# Terrain analysis regarding the modeled and surveyed topographic positions

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```
source("/home/fabs/Data/paper1_lenny/fabians_and_rossiters_functions.R")
load("/home/fabs/Data/paper1_lenny/neu_unzugeordnet/FWCV_NORDTIROL/relieflegends.RData")
load("/home/fabs/Data/paper1_lenny/neu_unzugeordnet/FWCV_NORDTIROL/mesomakrolegends.RData
")
load("/home/fabs/Data/paper1_lenny/modeldata_SuedundNordtirol.RData")
```

```
terrain_makro_gl1=c("Topographic_Wetness_Index","profc_DTM_50m_avg_ws7","minic_DTM_50m_av
g_ws5")
terrain_makro_gl1_quality =c("Topographic_Wetness_Index","slope_ws3","hindex_vr1500_hr100
0_t100")
terrain_makro_gl2 = c("Topographic_Wetness_Index","profc_DTM_50m_avg_ws7","minic_DTM_50m_
avg_ws5")
terrain_meso_gl1 = c("TPI_i0m_o70m_10m","slope_DTM_50m_avg_ws3")
terrain_meso_gl1_wotpi =c("crosc_ws5","minic_ws15","slope_DTM_50m_avg_ws3","maxic_ws5")
terrain_meso_gl1_quality= c("TPI_i0m_o80m_10m","slope_DTM_50m_avg_ws3","sindex_vr1500_hr1
500_t175","longc_ws11")
terrain_meso_gl2 = c("TPI_i0m_o90m_10m","Slope")
```

# Macro scale GL1
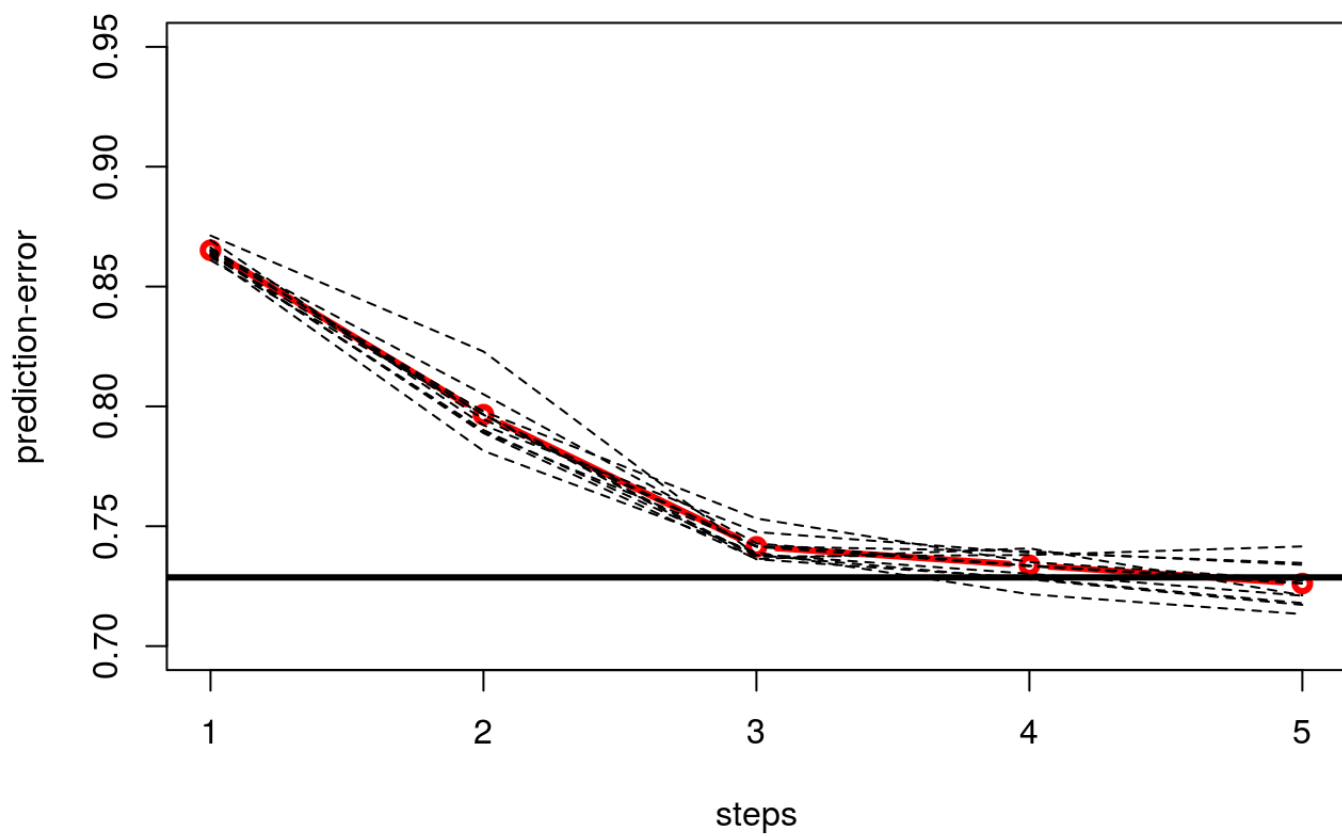
```
##                            k 1                           k 2
## 1 Topographic_Wetness_Index Topographic_Wetness_Index
## 2                 slope_ws5                 slope_ws5
## 3  hindex_vr1250_hr750_t100  hindex_vr1500_hr250_t175
## 4 hindex_vr1000_hr1250_t125           TPI_i0m_o70m_10m
## 5                     Slope                  LS_Factor
##                            k 3                           k 4
## 1 Topographic_Wetness_Index       TPI_i0m_o150m_10m
## 2                 slope_ws3                 slope_ws15
## 3 hindex_vr1500_hr1000_t100 hindex_vr1500_hr1000_t75
## 4                 slope_ws7    hindex_vr500_hr500_t25
## 5    vindex_vr250_hr250_t25                 slope_ws3
##                              k 5                             k 6
## 1   Topographic_Wetness_Index Topographic_Wetness_Index
## 2                   slope_ws3    slope_DTM_50m_avg_ws3
## 3 hillheight_vr1000_hr500_t75  hindex_vr1500_hr1250_t50
## 4             TPI_i0m_o50m_10m                 Convexity
## 5    hindex_vr1000_hr750_t125       TPI_i0m_o200m_10m
##                              k 7                               k 8
## 1   Topographic_Wetness_Index     Topographic_Wetness_Index
## 2                       Slope Terrain_Ruggedness_Index_TRI_r1
## 3 hillheight_vr1500_hr1000_t75     hillheight_vr750_hr250_t75
## 4             TPI_i0m_o80m_10m                   Slope_Height
## 5    vindex_vr1250_hr1500_t75     Channel_Network_Base_Level
##                              k 9                             k 10
## 1   Topographic_Wetness_Index   Topographic_Wetness_Index
## 2       slope_DTM_50m_avg_ws3                   slope_ws3
## 3 hillheight_vr1500_hr500_t25     hindex_vr1250_hr1000_t75
## 4                   minic_ws11                   minic_ws7
## 5               Slope_Height valleydepth_vr250_hr750_t500
```
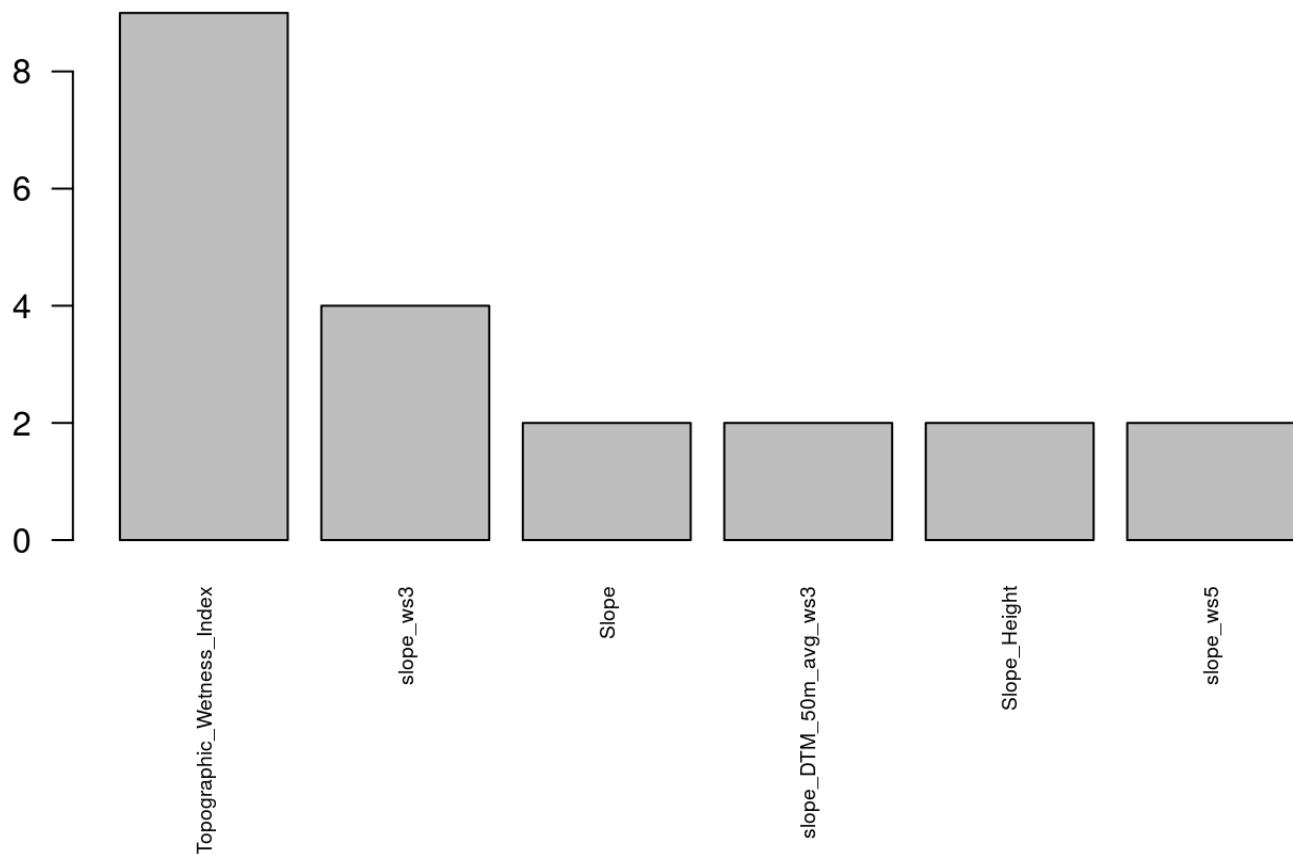
```
##                       allchosen Freq
## 27 Topographic_Wetness_Index    9
## 23                  slope_ws3    4
## 19                      Slope    2
## 20     slope_DTM_50m_avg_ws3    2
## 21               Slope_Height    2
## 24                  slope_ws5    2
```

