

# Characterization of HIV-1 genetic diversity and antiretroviral resistance in the state of Maranhão, Northeast Brazil

Élcio Leal<sup>a\*</sup>, Claudia Regina Arrais Rosa<sup>b,c</sup>, Marta Barreiros<sup>d</sup>, Jessyca Kalyne Farias Rodrigues<sup>e</sup>, Nilviane Pires S. Sousa<sup>b,d</sup>, Daniel Duarte Costa<sup>f</sup>, Francisco Dimitre Rodrigo Pereira Santos<sup>g</sup>, Antonio Dantas Silva<sup>h</sup>, Antonia Iracilda e Silva Viana<sup>c</sup>, Allan Kardec Barros<sup>b,d</sup>, Kleodoaldo Lima<sup>ij</sup>

<sup>a</sup> Institute of Biological Sciences, Federal University of Pará, Belém, PA, Brazil

<sup>b</sup> Graduate Program of the Northeast Biotechnology Network of the Federal University of Maranhão, São Luis, MA, Brazil

<sup>c</sup> Coordination of the Medical Course of the Federal University of Maranhão, Imperatriz, MA, Brazil

<sup>d</sup> Department of Electrical Engineering, Federal University of Maranhão, São Luís, MA, Brazil

<sup>e</sup> Department of Genetics, Federal University of Pernambuco, Recife, PE, Brazil

<sup>f</sup> Food Engineering Coordination, Federal University of Maranhão, Imperatriz, MA, Brazil

<sup>g</sup> Higher Education Unit of Southern Maranhão, Imperatriz, MA, Brazil

<sup>h</sup> Unimed of Empress, Imperatriz, MA, Brazil

<sup>i</sup> Clinical Hospital, Federal University of Pernambuco, Recife, PE, Brazil

<sup>j</sup> European Virus Bioinformatics Center, Leutrargaben 1, 07743 Jena, Germany

\* Corresponding author:

**Email: [elcioleal@gmail.com](mailto:elcioleal@gmail.com) (EL)**

## SUPPLEMENTARY MATERIAL

### HIV-1 Sequences used in the phylogenetic analysis shown in Figure 1:

A1.KE.1994.Q23\_17.AF004885;A1.KE.2000.KER2009.AF457053;A2.CD.1997.97CDKFE4.AF286240 ;A2.CD.1997.97CDKTB48.AF286238;A3.SN.1996.DDJ360.AY521630;A3.SN.2001.DDJ369.AY52163 1; A4.CD.1997.97CD\_KCC2.AM000053; A4.CD.1997.97CD\_KTB13.AM000054; A6.RU.2003.03RU20\_06\_13.AY500393; A6.UZ.2002.02UZ652.AY829203; B.AR.1999.ARMA132.AY037282; B.AR.2000.ARMS008.AY037269; B.AR.2002.02AR114146.DQ383746; B.AU.1986.MBC200.AF042100; B.BR.1989.BZ167.AY173956; B.BR.1990.BZ167.AB485641; B.BR.2002.02BR002.DQ358805; B.BR.2002.02BR008.DQ358808; B.BR.2003.BREPM1038.EF637048; B.BR.2003.BREPM2012.EF637046; B.BR.2004.BREPM1066.FJ195090; B.BR.2004.BREPM1070.FJ195086; B.BR.2005.BREPM1081.FJ195091; B.BR.2005.BREPM1084.FJ195088; B.BR.2005.BREPM1093.FJ195089; B.FR.1983.HXB2-LAI-IIIB-BRU.K03455; B.FR.1985.NL43xWC001.AF003887; B.US.1985.Ba\_L.AB221005; B.US.1986.AD87\_ADA.AF004394; B.US.1991.DH12\_3.AF069140; B.US.1991.US2.AB485640; B.US.1997.ARES2.AB078005; C.BR.2002.02BR2022.JN692434; C.BR.2004.04BR013.AY727522;; C.BR.2004.04BR021.AY727523; C.BR.2007.BP00040\_LH01.JN687655; C.BW.1996.96BW01B03.AF110959; C.IN.1993.93IN101.AB023804; C.IN.1995.95IN21068.AF067155; C.ZA.2003.03ZASK212B.DQ978981;; D.KE.2001.NKU3006.AF457090; D.UG.1991.UG270.AB485650; D.UG.1998.98UG57146.AF484513; D.UG.1999.99UGA07412.AF484477; F1.AR.2002.ARE933.DQ189088; F1.BR.1989.BZ126.AY173957; F1.BR.1990.BZ163.AB485656; F1.BR.1993.93BR020\_1.AF005494; F1.BR.2002.02BR082.FJ771006; F1.BR.2007.07BR844.FJ771010; F1.BR.2010.10BR\_PE107.KJ849782; F1.BR.2010.10BR\_RJ015.KJ849791; F1.BR.2010.10BR\_RJ055.KT427774; F1.BR.2010.10BR\_SP029.KT427814; F1.BR.2010.10BR\_SP070\_1.KT427663; F1.BR.2010.DEMF110BR015.KU749395; F1.BR.2011.DEMF111BR037.KU749396; F1.ES.-.P1146.DQ979023; F1.FI.1993.FIN9363.AF075703; F1.FR.1996.96FR-MP411.AJ249238; F1.RO.1996.BCI\_R07.AB485658; F2.CM.1995.95CM-MP255.AJ249236; F2.CM.1997.CM53657.AF377956; F2.CM.2010.DEMF210CM001.JX140672; F2.CM.2011.DEMF211CM025.KU749420; G.GH.2003.GHNJ175.AB231893; G.KE.1993.HH8793.AB485662; G.SE.1993.SE6165\_G6165.AF061642; H.BE.1993.VI991.AF190127; H.CD.2001.CG-0536-02\_NGSID14.KY392777; J.AO.1993.93AOHDC253.KU310620; J.CD.1997.J\_97DC\_KTB147.EF614151; J.SE.1993.SE9280\_7887.AF082394; K.CD.1997.97ZR-EQTB11.AJ249235; K.CM.1996.96CM-MP535.AJ249239.

