcugf ''qp'tguwmu'' qh'tgr gcvgf ''qo qi tcr j {0'Vj g''dcemi tqwpf 'ku'yj g''f kurtkdwwkqp''qh''Vp/Vs'tcvkqu''kp''hqwt''vko g''kpvgtxcnu0'

Vj g"hktuv"gzco r ng"ku"P gxcf q"f gn"T wkļ "kp"Eqnqo dkc" yi cv"tgo ckpu"kp" yi g"cevkxg"uvcvg"qh"kpvgpukxg" f gi cuukpi "ukpeg"42320'Dgpgcyi "yi g"xqnecpq"gf khleg." y g"j cxg"f gygevgf "cp"cpqo cn("qh"j ki j "Xr IXu"tcvkq" yi cv"

r quuldn("tgr tgugpvu"c"uj cmqy "o ci o c"tgugtxqlt"ucwtcvgf "y kj "hmlf u0'Ceeqtf kpi "vq" y g"tguwnu"qh'tgr gcvgf "vq qi tcr j {"*Xcti cu"gv'cn0"4239+"kp" y g"r gtkqf "htqo "4232" vq"4236." y ku"cpqo cn("f getgcugf "y g"xqnwo g"cpf" co r nkwf g." y j lej 'tgr tgugpvu"i tcf wcn'guecr g"qh'hmlf u'htqo "y g"o ci o c"tgugtxqlt0"kp"4237/4238. 'y ku'cpqo cn("kpetgcugf "ci ckp" y cv'ku"gzr nckpgf "d {"kpeqo g"qh'c"pgy "r qtvlqp"qh'hmlf /tkej "o ci o c"htqo "f ggr gt"uqwtegu0"Uwej "r gtkqf ke"odtgcyj kpi ö"qh'o ci o c"tgugtxqkt"uggo u'vq"dg"kp"ci tggo gpv'y kyj "y g'tgi ko g"qh'f gi cuukpi "cpf" o ci o c"f qo g"go r ncego gpv0"

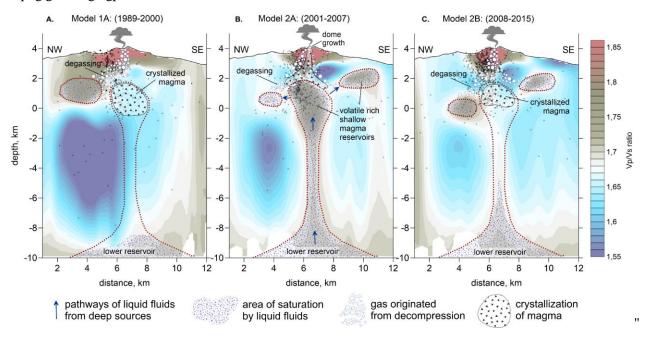


Figure 2. "Uej go cvle" kpvgtrt gvcvkqp" qh'vj g'vqo qi tcrj { "tguwnu" dgpgcvj "vj g"I crgtcu "xqrecpq" *Eqmo dkc+" f wtkpi "vj tgg" vko g"r gtkqf u0 Vj g"dcemi tqwpf "ku'vj g"f kuvtkdwkqp" qh'vj g"Xr IXu'tcvkq" cmpi "vj g"xgtvlecn'ugevkqp" etquukpi "vj g"xqrecpq" uwo o kx0"