```
## Loading required package: e1071
```

```
## [1] "10fold cv-error:  0.496894409937888  for predictors Topographic_Wetness_Index AND
## profc_DTM_50m_avg_ws7 AND minic_DTM_50m_avg_ws5"
##
## preds  FL  LO  DA  FS  BS  SH  RI
##    FL  11   0   3   1   0   0   0
##    LO   1  76   1   8  16   5  12
##    DA   3   1   6   0   2   2   1
##    FS   6  15   8  66  21   0  15
##    BS  29  95  27  85 526  46 203
##    SH   1   0   0   1   0  12   3
##    RI   4  21   1  12  67  34 163
## [1] Number of observations: 1610
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5342 , 0.0124 , 2.3
```

```
## [1] 95 % confidence limits for accuracy: 0.5095 ... 0.5588
## [1] User's accuracy
##     FL     LO     DA     FS     BS     SH     RI
## 0.7333 0.6387 0.4000 0.5038 0.5203 0.7059 0.5397
## [1] Producer's reliability:
##     FL     LO     DA     FS     BS     SH     RI
## 0.2000 0.3654 0.1304 0.3815 0.8323 0.1212 0.4106
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.3226 , 0.0167 , 5.2
## [1] 95 % confidence limits for kappa: 0.2897 ... 0.3556
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     BS     SH     RI
## 0.7239 0.5850 0.3824 0.4441 0.2103 0.6866 0.3891
##     FL     LO     DA     FS     BS     SH     RI
## 0.1179 0.0492 0.1295 0.0469 0.0160 0.1174 0.0345
##   FL   LO   DA   FS   BS   SH   RI
## 16.3  8.4 33.9 10.6  7.6 17.1  8.9
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     BS     SH     RI
## 0.1925 0.3147 0.1223 0.3267 0.5492 0.1118 0.2745
##     FL     LO     DA     FS     BS     SH     RI
## 0.0530 0.0331 0.0489 0.0375 0.0353 0.0314 0.0259
##   FL   LO   DA   FS   BS   SH   RI
## 27.5 10.5 40.0 11.5  6.4 28.1  9.4
## [1] Number of observations: 1610
## [1] Prior class probabilities:
## [1] 0.1428571 0.1428571 0.1428571 0.1428571 0.1428571 0.1428571 0.1428571
## [1] Observed class proportions:
##     FL     LO     DA     FS     BS     SH     RI
## 0.0093 0.0739 0.0093 0.0814 0.6280 0.0106 0.1876
## [1] Reference class proportions:
##     FL     LO     DA     FS     BS     SH     RI
## 0.0342 0.1292 0.0286 0.1075 0.3925 0.0615 0.2466
## [1] Tau, stdev, & CV%: 0.4565 , 0.0128 , 2.8
## [1] 95% confidence limits for tau:0.4311...0.4819
## [1] "mean quality =  0.252289236677718"
## [1] "The quality of the modeled TP is  0.252289236677718"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  0.354177344391141"
```