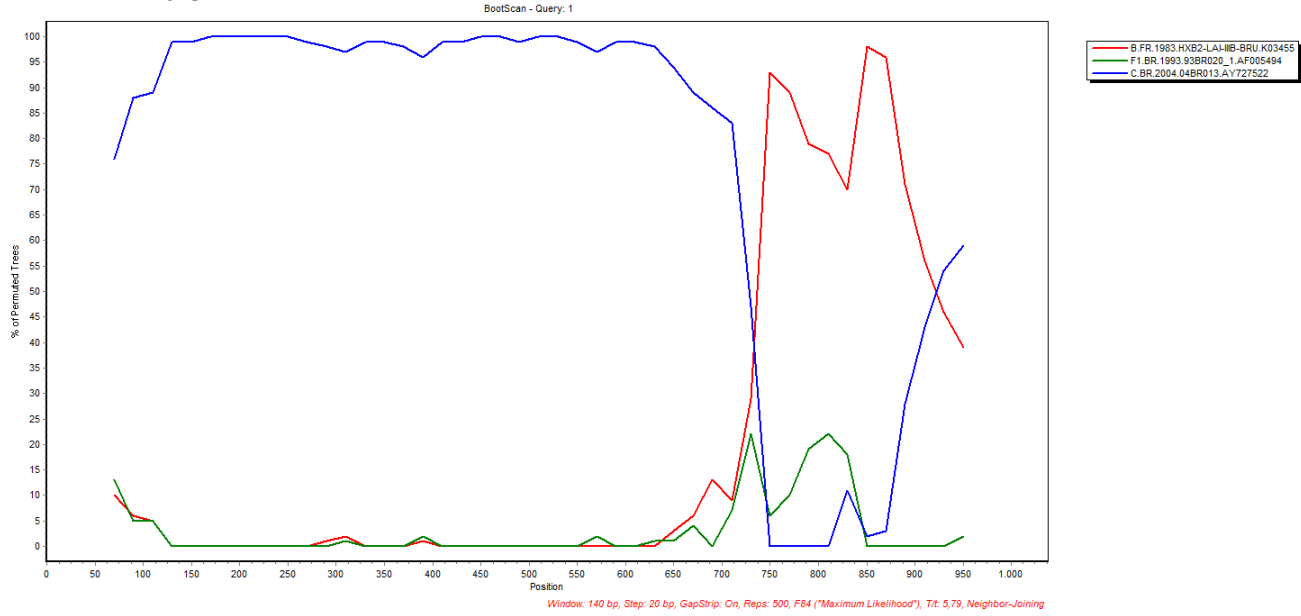
## SUPPLEMENTARY MATERIAL

### HIV-1 Sequences used in the phylogenetic analysis shown in Figure 2:

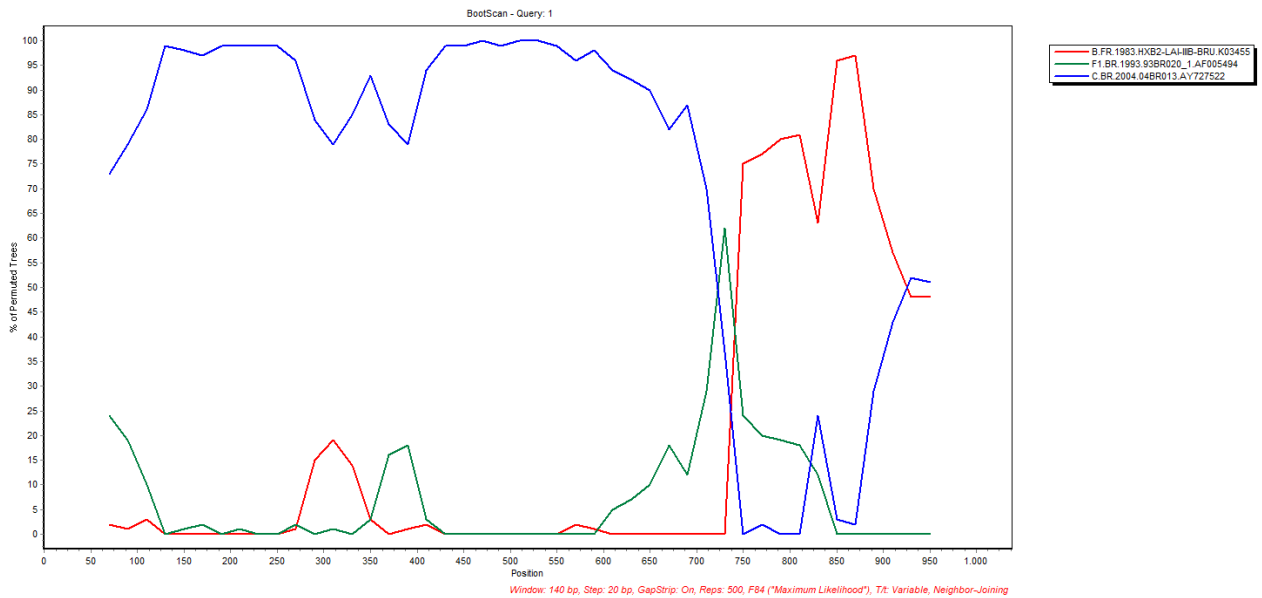
40\_BF.BR.2004.04BRRJ115.EU735538; 40\_BF.BR.2005.05BRRJ200.EU735539;  
40\_BF.BR.2004.04BRSQ46.EU735540; 40\_BF.BR.2005.05BRRJ055.EU735537;  
90\_BF1.BR.2009.BRTO10\_66.KY628225; 90\_BF1.BR.2010.BRG04141.KY628219;  
90\_BF1.BR.2007.BRGO3027.KY628215; 90\_BF1.BR.2010.BRGOAP801.KY628223;  
39\_BF.BR.2003.03BRRJ103.EU735534; 39\_BF.BR.2003.03BRRJ327.EU735536;  
F2.CM.2011.DEMF211CM025.KU749420; F2.CM.2010.DEMF210CM001.JX140672;  
F2.CM.1995.95CM-MP255.AJ249236; F2.CM.1997.CM53657.AF377956;  
39\_BF.BR.2004.04BRRJ179.EU735535; F1.BR.2010.10BR\_SP029.KT427814;  
F1.BR.2010.DEMF110BR015.KU749395; F1.BR.1993.93BR020\_1.AF005494;  
F1.BR.2010.10BR\_SP070\_1.KT427663; F1.BR.2011.DEMF111BR037.KU749396;  
28\_BF.BR.2005.0679SV.JF804812; D.UG.1991.UG270.AB485650;  
D.UG.1999.99UGA07412.AF484477; D.KE.2001.NKU3006.AF457090;  
D.UG.1998.98UG57146.AF484513; 47\_BF.BR.2010.10BR\_RJ026.KJ849798;  
47\_BF.ES.2008.P1942.GQ372987; 47\_BF.ES.2008.X2457\_2.FJ670529;  
42\_BF.LU.2003.luBF\_07\_03.EU170140; 42\_BF.LU.2005.luBF\_13\_05.EU170136;  
42\_BF.LU.2004.luBF\_12\_04.EU170142; 42\_BF.LU.2006.luBF\_19\_06.EU170138;  
29\_BF.BR.2002.BREPM119.AY771590; B.BR.2005.BREPM1084.FJ195088;  
B.BR.2002.02BR008.DQ358808; B.BR.1989.BZ167.AY173956; B.BR.1990.BZ167.AB485641;  
B.BR.2003.BREPM1038.EF637048; 44\_BF.CL.2000.CH80.FJ358521;  
44\_BF.CL.2001.CH12.AY536235; 29\_BF.BR.2005.0264RI.JF804807;  
17\_BF.BO.2002.BO02\_BOL119.EU581827; 17\_BF.AR.2002.AR02\_ARG2233.EU581826;  