 $Cpq i gt "Eqmo dkcp" xqrecpq" I crgtcu'ku'qpg"qh'iy g"o quv'cevkxg" xqrecpqgu'kp" iy g"y qtrf 0"Y g"eqpukf gt" yi g"r gtkqf "qh''3; : ; /4237. "kp"y j kej "'yi g"xqrecpq" o cpkhgurgf "ht gs wgpv'gt wr vkqpu''cpf "j ki j "ugkuo ke "cevkxkv{0"Y g" qdvckpgf "'yi g"xctkcvkqpu''kp"'yi g"ugkuo ke "xgrqekv{"uxt wewt gu''dgpgcyj "I crgtcu''f wt kpi "'yi g''yi tgg''vko g"gr kuqf gu''qh'' 3; : ; /4222. "4223/4229" cpf "422: /42370" kp"'yi g"ugeqpf "gr kuqf g. "y g"qdugt xg"c "eqnwo pct "cpqo cn{"y kyj "c"j ki j " Xr IXu"t cvkq" yi cv'r quukdn{"tgr t gugpwu''c "eqpf wkv''ucpur qt vkpi "c"pgy "r qt vkqp"qh''o ci o c"o cvgt kcri'lnt qo "dgrqy 0" Vj ku"t guwnv''o c{"kpf kecvg" yi cv''kp" yi ku''r gtkqf ." y j kej "ewro kpcvgf" y kyj "f qo g"go r reego gpv''cpf "eqmcr ug. "yi g" xqrecpq" y cu''f kt gevn{"ht qo "f ggr gt" o ci o c"uqwt egu0" kp" qyj gt "gr kuqf gu. "yi g"eqpf wkv''ku''r guu''x kukdrg" kp" yi g" vqo qi t cr j {"o qf gnu." cpf "y g"r tqr qug" yi cv''yi g"xqrecpke" cevkxkv{"y cu''o gtgn{"eqpvtqrngf" d{"uj cmqy "o ci o c" tgugt xqktu''cv'4/6" no "dgrqy "yi g"uwthceg0"$

Uło krct'uwf {'j cu'dggp'r gthqto gf 'hqt''y g'O qwpv'Ur wtt'lp'CrcumcO'Y g'gzr nqtgf ''y g'ugkuo ke'untwewtg'' dgpgcyj ''y g''xqrecpq''kp''y tgg''yko g''y kpf qy u<'3; ; 8/4223."4224/4226"cpf ''4227/42340'F wtkpi ''y g''qdugtxcvkqp'' r gtkqf .''y g'o clqt''wptguwi'qh'y g''xqrecpq''qeewttgf ''kp''3; ; 9''cpf ''4226/42280'Uko krctn(''cu'kp''y g''ecug''qp''P gxcf q'' f gn'T wk .''kp''cm''y g'y kpf qy u.''y g''qdugtxgf ''c''rcti g''cpqo cn(''y ky ''j ki j ''Xr IXu'tcvkq''nqecvgf 'tki j v'dgpgcyj ''y g'' xqrecpq'Okp''gr kuqf g''4. 'kp''tgur gev'vq''y g''gr kuqf g''3. 'y g''qdugtxgf ''c''eqpulf gtcdrg''cuegpv'qh'y g''cpqo cn(''kp''3; ; 8/4223.''y g''wr r gt''y ko ky'qh''y g''cpqo cn(''y cu''qdugtxgf ''cv'¢7''mo ''f gr y ''dgnqy ''uwthceg.''y j gtgcu''kp''4224/4226''ky' y cu''cr r tqzko cvgn(''cv'5'mo ''f gr y Okp''y g''nqnqy kpi ''gr kuqf g''*4227/4234+''y g''uj cr g''qh''y g''cpqo cn(''tgo ckpgf'' wpej cpi gf .''y j gtgcu''urki j v'f getgcug''qh''Xr IXu''y cu''f gyevgf O'Y g''r tqr qug''y cv'y gug''ej cpi gu''tgr tgugpv''y g'' hrwlf ''o ki tcvkqp''kp''y g''o ci o c'u{uvgo ''y cv'chhgewi'y g''r ctvkcn'o gnkpi ''cpf ''f gi cuukpi ''r tqeguugu'kp''y g''r nwo dkpi ''u{uvgo ''dgpgcyj ''y g''xqrecpq''cpf ''eqpvtqnu''y g''gtwr vkqp''cevkxk\{''r j cugu''qh''O vO'Ur wttO'''