```
## [1] "10fold cv-error:  0.503105590062112  for predictors Topographic_Wetness_Index AND
## slope_ws3 AND hindex_vr1500_hr1000_t100"
##
## preds FL LO DA FS BS SH RI
##    FL 24  3  0  2  3  1  3
##    LO  3 51  3  6  8  2  4
##    DA  2  3 22  7  6  1  0
```

```
##    FS    5  16    8  74  50    3  21
##    BS   18 111   11  65 496   56 204
##    SH    0   0    0   0   0    0   0
##    RI    3  24    2  19  69   36 165
## [1] Number of observations: 1610
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5168 , 0.0125 , 2.4
## [1] 95 % confidence limits for accuracy: 0.4921 ... 0.5415
## [1] User's accuracy
##     FL     LO     DA     FS     BS     SH     RI
## 0.6667 0.6623 0.5366 0.4181 0.5161    NaN 0.5189
## [1] Producer's reliability:
##     FL     LO     DA     FS     BS     SH     RI
## 0.4364 0.2452 0.4783 0.4277 0.7848 0.0000 0.4156
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.3072 , 0.0167 , 5.4
## [1] 95 % confidence limits for kappa: 0.2742 ... 0.3402
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     BS     SH     RI
## 0.6549 0.6122 0.5230 0.3480 0.2034    NaN 0.3614
##     FL     LO     DA     FS     BS     SH     RI
## 0.0807 0.0608 0.0792 0.0389 0.0170    NaN 0.0334
##   FL   LO   DA   FS   BS   SH   RI
## 12.3  9.9 15.1 11.2  8.4  NaN  9.2
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     BS     SH     RI
## 0.4235 0.2073 0.4646 0.3571 0.4662 0.0000 0.2718
##     FL     LO     DA     FS     BS     SH     RI
## 0.0671 0.0283 0.0744 0.0396 0.0349 0.0000 0.0263
##   FL   LO   DA   FS   BS   SH   RI
## 15.8 13.6 16.0 11.1  7.5  NaN  9.7
## [1] Number of observations: 1610
## [1] Prior class probabilities:
## [1] 0.1428571 0.1428571 0.1428571 0.1428571 0.1428571 0.1428571 0.1428571
## [1] Observed class proportions:
##     FL     LO     DA     FS     BS     SH     RI
## 0.0224 0.0478 0.0255 0.1099 0.5969 0.0000 0.1975
## [1] Reference class proportions:
##     FL     LO     DA     FS     BS     SH     RI
## 0.0342 0.1292 0.0286 0.1075 0.3925 0.0615 0.2466
## [1] Tau, stdev, & CV%: 0.4362 , 0.013 , 3
## [1] 95% confidence limits for tau:0.4105...0.4619
## [1] "mean quality =  0.27641105138279"
## [1] "The quality of the modeled TP is  0.27641105138279"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
```

# Terrain parameter statistics for modeled topographic positions based on quality

```
classes <- levels(ST_makrored$preds_MGL1_A)
preds <- "preds_MGL1_Q"
for (p in unique(c(terrain_makro_gl1,terrain_makro_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_makrored[ST_makrored[[preds]]==cl,])))
    print(summary(ST_makrored[ST_makrored[[preds]]==cl,p]))
  }
}
```

```
## [1] "FL  and  Topographic_Wetness_Index  ; n =  36"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.121   5.391   5.949   6.176   6.716  11.790
## [1] "LO  and  Topographic_Wetness_Index  ; n =  77"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.785   5.267   5.983   6.316   7.144  12.150
## [1] "DA  and  Topographic_Wetness_Index  ; n =  41"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.397   5.118   5.963   6.296   7.163  10.370
## [1] "FS  and  Topographic_Wetness_Index  ; n =  177"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.005   5.218   5.890   6.118   6.570  15.390
## [1] "BS  and  Topographic_Wetness_Index  ; n =  961"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.788   5.316   5.985   6.434   7.044  18.000
## [1] "SH  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  Topographic_Wetness_Index  ; n =  318"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.029   5.277   6.056   6.194   6.842  13.130
## [1] "FL  and  profc_DTM_50m_avg_ws7  ; n =  36"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -2.553e-03 -5.433e-04 -5.906e-05 -7.454e-05  3.867e-04  2.934e-03
## [1] "LO  and  profc_DTM_50m_avg_ws7  ; n =  77"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0029800 -0.0006125 -0.0001802 -0.0001224  0.0001943  0.0045830
## [1] "DA  and  profc_DTM_50m_avg_ws7  ; n =  41"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0040980 -0.0009617 -0.0002917 -0.0003576  0.0002164  0.0015370
## [1] "FS  and  profc_DTM_50m_avg_ws7  ; n =  177"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0048290 -0.0008557 -0.0002305 -0.0003216  0.0002753  0.0029420
## [1] "BS  and  profc_DTM_50m_avg_ws7  ; n =  961"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0059900 -0.0006100 -0.0001281 -0.0001989  0.0003237  0.0061300
```

```
## [1] "SH  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  profc_DTM_50m_avg_ws7  ; n =  318"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0057160 -0.0006331 -0.0001351 -0.0002716  0.0002685  0.0033580
## [1] "FL  and  minic_DTM_50m_avg_ws5  ; n =  36"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -5.481e-03 -2.000e-03 -9.220e-04 -9.765e-04 -8.105e-05  2.845e-03
## [1] "LO  and  minic_DTM_50m_avg_ws5  ; n =  77"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0070000 -0.0026110 -0.0012320 -0.0016080 -0.0002502  0.0041300
## [1] "DA  and  minic_DTM_50m_avg_ws5  ; n =  41"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0093680 -0.0024260 -0.0010040 -0.0017030 -0.0002499  0.0013860
## [1] "FS  and  minic_DTM_50m_avg_ws5  ; n =  177"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0120400 -0.0025360 -0.0012230 -0.0017270 -0.0003427  0.0016490
## [1] "BS  and  minic_DTM_50m_avg_ws5  ; n =  961"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0136800 -0.0021570 -0.0009811 -0.0014660 -0.0001414  0.0034250
## [1] "SH  and  minic_DTM_50m_avg_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  minic_DTM_50m_avg_ws5  ; n =  318"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0084670 -0.0022140 -0.0009515 -0.0013410 -0.0002251  0.0039130
## [1] "FL  and  slope_ws3  ; n =  36"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.352  26.530  28.550  29.660  35.400  44.830
## [1] "LO  and  slope_ws3  ; n =  77"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   11.49   25.53   32.66   31.98   37.95   54.49
## [1] "DA  and  slope_ws3  ; n =  41"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   9.119  23.240  31.830  29.670  37.440  44.800
## [1] "FS  and  slope_ws3  ; n =  177"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.3189 24.7400 32.6600 31.2000 37.4300 58.5300
## [1] "BS  and  slope_ws3  ; n =  961"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1516 24.8900 32.5600 31.2300 38.0000 66.2100
## [1] "SH  and  slope_ws3  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  slope_ws3  ; n =  318"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.4799 25.4400 32.2600 31.2700 37.7800 67.6800
## [1] "FL  and  hindex_vr1500_hr1000_t100  ; n =  36"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##  0.0000  0.9136  1.0000  0.7916  1.0000  1.0000
## [1] "LO  and  hindex_vr1500_hr1000_t100  ; n =  77"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.3815  1.0000  0.7613  1.0000  1.0000
## [1] "DA  and  hindex_vr1500_hr1000_t100  ; n =  41"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  1.0000  0.6769  1.0000  1.0000
## [1] "FS  and  hindex_vr1500_hr1000_t100  ; n =  177"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.8971  1.0000  0.8122  1.0000  1.0000
## [1] "BS  and  hindex_vr1500_hr1000_t100  ; n =  961"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.3661  1.0000  0.7355  1.0000  1.0000
## [1] "SH  and  hindex_vr1500_hr1000_t100  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  hindex_vr1500_hr1000_t100  ; n =  318"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.4455  1.0000  0.7457  1.0000  1.0000
```

# Terrain parameter statistics for modeled topographic positions based on Overall accuracy