17\_BF.PE.2002.PE02\_PCR0155.EU581828; 17\_BF.PY.2002.PY02\_PSP0073.EU581824;  
12\_BF.UY.1999.URTR35.AF385935; 12\_BF.AR.1997.A32879.AF408629;  
12\_BF.UY.1999.URTR23.AF385934; 38\_BF1.UY.2003.UY03\_3389.FJ213783;  
38\_BF.UY.1999.99UY\_TRA0123.JN235962; 38\_BF1.UY.2004.UY04\_4022.FJ213782;  
28\_BF.BR.1999.BREPM12313.DQ085872; 29\_BF.BR.2005.0647SV.JF804811;  
29\_BF.BR.2005.0744SV.JF804814; 29\_BF.BR.1999.BREPM11948.DQ085871;  
29\_BF.BR.2005.0063SP.JF804806; 28\_BF.BR.2005.0614SV.JF804809;  
29\_BF.BR.1999.99UFRJ\_1.AY455778; 28\_BF.BR.1999.BREPM12817.DQ085874;  
28\_BF.BR.1999.BREPM12609.DQ085873; 29\_BF.BR.2001.BREPM16704.DQ085876;  
H.BE.1993.VI991.AF190127; H.CD.2001.CG; 0536-02\_NGSID14.KY392777;  
C.BR.2004.04BR013.AY727522; C.ZA.2003.03ZASK212B.DQ978981;  
C.BW.1996.96BW01B03.AF110959; C.IN.1993.93IN101.AB023804; C.IN.1995.95IN21068.AF067155;  
C.BR.2002.02BR2022.JN692434; 31\_BC.BR.2002.110PA.EF091932;  
31\_BC.BR.2004.04BR137.AY727526; 31\_BC.BR.2004.04BR142.AY727527;  
C.BR.2007.BP00040\_LH01.JN687655; C.BR.2004.04BR021.AY727523;  
J.SE.1993.SE9280\_7887.AF082394 J.AO.1993.93AOHDC253.KU310620;  
J.CD.1997.J\_97DC\_KTB147.EF614151; A2.CD.1997.97CDKFE4.AF286240;  
A2.CD.1997.97CDKTB48.AF286238; A4.CD.1997.97CD\_KCC2.AM000053;  
A4.CD.1997.97CD\_KTB13.AM000054; A6.RU.2003.03RU20\_06\_13.AY500393;  
A6.UZ.2002.02UZ652.AY829203; A3.SN.1996.DDJ360.AY521630; A3.SN.2001.DDJ369.AY521631;  
A1.KE.1994.Q23\_17.AF004885; A1.KE.2000.KER2009.AF457053; K.CD.1997.97ZR-  
EQTB11.AJ249235; K.CM.1996.96CM; MP535.AJ249239; G.GH.2003.GHNJ175.AB231893;  
G.KE.1993.HH8793.AB485662; G.SE.1993.SE6165\_G6165.AF061642

