

\$QWKURSRJHQLF &KDQJH 5HJLPH RI 7URSRVSK  
\* OREDO (QYLURQPHQW

2]WXUN ) .HOHV 0 DQG (YUHQGLOHN )  
'HSDUWPHQW RI (QYLURQPHQWDO (QJLQHHULQJ \$EDQW ,)]HW %D\VD0 8QLYHUVLW\ %ROX 7XUNH\  
&RUUHVSRQGLQJ YUHQGLOHN ) \$EDQW ,)]HW %D\VD0 8QLYHUVLW\ )DFXOW\ RI (QJLQHHULQJ \$UFKLWHFW\  
%ROX 7XUNH\ 7HO )D[ IHYUHQGLQJ BNOLEX HGX WU  
5HFHLYHG GDWH -XO \$%FFHSHWHG3 6DWH KXG GDWH  
&RSULJKW 2]WXUN HW DO 7KLVLV DQ RSHQ DFFHV DULFOH GLVWULEXWHG XQG HU WKH WHUPV RI WK  
GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXUFH D

(GLWRULDO

7URSRVSKHULFLR]RQH RI WKH DWPRVSKHULF SROOXWDQWV DQG D  
NH\ R[LGDQW LQ SKRWRFKHPLFDO VPRJ DQG IRUPDWLRQ RI JURXQG OHYHO 2  
LV D SKRWRFKHPLFDOO\ GULYHQ SURFHVV LQ ZKLFK QLWURJHQ R[LGHV 12  
FDUERQ PRQR[LGH &2 DQG YRODWLQDFWUJDQLF FRPSRXQGV 92&  
LQ WKH DWPRVSKHUH LQ WKH SUHVHQFH RI VRODU UDGLDWLRQ > @ 2]RQH  
SUHFXUVRUV DUH PDLQO\ UHOHDVHG IURP PRWRU YHKLFOHV LQG XVWULDO  
DFWLYLWLHV DQG SRZHU JHQHUDWRQ IDFLOLWLHV ZKLOH YHJHWDWLYH HPLV  
ZLOG}DQG OLJKWQLQJ DUH FRQVLGHUHG WR EH WKH QDWXUDO VRXUFHV RI 2  
SUHFXUVRU JDVHV 6XUIDFH GHSRVLWLRQ DQG UHDFWLRQ ZLWK WKH K\GURJHQ  
SHUR\ UDGLFDO LQ WKH WURSRVSKHUH DUH WKH WZR PDLQ VLQNV IRU JURXQG  
OHYHO @ 6LQFH WKHLI VDWLQV WRHO ZLWK WKH LQFUHDVHG  
DLU WHPSHUDWXUH DWLWRQV VKRZ D SHDN RQFH WKH VRODU  
UDGLDWLRQ SHDNV 'DOL DWLGR GLXIURODD ERRO WHPSHUDWH  
ORFDWRQ %ROX 7XUNH\ ZUH GHSLFWHG LQ )LJXUH \$ GD\WLP SHDN  
a SSEY ZDV REVHUYHG OHRWZHHG DUO\ DQG  
6LPLODU SDWWHUQV KDYH EHHQLRQ REVHUYHG IRU JURXQG OHYHO 2  
UHODWHG OLWHUDWXUH LQ @DEG RHWK M XGLHVDLQ  
UHODWHG OLWHUDWXUH KDYH IRFXVHG RQ WKH DGYHUVH LPDFWV RI JURXQG OH  
2 RQ KXPdq KHdowk > @ FURSV > @ VIRUHVWV > @ DQG PDWHULDOV > @ 2  
WKH WKH LQGLRFDWHG KRXXVH JDV \*\* LQ WHUPV RI UDGLDWLYH  
IRUFLQJH HQRXFK LQWHUQDWRQDO RUJDQL]DWLRQV DV WKH :RUOG  
+HDWK 2UJDQL]DWLRQ :+2 WKH 8QLWHG 6WDWHV (QYLURQPHQWDO  
3URWHFWLRQ \$JHQF\ 86(3\$ DQG WKH (XURSHDQ 8QLRQ (8 KDYH VH  
JXLGHOLQH HV GBUO2 PD[LXP HLJKWK K K K O P G HDQ 2  
OLPLW LV E\w#2P> @ DQG SSP E\ WKH 86(3\$ IRU  
1DWLRQDO \$PELHQW \$LU 4XDFLWRX6P DQG OUV > @  
HKW KRXU PHDQ VKRXOC QRW EH H[FHHGHG IRU PRUH WKDQ  
GD\V SHU \HDU VR DV WR EH DYHJDJHG RYHU WKUHH FRQVHFXWLYH \HDUV  
DFFRUGLQJ WR WKH (8 UHJODWLRQV ZLWK 'LUHFWLYH (&