```r
classes <- levels(ST_makrored$preds_MGL1_A)
preds <- "preds_MGL1_A"
for (p in unique(c(terrain_makro_gl1,terrain_makro_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_makrored[ST_makrored[[preds]]==cl,])))
    print(summary(ST_makrored[ST_makrored[[preds]]==cl,p]))
  }
}
```

```
## [1] "FL  and  Topographic_Wetness_Index  ; n =  15"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.771   5.596   6.210   6.734   7.306  10.370
## [1] "LO  and  Topographic_Wetness_Index  ; n =  119"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.785   5.116   5.983   6.476   7.205  17.340
## [1] "DA  and  Topographic_Wetness_Index  ; n =  15"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.896   4.769   5.629   6.130   6.776  11.790
## [1] "FS  and  Topographic_Wetness_Index  ; n =  131"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.005   5.256   5.872   6.031   6.591  11.690
## [1] "BS  and  Topographic_Wetness_Index  ; n =  1011"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.788   5.316   5.969   6.403   7.026  18.000
## [1] "SH  and  Topographic_Wetness_Index  ; n =  17"
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.470   5.715   6.328   6.712   7.478  10.190
## [1] "RI  and  Topographic_Wetness_Index  ; n =  302"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.809   5.287   6.052   6.162   6.797  12.560
## [1] "FL  and  profc_DTM_50m_avg_ws7  ; n =  15"
##       Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -2.553e-03 -5.796e-04 -2.678e-04 -4.785e-04 -8.309e-05  4.412e-04
## [1] "LO  and  profc_DTM_50m_avg_ws7  ; n =  119"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0059900 -0.0006095 -0.0001465 -0.0002984  0.0002024  0.0045830
## [1] "DA  and  profc_DTM_50m_avg_ws7  ; n =  15"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0024880 -0.0004473 -0.0002833 -0.0000240  0.0004121  0.0023600
## [1] "FS  and  profc_DTM_50m_avg_ws7  ; n =  131"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -4.098e-03 -5.992e-04 -1.142e-04 -8.805e-05  4.422e-04  2.542e-03
## [1] "BS  and  profc_DTM_50m_avg_ws7  ; n =  1011"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0057230 -0.0006405 -0.0001356 -0.0002135  0.0003122  0.0061300
## [1] "SH  and  profc_DTM_50m_avg_ws7  ; n =  17"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0023940 -0.0011550 -0.0007211 -0.0006782 -0.0001583  0.0016150
## [1] "RI  and  profc_DTM_50m_avg_ws7  ; n =  302"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0046650 -0.0006447 -0.0001434 -0.0002622  0.0002713  0.0032060
## [1] "FL  and  minic_DTM_50m_avg_ws5  ; n =  15"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0075420 -0.0019320 -0.0010040 -0.0016550 -0.0005164 -0.0001371
## [1] "LO  and  minic_DTM_50m_avg_ws5  ; n =  119"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0109300 -0.0025780 -0.0011260 -0.0018050 -0.0001726  0.0041300
## [1] "DA  and  minic_DTM_50m_avg_ws5  ; n =  15"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0040900 -0.0010660 -0.0002502 -0.0002764  0.0008051  0.0024380
## [1] "FS  and  minic_DTM_50m_avg_ws5  ; n =  131"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -1.204e-02 -1.734e-03 -8.191e-04 -1.288e-03 -5.559e-05  1.731e-03
## [1] "BS  and  minic_DTM_50m_avg_ws5  ; n =  1011"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0136800 -0.0022830 -0.0010210 -0.0015140 -0.0002099  0.0034250
## [1] "SH  and  minic_DTM_50m_avg_ws5  ; n =  17"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0038100 -0.0019100 -0.0013300 -0.0013770 -0.0003102  0.0005920
## [1] "RI  and  minic_DTM_50m_avg_ws5  ; n =  302"
##        Min.      1st Qu.     Median       Mean     3rd Qu.       Max.
## -0.0077980 -0.0022010 -0.0010350 -0.0013340 -0.0001277  0.0039130
## [1] "FL  and  slope_ws3  ; n =  15"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   9.119  26.900  33.760  31.750  38.380  53.740
```

```
## [1] "LO  and  slope_ws3  ; n =  119"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.457  24.680  32.680  31.170  38.930  54.490
## [1] "DA  and  slope_ws3  ; n =  15"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.352  22.190  29.510  29.800  40.000  49.540
## [1] "FS  and  slope_ws3  ; n =  131"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.3189 24.3300 31.6900 30.4100 36.4200 58.5300
## [1] "BS  and  slope_ws3  ; n =  1011"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1516 25.2500 32.4100 31.1500 37.9600 67.6800
## [1] "SH  and  slope_ws3  ; n =  17"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   11.04   24.39   32.36   31.41   36.63   58.68
## [1] "RI  and  slope_ws3  ; n =  302"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.4799 25.4100 32.6200 31.7400 37.9500 63.6800
## [1] "FL  and  hindex_vr1500_hr1000_t100  ; n =  15"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.2341  1.0000  0.6546  1.0000  1.0000
## [1] "LO  and  hindex_vr1500_hr1000_t100  ; n =  119"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.3113  1.0000  0.7174  1.0000  1.0000
## [1] "DA  and  hindex_vr1500_hr1000_t100  ; n =  15"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.4821  1.0000  0.7310  1.0000  1.0000
## [1] "FS  and  hindex_vr1500_hr1000_t100  ; n =  131"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  1.0000  1.0000  0.9052  1.0000  1.0000
## [1] "BS  and  hindex_vr1500_hr1000_t100  ; n =  1011"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.3902  1.0000  0.7376  1.0000  1.0000
## [1] "SH  and  hindex_vr1500_hr1000_t100  ; n =  17"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00000 0.00000 0.04674 0.45480 1.00000 1.00000
## [1] "RI  and  hindex_vr1500_hr1000_t100  ; n =  302"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.4071  1.0000  0.7432  1.0000  1.0000
```

# Terrain parameter statistics for surveyed topographic positions