# SUPPLEMENTARY MATERIAL Figure S1

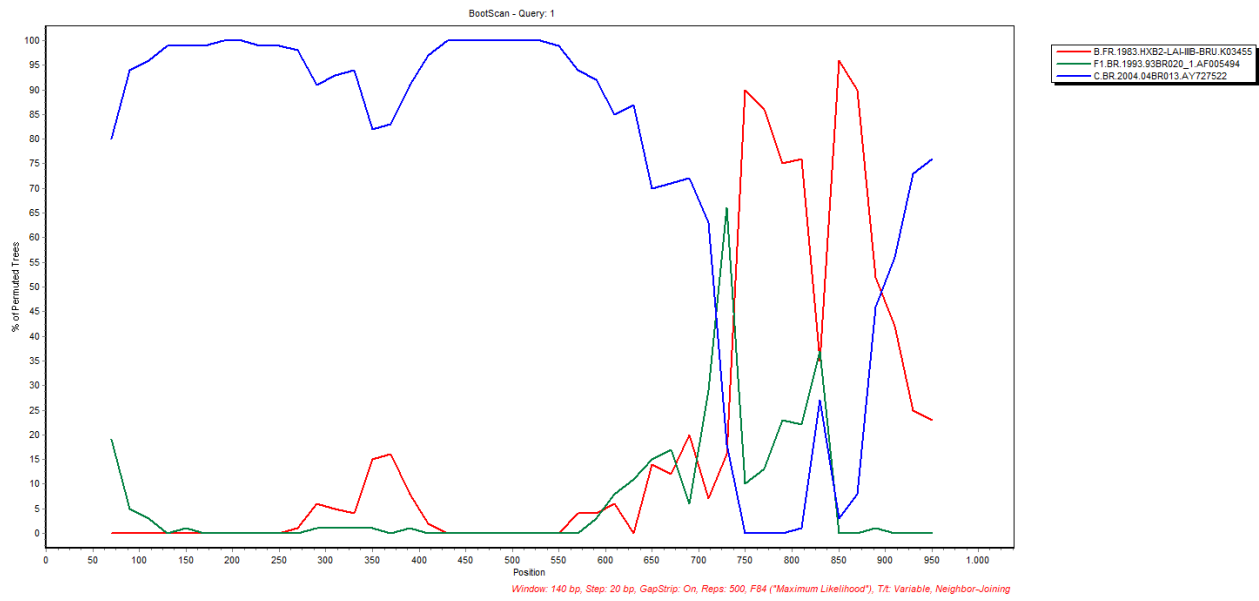
11BRMA079



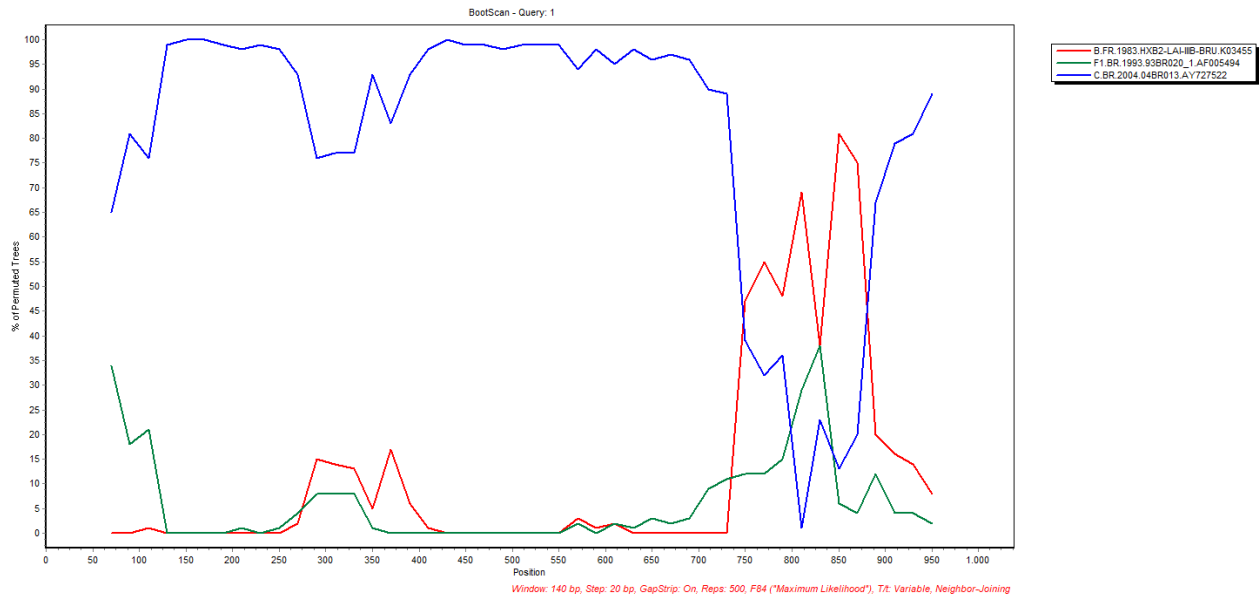
14BRMA0443