H 0HGLWHUUDQHdq EDVLQ LV Fkdudfwhul]hg E\ D VWURQJ SKRWRFKHPLFDO  
DWLYLW\ DQG D BSWHOKHOMPL GLLVROUHQWRQ  
ZLWK D YDULHW\ RI FKHPLFDO FRPSRVLWLRQ DQG LV HVSHFLDOO\ VXVHSHWLEOH  
DLU SROOXWLRQ EHFDXVH RI WKH FORXG IUHH DWPRVSKHUH DQG HOHYDWHG VR  
UDGLDWLRQ LQWHQVLW\ > @ \$FFRUGLQJ WR WKH ,3&& > @ WKH FOLPDWH FKDQJ  
ZLOO EH PRUH SURQRXQFHG LQ WKH 0HGLWHUUDQHdq UHJLRQ WKDQ WKH RWKHU  
SDUVV RI WKH ZRUOG DQG DYHJDJH WHPSHUDWXUH ZLOO LQFUHDVH E\ r&  
JOREDoo\ ZKLV DUH HOVPHZ HHQ FXUUHQW DQG SURMHFWHG  
WHPSHUDWXUH ZRXOG EH DW OHDVW r& IRU WKH 0HGLWHUUDQHdq UHJLRQ \$V D  
UHVXOW RI WKLV VKDUS ULVH LQ WKH PHDQ DQXDO WHPSHUDWXUH D PRUH GUD  
GHFUHDVH LQ SUHFLSLDWLRQ UDLQIDOO LV H[SHFWHG IRU WKH UHJLRQ > @ :+  
> @ UHSRUWHG WKD WLU SROOXWLRQ KDV EHRPH RQH RI LWV WRS SULRULWLHV  
DERXW (DVWHUQ 0HGLWHUUDQHdq FLWL]HQV GLHG SUHPDWXUHO\ GXH WR  
DLU SROOXWLRQ LQ

H 0HGLWHUUDQHdq EDfNJURXQG JURXQG OHYH.U TP0DLÀ TP0DLÀ 0 H  
>G`RU>GDP0HO@0Q -D 004 •d68• 8 ÇWS

\*RQ]DOH] )HUQDQGH] , .DPLQVND \$ 'RCPDRDOH(OXEHSDHLQWXUD) \*%VWHQ +  
4XDUULH 6 HW DO ~X[(VWWSRQLWKLUHOB)WCRHDKHSR]RQH PHDVXUHPHQWV RQ  
ZLQWHU ZKHDW DQDO\VLV RI XQFHUWDLQWEHQWEDDOHQHGWGDUWQHDQ\$.SDQPRVROYLVKRO  
JHQRW\SHV \$WPRV (QYLURQ \*HUDVRSRXORXYDUDNLV \* 9UHNRXVVLV 0  
\*HURVD)LQFR \$ 0HUHX 6 9LWDOH 0 0DQK\O)RSRWOR 1 2]RQH YDULDELOLW\ L  
&RPSDULVRQ RI VHDVRQDO YDULDMHQRVDRWRHRBBVW\HSRQXUHGDUWGUUUDQHDQ EDVHG RQ  
0HGLWHUUDQHDQ +ROP RDN IRUHVW EHWZHHQ WKH H\FHSWLRQDOO\ GU\ DQG WKH  
IROORZLQJ \HDU (QYLURQ 3ROO 6LFDJGGH 0DUFR \$ 7URXVVLHU ) 5HQRX  
+RDQJ & 1JX\HQ 7 6WDQOH\ ' 0HFWLO\ \$HURDVH 1Q VXUIDFH R]RQH FRQFHQWUDWL  
R]RQDWLRQ RQ IXQJDO UHVLVWDOHQWVHUEDEBRLDQJHRODNLQ WKH FLWLQ WKH- RV (QYLURQ  
%XLOGLQJ (QYLURQ  
,3&& &OLPDWH &KDRQWLYEVW5HSRUW RI WKH  
:RUNLQJ \*URXS , RI WKH  
,QWHU JRYHUQPHQWDO 3DQHO RQ &OLPDWH &KDQJH ,3&& 6HFUHWLULDW \*HQHYD  
:+2 5HSRUW RI WKH 5HJLRQDO &RPLLWVH IRU WKH (DVWHUQ  
0HGLWHUUDQHDQ 6L[WLHWK 6HVVLQ 0XVFDW 2PDQ 2FWREHU (0  
5& ( )HEUXDU\  
86(3\$ 1DWLRQDO \$PELHQW \$LU 4XDOLW\ 6WDQGDUGV 1\$\$46 &)5  
SDUW  
/HOLHYHONGUUHVKHLP + %RUUPDQQ 6 &UXW]HQ 3- 'HQWHQHU )- HW DO  
\*OREDO DLU SROOXWLRQ FURVVURDGV RYHU WKH 0HGLWHUUDQHDQ 6FLHQFH