```
classes <- levels(ST_makrored$preds_MGL1_A)
preds <- "Def_red_mak"
for (p in unique(c(terrain_makro_gl1,terrain_makro_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_makrored[ST_makrored[[preds]]==cl,])))
    print(summary(ST_makrored[ST_makrored[[preds]]==cl,p]))
  }
}
```

```
## [1] "FL  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "LO  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "DA  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "FS  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  Topographic_Wetness_Index  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "FL  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "LO  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "DA  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "FS  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  profc_DTM_50m_avg_ws7  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  profc_DTM_50m_avg_ws7  ; n =  0"
```

```
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "FL  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "LO  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "DA  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "FS  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  minic_DTM_50m_avg_ws5  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "FL  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "LO  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "DA  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "FS  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "RI  and  slope_ws3  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "FL  and  hindex_vr1500_hr1000_t100  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "LO  and  hindex_vr1500_hr1000_t100  ; n =   0"
##     Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
```

```
## [1] "DA  and  hindex_vr1500_hr1000_t100  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.   Max.
##
## [1] "FS  and  hindex_vr1500_hr1000_t100  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.   Max.
##
## [1] "BS  and  hindex_vr1500_hr1000_t100  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.   Max.
##
## [1] "SH  and  hindex_vr1500_hr1000_t100  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.   Max.
##
## [1] "RI  and  hindex_vr1500_hr1000_t100  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.   Max.
##
```

# Meso scale GL1