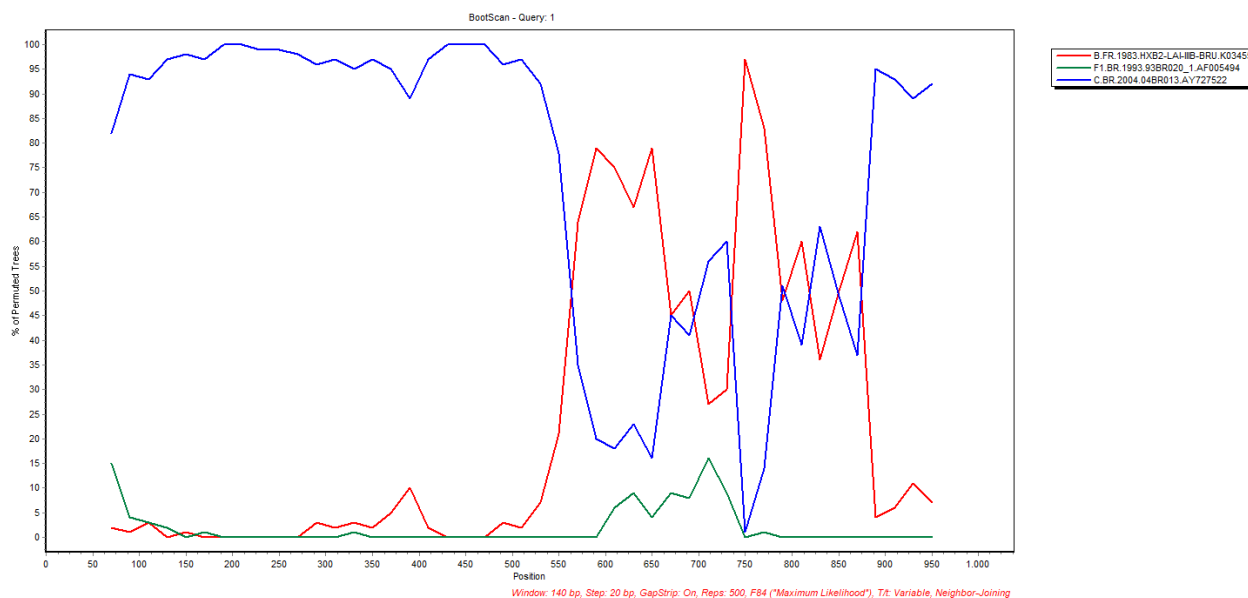
# 16BRMA11778



# 15BRMA0065



16BRMA04390



15BRMA0501

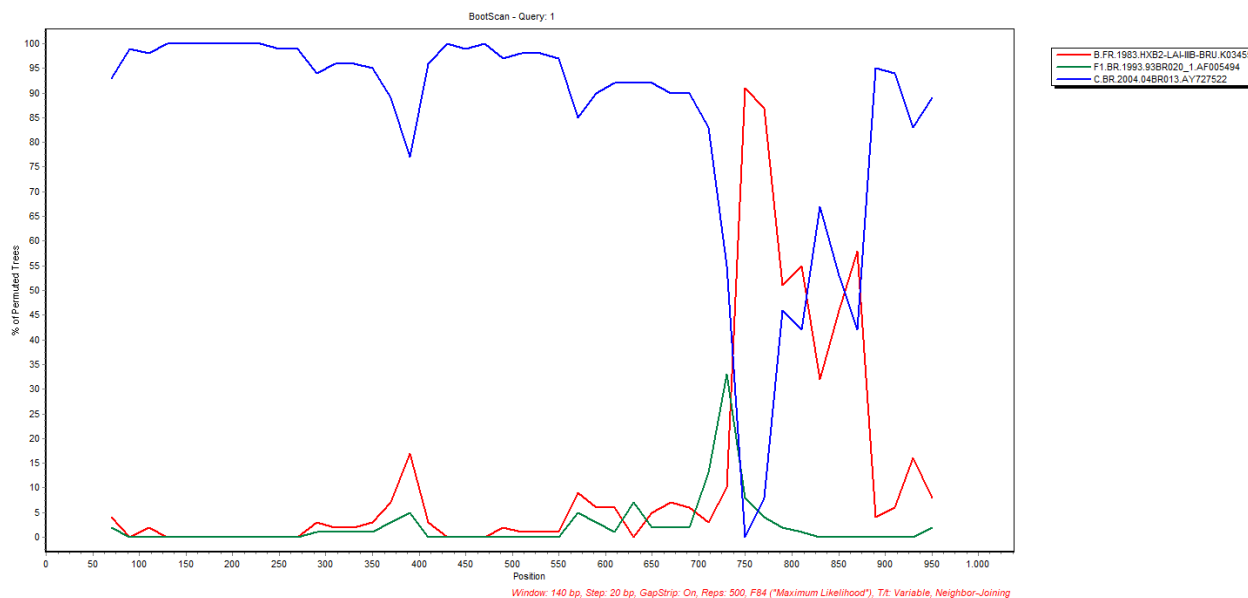
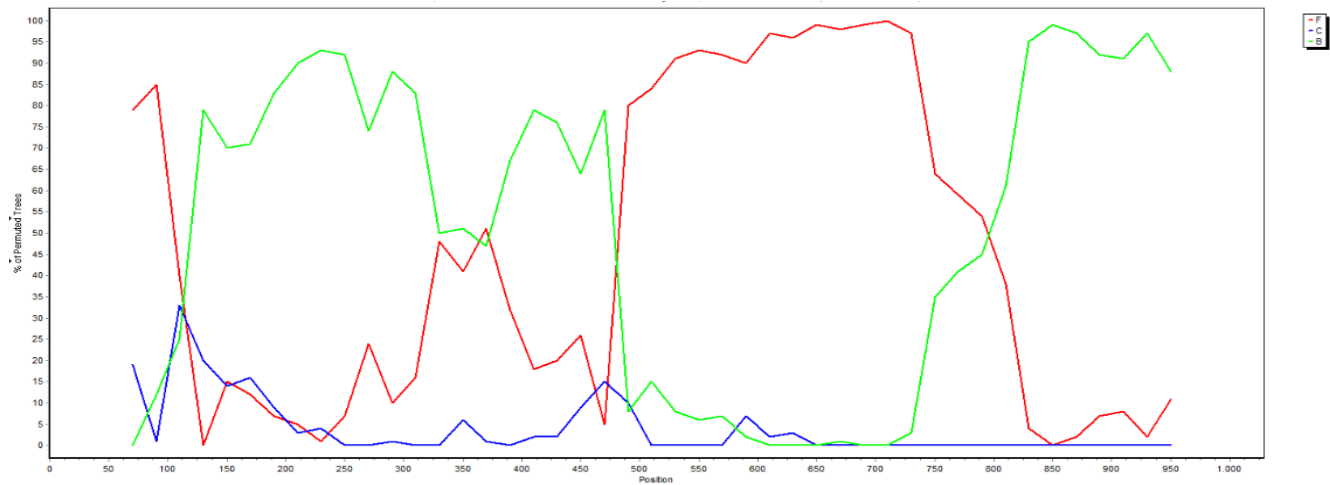