 $Vj \ g"tgr \ gcvgf "vqo \ qi \ tcr \ j \ \{"uwwf \ kgu"r \ gthqto \ gf "hqt"P \ gxcf \ q"f \ gn"Twkl ."I \ crgtcu."O vO'Ur wtt."cpf "qvj \ gt" \ cevkxg'xqrecpqgu'j \ cxg'tgxgcrgf "eqpukf \ gtcdrg"ej \ cpi \ gu'qh'ugkuo ke'xgrqekkgu'qeewttgf 'y kyj kp'c'hgy "{gctuOVj \ gug" \ vgo \ r \ qtcn' xctkcvkqpu" ecp" \ dg" \ ecwugf " \ d{"hrwkf" o ki \ tcvkqp." y j kej ." kp" wtp." chhgevu" y g" r \ tqeguugu" qh" o \ grwpi \ let \{uvcrkl \ cvkqp'cpf 'f \ gi \ cuukpi \ O'Cm'y \ gug'hcevqtu'eqpvtqn'y \ g"qeewttgpeg''qh'xqrecpke''gtwr \ vkqpuO'$

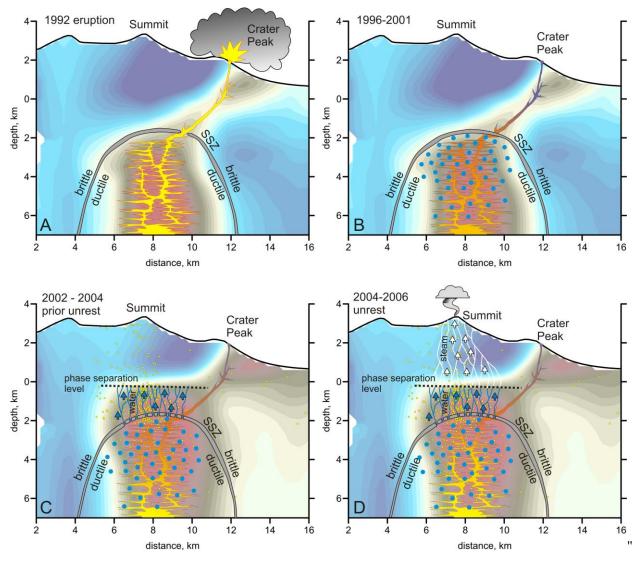


Figure 3. Eqpegr worluej go g'qh'vj g'r quuldng'iwci gu'qh'vj g'O vOUr wtt'xqreople'cevkxkv{ OCOO ci o cvle'gtwr vlqp" lp"3; ; 4"xlc" vj g"hropni'eqpf vkv0'P q"cevkxkv{ "qeewttgf "lp" vj g"uwo o kv'ctgc." vj lej "y cu'uetggpgf "d{"c"pqp/r gto gcdng''ugrhvugcngf "| qpg"*VUN+"f gr levgf "d{"vj g"i tc{"rc{gt0'D0T grczcvlqp"r gtlqf "htqo "3; ; 8"vq"4223<"vj g"hropni'eqpf vkv'dgeqo gu'lko r cuucdng0'Hnwkf u'*dnwg'f qw+"ceewo wncvg'lp" vj g"f wevkng'r ctv'qh'vj g'o ci o c'tgugtxqkt0' E0'Dgi lpplpi "qh'vj g"wptguv'htqo "4224"vq"4226="vj g"uvtqpi "ugkuo le"cevkxkv{"y kvj qwv'cr r ctgpv'f gi cuulpi "qp" vj g"uwthceg'tgr tgugpwu'f kut wr vlqp"qh'vj g"UUN'cpf "r gpgvtcvkqp"qh'nks wkf "hnwkf u'lpvq" vj g"dtkwng'r ctv'qh'vj g"et wuv'*dnwg"cttqy u'cpf "nlpgu+0'F 0'Xqnecple "wptguv'htqo "4226"vq"4228="nks wkf "hnwkf u'tgcej "vj g"r j cug'ugr ctcvkqp"ngxgn'cpf" vj gp"eqpvlpwg"cuegpf lpi "cu"i cu"*y j kg"cttqy u"cpf "nlpgu+0'Vj g"dcemi tqwpf "ku" vj g"f knvkdwklqp"qh" vj g"Xr IXu"tcvkq"cnpi "vj g"xgtvkecn'ugevkqp"etquulpi "vj g"xqnecpq'uwo o kv0'

Vj ku'uwf { "j cu'dggp"uwr r qtvgf "d { "TUHII tcpv'36/39/22652"cpf "THDT"I tcpv'38/27/226990"

References:

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