```
## [1] "SOUTH TYROL"
```
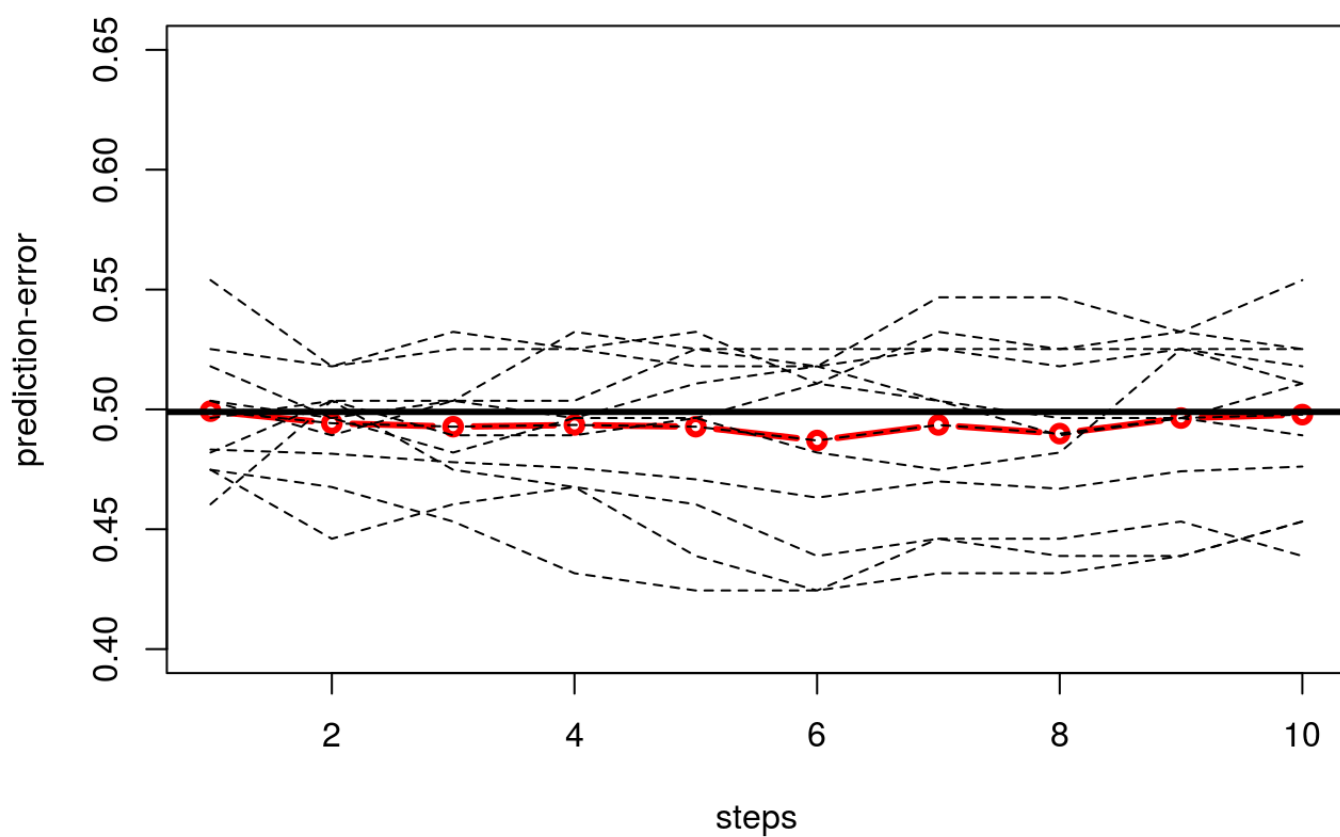
```
##                            k 1                          k 2
## 1           TPI_i0m_o80m_10m               TPI_i0m_o70m_10m
## 2      slope_DTM_50m_avg_ws3         Modified_Catchment_Area
## 3           TPI_i0m_o70m_10m                           Slope
## 4                  maxic_ws7               Normalized_Height
## 5            Catchment_slope                       maxic_ws7
## 6                 longc_ws15               Mid_Slope_Positon
## 7          TPI_i0m_o400m_10m Vector_Terrain_Ruggedness_VRM_r1
## 8      slope_DTM_50m_avg_ws7            profc_DTM_50m_avg_ws5
## 9              TPI_i0m_o1100m                       Convexity
## 10                 Convexity                        elev_ws5
##                            k 3             k 4               k 5
## 1           TPI_i0m_o60m_10m TPI_i0m_o80m_10m    TPI_i0m_o70m_10m
## 2      slope_DTM_50m_avg_ws3        slope_ws5 slope_DTM_50m_avg_ws3
## 3                  crosc_ws7        crosc_ws3           maxic_ws5
## 4          Normalized_Height   TPI_i0m_o1150m      TPI_i0m_o1000m
## 5 Terrain_Ruggedness_Index_TRI_r1 TPI_i0m_o20m_10m          crosc_ws15
## 6                 minic_ws15        crosc_ws5           longc_ws15
## 7    longc_DTM_50m_avg_ws7 Minimal_Curvature slope_DTM_50m_avg_ws5
## 8 sagaTopographic_Wetness_Index            Slope crosc_DTM_50m_avg_ws7
## 9                 profc_ws15        maxic_ws5           profc_ws11
## 10                minic_ws7  Catchment_slope    Protection_Index
##                            k 6             k 7               k 8
## 1           TPI_i0m_o80m_10m TPI_i0m_o80m_10m    TPI_i0m_o60m_10m
## 2      slope_DTM_50m_avg_ws3            Slope slope_DTM_50m_avg_ws3
## 3                  crosc_ws5        maxic_ws7           maxic_ws5
## 4          TPI_i100m_o150m   TPI_i150m_o200m   Closed_Depressions
## 5                  maxic_ws7   TPI_i200m_o1350m planc_DTM_50m_avg_ws5
## 6          TPI_i0m_o1300m slope_DTM_50m_avg_ws5 crosc_DTM_50m_avg_ws7
## 7 Tangential_Curvature_10m        aspect_ws15           minic_ws5
## 8                      Slope maxic_DTM_50m_avg_ws3          slope_ws15
## 9          TPI_i0m_o90m_10m longc_DTM_50m_avg_ws7           minic_ws7
## 10         Profile_Curvature  Mass_Balance_Index           maxic_ws7
##                            k 9            k 10
## 1           TPI_i0m_o70m_10m TPI_i0m_o80m_10m
## 2                      Slope slope_DTM_50m_avg_ws3
## 3                  planc_ws5        maxic_ws5
## 4            Catchment_slope       minic_ws15
## 5             Plan_Curvature       longc_ws15
## 6          TPI_i0m_o30m_10m  Catchment_slope
## 7          TPI_i0m_o40m_10m        crosc_ws3
## 8                 minic_ws15  TPI_i100m_o850m
## 9  planc_DTM_50m_avg_ws3     TPI_i0m_o1250m
## 10 crosc_DTM_50m_avg_ws3     TPI_i0m_o30m_10m
```
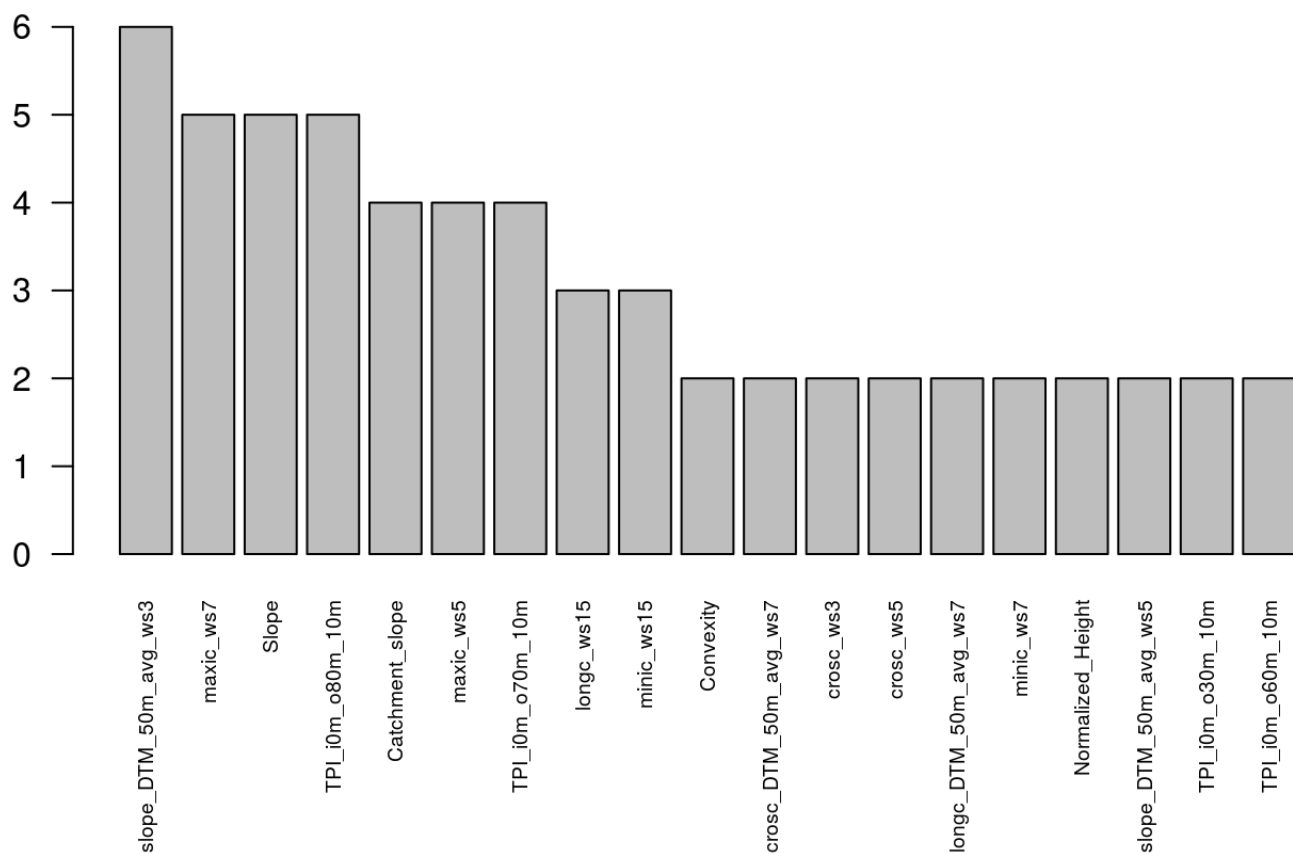
```
##                 allchosen Freq
## 36 slope_DTM_50m_avg_ws3    6
## 17          maxic_ws7       5
## 35             Slope        5
## 54    TPI_i0m_o80m_10m      5
## 2     Catchment_slope       4
## 16          maxic_ws5       4
## 53    TPI_i0m_o70m_10m      4
## 13          longc_ws15      3
## 19          minic_ws15      3
## 4           Convexity       2
## 6  crosc_DTM_50m_avg_ws7    2
## 8           crosc_ws3       2
## 9           crosc_ws5       2
## 12 longc_DTM_50m_avg_ws7    2
## 21          minic_ws7       2
## 24    Normalized_Height     2
## 37 slope_DTM_50m_avg_ws5    2
## 49    TPI_i0m_o30m_10m      2
## 52    TPI_i0m_o60m_10m      2
```

```
## [1] "10fold cv-error:  0.486657303370786  for predictors TPI_i0m_o70m_10m AND slope_DT
M_50m_avg_ws3"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
```