Figure S1 - Patterns of intersubtype genetic recombination of BC recombinants. Recombination analysis performed by bootscanning methodology using SIMPLOT software. Reference strains: B.FR.1983.HXB2-LAI-IIIB-BRU.K03455 (subtype B, red),

F1.BR.1993.93BR020-1. AF005494 (subtype F, green), C.BR.2004.04BR013.AY727522 (subtype C, blue).

## SUPPLEMENTARY MATERIAL S2



Recombination pattern Cluster 2 (coloured by red in figure 2)

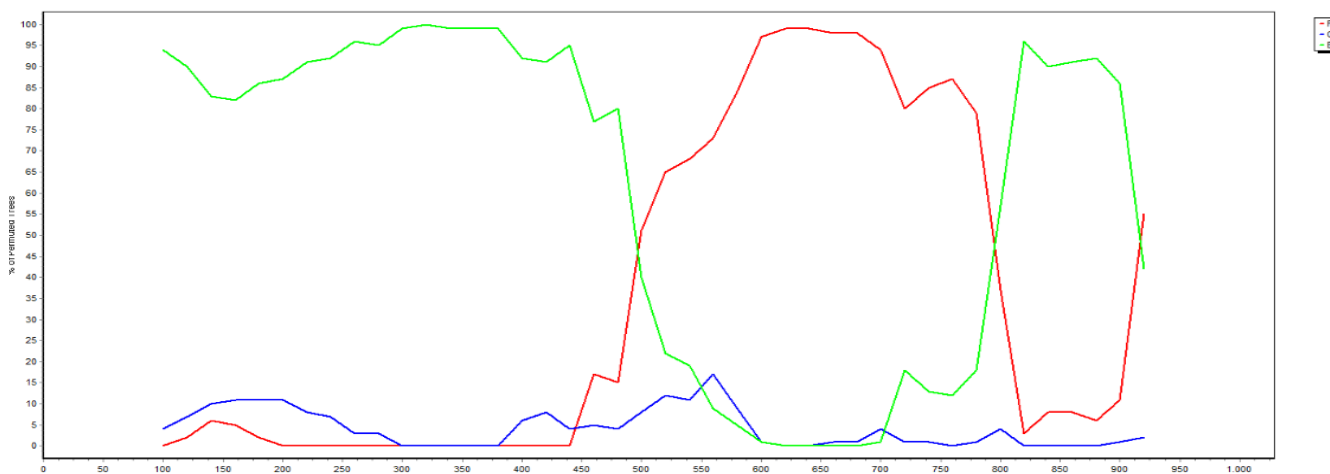
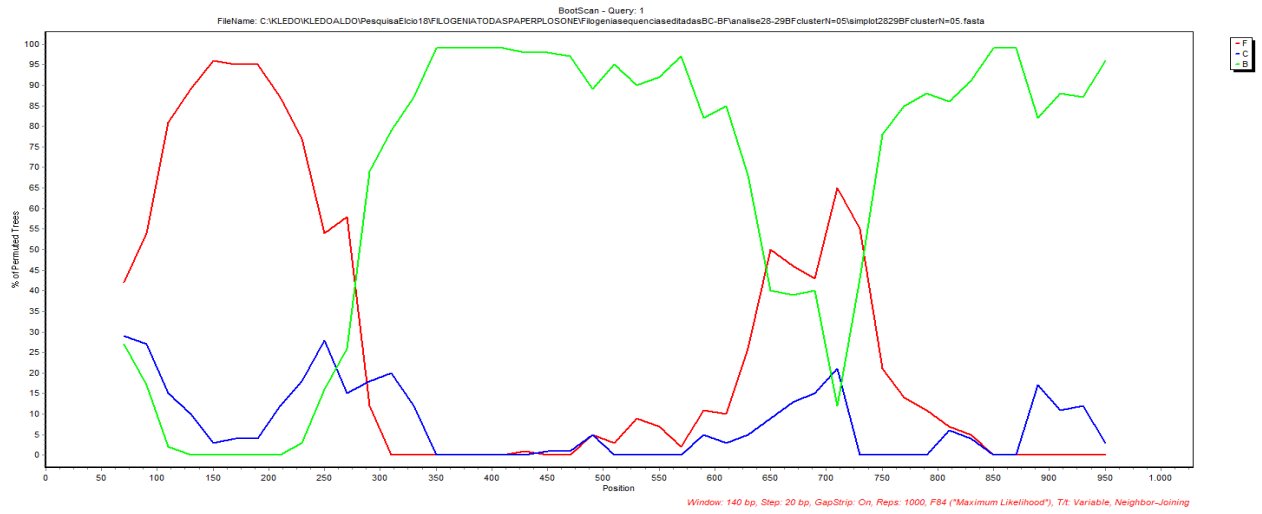


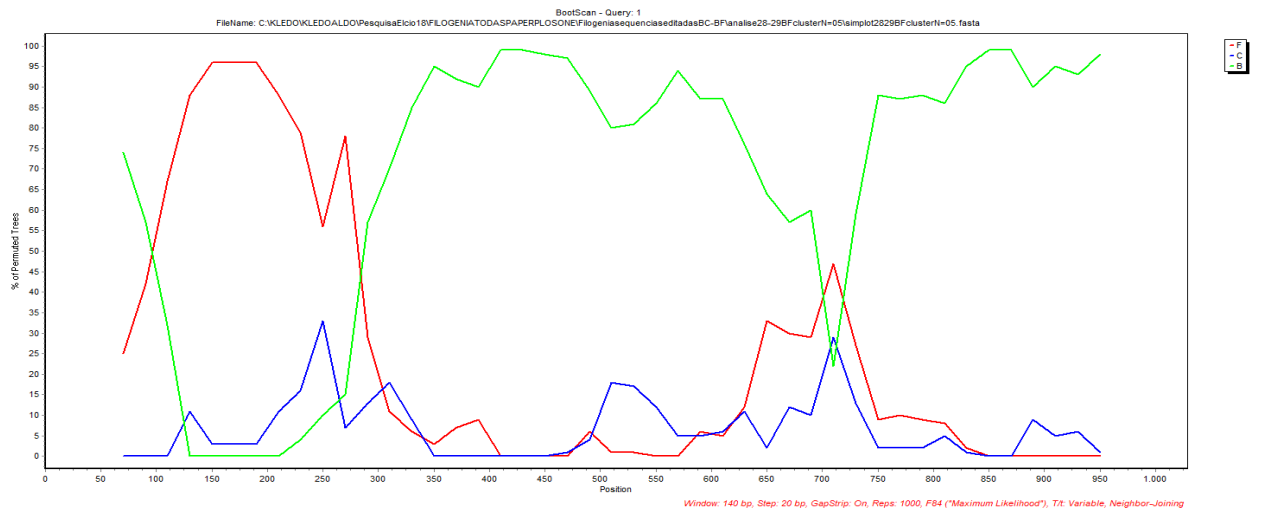
Figure S2 - Patterns of intersubtype genetic recombination of URFs BF presented in two major clusters. Cluster 1 with 14 query sequences and Cluster 2 with 9 one. Recombination analysis performed by bootscanning methodology using SIMPLOT software. Reference strains: B.FR.1983.HXB2-LAI-IIIB-BRU.K03455 (subtype B, red), F1.BR.1993.93BR020-1. AF005494 (subtype F, green), C.BR.2004.04BR013.AY727522 (subtype C, blue).  
Recombination pattern Cluster 1 (Coloured by green in figure 2)