```
##    FL   9   3   2   0   1   1   0   1   3
##    LO   1  34   1  14   1   2   2   0   3
##    DA   4   7  15   4   3   1   0   1   3
##    FS   0   0   0   8   0   3   0   1   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS   7  58  41  71  65 589  53  68 165
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   1   0   5   0
##    RI   0   3   2   4   2  33   7  29  93
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5288 , 0.0132 , 2.5
## [1] 95 % confidence limits for accuracy: 0.5025 ... 0.5551
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4500 0.5862 0.3947 0.6667    NaN 0.5273    NaN 0.8333 0.5376
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4286 0.3238 0.2459 0.0792 0.0000 0.9349 0.0000 0.0476 0.3483
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.246 , 0.0164 , 6.7
## [1] 95 % confidence limits for kappa: 0.2135 ... 0.2785
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4418 0.5533 0.3676 0.6412    NaN 0.1522    NaN 0.8201 0.4309
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1120 0.0686 0.0815 0.1461    NaN 0.0128    NaN 0.1641 0.0439
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.4 12.4 22.2 22.8  NaN  8.4  NaN 20.0 10.2
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4204 0.2951 0.2252 0.0714 0.0000 0.6981 0.0000 0.0436 0.2582
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1086 0.0452 0.0548 0.0254 0.0000 0.0419 0.0000 0.0194 0.0291
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.8 15.3 24.3 35.5  NaN  6.0  NaN 44.5 11.3
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0140 0.0407 0.0267 0.0084 0.0000 0.7844 0.0000 0.0042 0.1215
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4699 , 0.0119 , 2.5
## [1] 95% confidence limits for tau:0.4463...0.4935
## [1] "mean quality =  0.180377190390757"
## [1] "The quality of the modeled TP is  0.180377190390757"
```
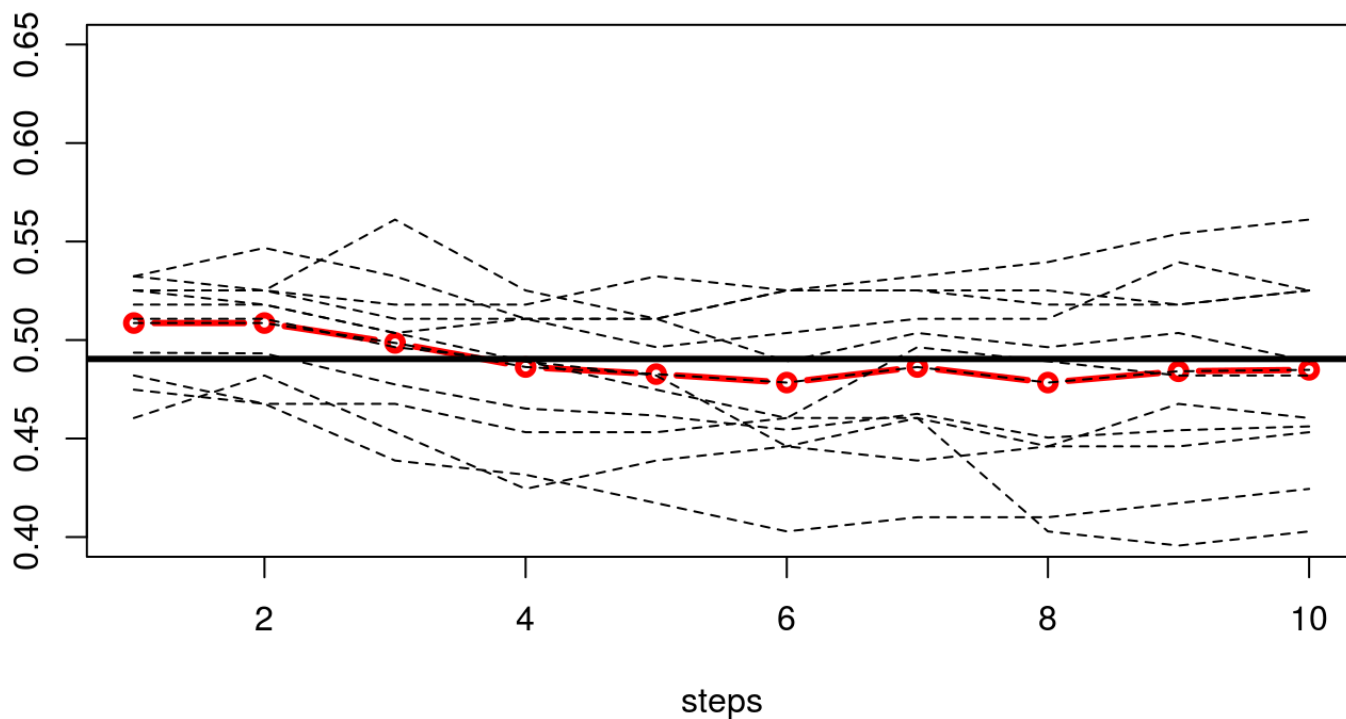
```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "########  Cramer's V =  NaN"
```



```
##                        k 1                              k 2
## 1            crosc_ws5                         crosc_ws7
## 2           minic_ws15                         profc_ws7
## 3  slope_DTM_50m_avg_ws3                 Protection_Index
## 4           maxic_ws5 Terrain_Ruggedness_Index_TRI_r1
## 5            longc_ws5          aspect_DTM_50m_avg_ws7
## 6      Protection_Index              Standardized_Height
## 7  longc_DTM_50m_avg_ws5         slope_DTM_50m_avg_ws5
## 8  minic_DTM_50m_avg_ws5                       minic_ws15
## 9            Convexity   Channel_Network_Base_Level
## 10          slope_ws3                 Catchment_slope
##                        k 3                       k 4
## 1            crosc_ws5                 crosc_ws5
## 2      General_Curvature                 profc_ws11
## 3                Slope slope_DTM_50m_avg_ws3
## 4           minic_ws15    Standardized_Height
## 5     Normalized_Height                 profc_ws7
## 6           maxic_ws5                 crosc_ws11
## 7      Total_Curvature    Minimal_Curvature
## 8          maxic_ws15                 minic_ws7
```