## SUPPLEMENTARY MATERIAL Figure S3

# 16BRMA10040

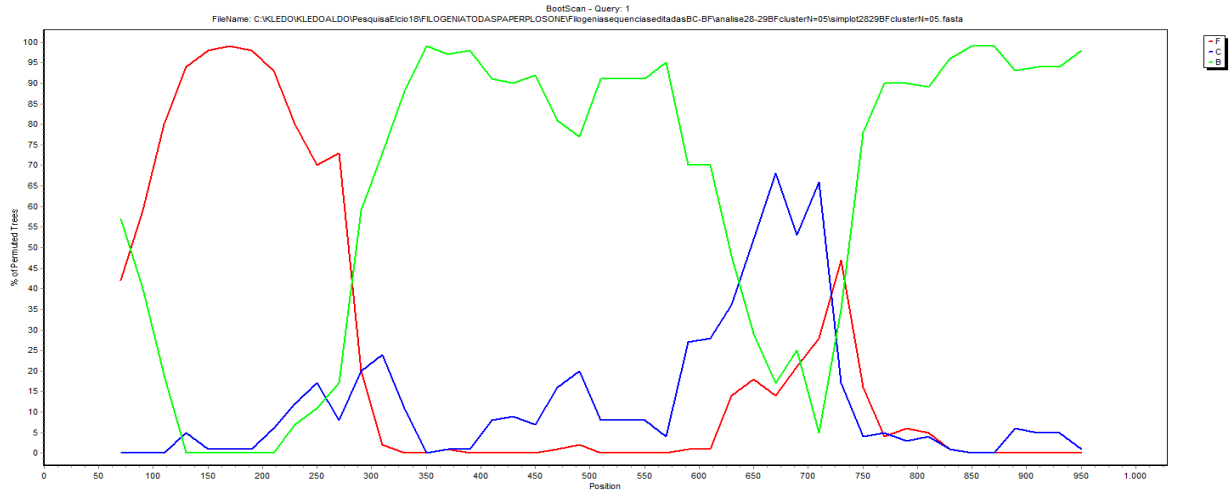


# 16BRMA09681



# 13BRMA0184

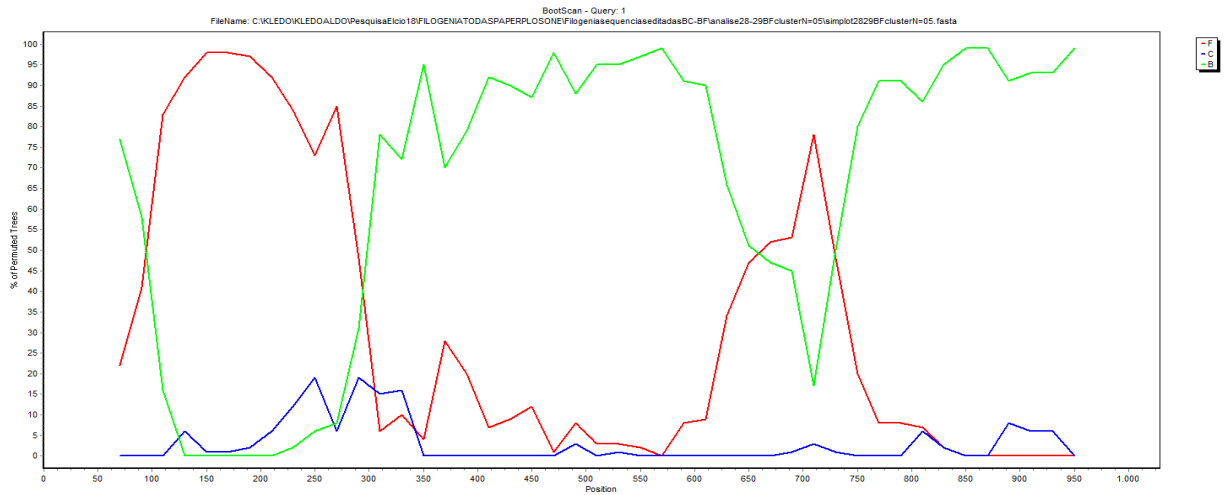




16BRMA06276



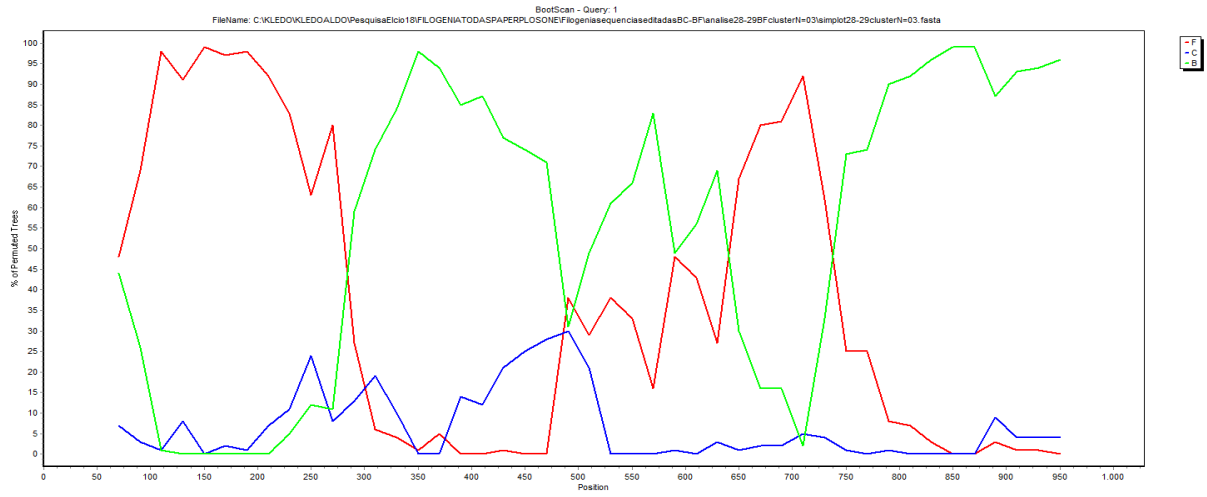
16BRMA06280



# 14BRMA0021



# 15BRMA0416



# 13BRMA0508

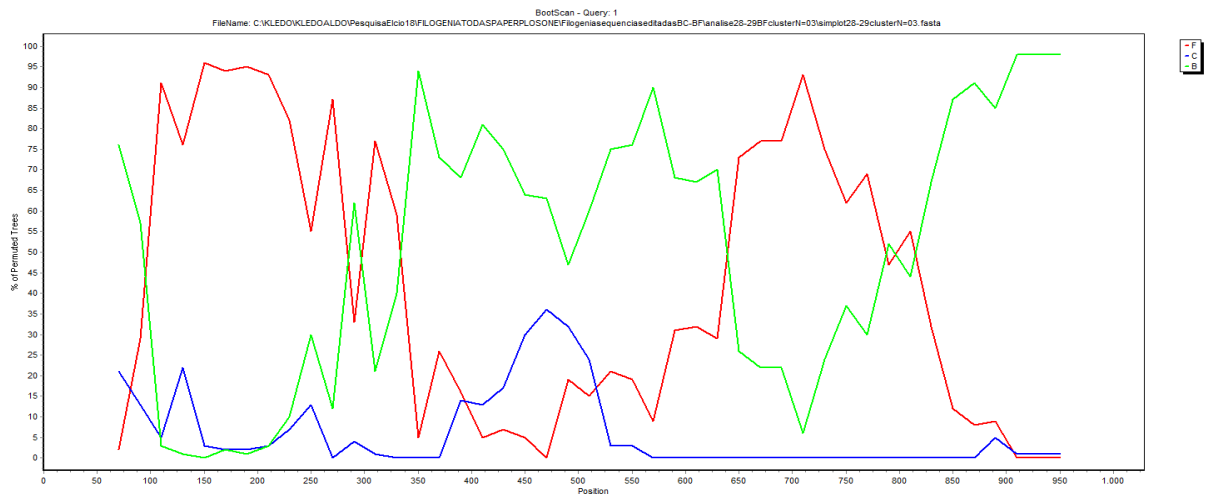


Figure S3 - Patterns of intersubtype genetic recombination of URFs BF recombinants related with CRFs 28 e 29\_BF. Recombination analysis performed by bootscanning methodology using SIMPLOT software. Reference strains: B.FR.1983.HXB2-LAI-IIIB-BRU.K03455 (subtype B, red), F1.BR.1993.93BR020-1. AF005494 (subtype F, green), C.BR.2004.04BR013.AY727522 (subtype C, blue).  
Cluster C (figure 2):