```
## 9                     crosc_ws7              Catchment_slope
## 10 crosc_DTM_50m_avg_ws5                          crosc_ws15
##                                     k 5                      k 6
## 1                              crosc_ws5                crosc_ws5
## 2                     General_Curvature        General_Curvature
## 3                  slope_DTM_50m_avg_ws3                    Slope
## 4                             longc_ws11                profc_ws11
## 5                       Protection_Index               minic_ws15
## 6                             crosc_ws15         Protection_Index
## 7                  slope_DTM_50m_avg_ws7  planc_DTM_50m_avg_ws3
## 8                        Catchment_slope                Convexity
## 9      Terrain_Ruggedness_Index_TRI_r1                  minic_ws5
## 10                            profc_ws11               crosc_ws11
##                           k 7                  k 8                      k 9
## 1                    crosc_ws5            crosc_ws5                crosc_ws7
## 2               Plan_Curvature            planc_ws15                    Slope
## 3                   crosc_ws15  slope_DTM_50m_avg_ws3  longc_DTM_50m_avg_ws7
## 4                        Slope          Slope_Height                minic_ws7
## 5             Normalized_Height            minic_ws11    Standardized_Height
## 6            Profile_Curvature            maxic_ws5               minic_ws15
## 7                    maxic_ws3             slope_ws3          Catchment_slope
## 8                      Texture    Profile_Curvature                 slope_ws7
## 9                   maxic_ws15            minic_ws15  minic_DTM_50m_avg_ws3
## 10       Tangential_Curvature             Convexity               minic_ws11
##                          k 10
## 1                    crosc_ws5
## 2                    minic_ws7
## 3                    maxic_ws5
## 4        slope_DTM_50m_avg_ws3
## 5        minic_DTM_50m_avg_ws5
## 6                   minic_ws15
## 7      aspect_DTM_50m_avg_ws3
## 8                    Convexity
## 9                   longc_ws15
## 10      crosc_DTM_50m_avg_ws7
```
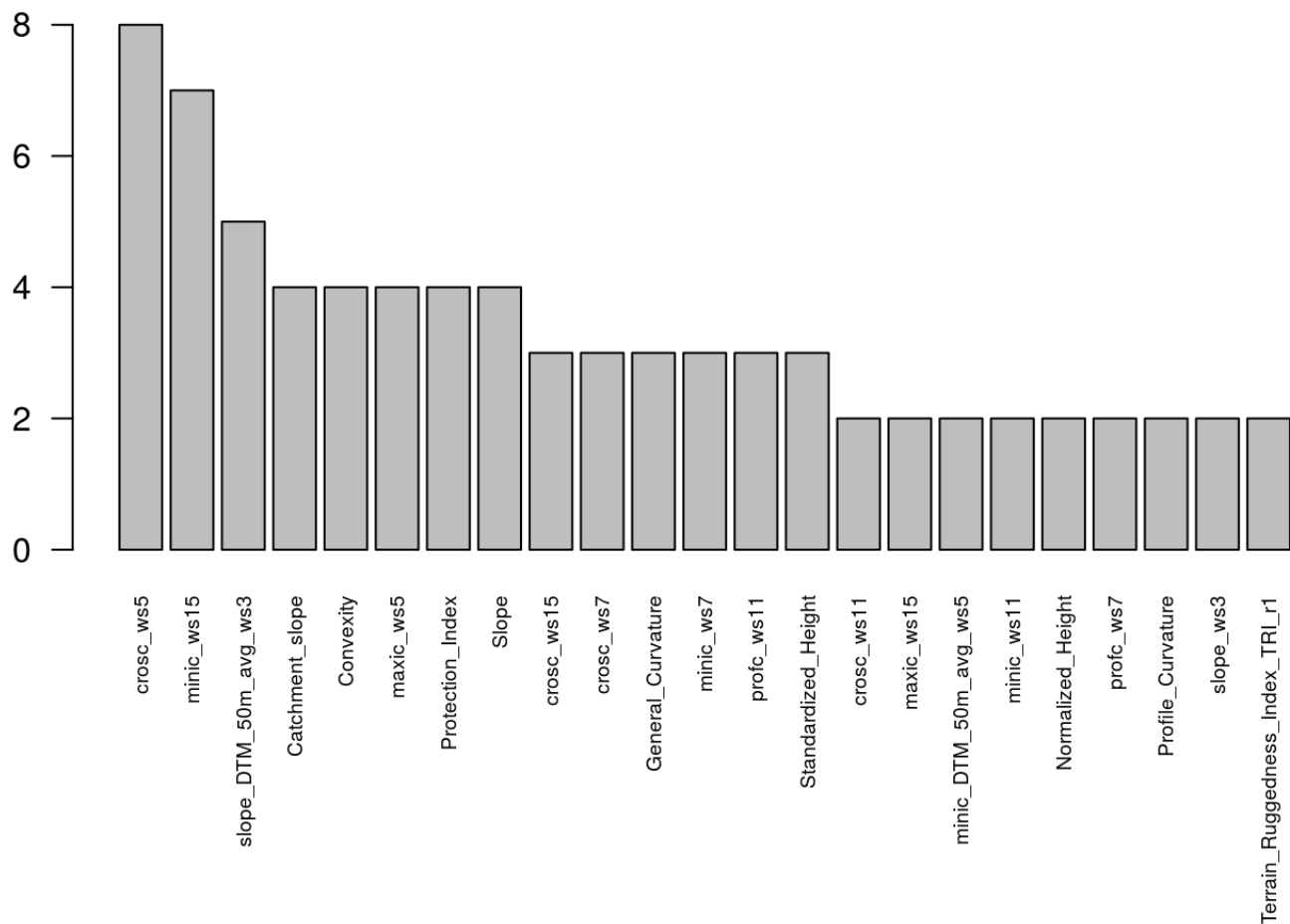
```
##                         allchosen Freq
## 10                       crosc_ws5    8
## 24                      minic_ws15    7
## 37           slope_DTM_50m_avg_ws3    5
## 3                 Catchment_slope    4
## 5                       Convexity    4
## 20                      maxic_ws5    4
## 35                Protection_Index    4
## 36                           Slope    4
## 9                      crosc_ws15    3
## 11                       crosc_ws7    3
## 12              General_Curvature    3
## 26                       minic_ws7    3
## 32                      profc_ws11    3
## 43              Standardized_Height    3
## 8                      crosc_ws11    2
## 18                      maxic_ws15    2
## 22           minic_DTM_50m_avg_ws5    2
## 23                      minic_ws11    2
## 28                Normalized_Height    2
## 33                       profc_ws7    2
## 34              Profile_Curvature    2
## 41                       slope_ws3    2
## 45 Terrain_Ruggedness_Index_TRI_r1    2
```

```
## [1] "10fold cv-error:  0.478932584269663  for predictors crosc_ws5 AND minic_ws15 AND
slope_DTM_50m_avg_ws3 AND maxic_ws5"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   8   1   2   0   1   1   0   1   2
##    LO   0  35   1   9   0   0   2   0   1
##    DA   5   5  17   4   3   1   0   1   2
##    FS   0   4   0  16   0   4   1   0   2
##    SF   0   0   0   0   0   0   0   0   0
##    BS   8  56  38  68  64 589  53  71 148
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   3   0
##    RI   0   4   3   4   4  35   6  29 112
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5478 , 0.0132 , 2.4
## [1] 95 % confidence limits for accuracy: 0.5216 ... 0.574
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.5000 0.7292 0.4474 0.5926    NaN 0.5379    NaN 1.0000 0.5685
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.3810 0.3333 0.2787 0.1584 0.0000 0.9349 0.0000 0.0286 0.4195
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.2805 , 0.0169 , 6
## [1] 95 % confidence limits for kappa: 0.247 ... 0.314
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4925 0.7076 0.4226 0.5615    NaN 0.1712    NaN 1.0000 0.4690
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1262 0.0686 0.0830 0.1010    NaN 0.0135    NaN 0.0000 0.0407
##    FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.6  9.7 19.6 18.0  NaN  7.9  NaN  0.0  8.7
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.3739 0.3101 0.2589 0.1422 0.0000 0.7183 0.0000 0.0265 0.3263
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1062 0.0453 0.0572 0.0349 0.0000 0.0393 0.0000 0.0151 0.0311
##    FL   LO   DA   FS   SF   BS   SS   SH   RI
## 28.4 14.6 22.1 24.5  NaN  5.5  NaN 57.0  9.5
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0112 0.0337 0.0267 0.0190 0.0000 0.7690 0.0000 0.0021 0.1383
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.4912 , 0.0118 , 2.4
## [1] 95% confidence limits for tau:0.4677...0.5147
## [1] "mean quality =  0.198653957414569"
## [1] "The quality of the modeled TP is  0.198653957414569"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
```
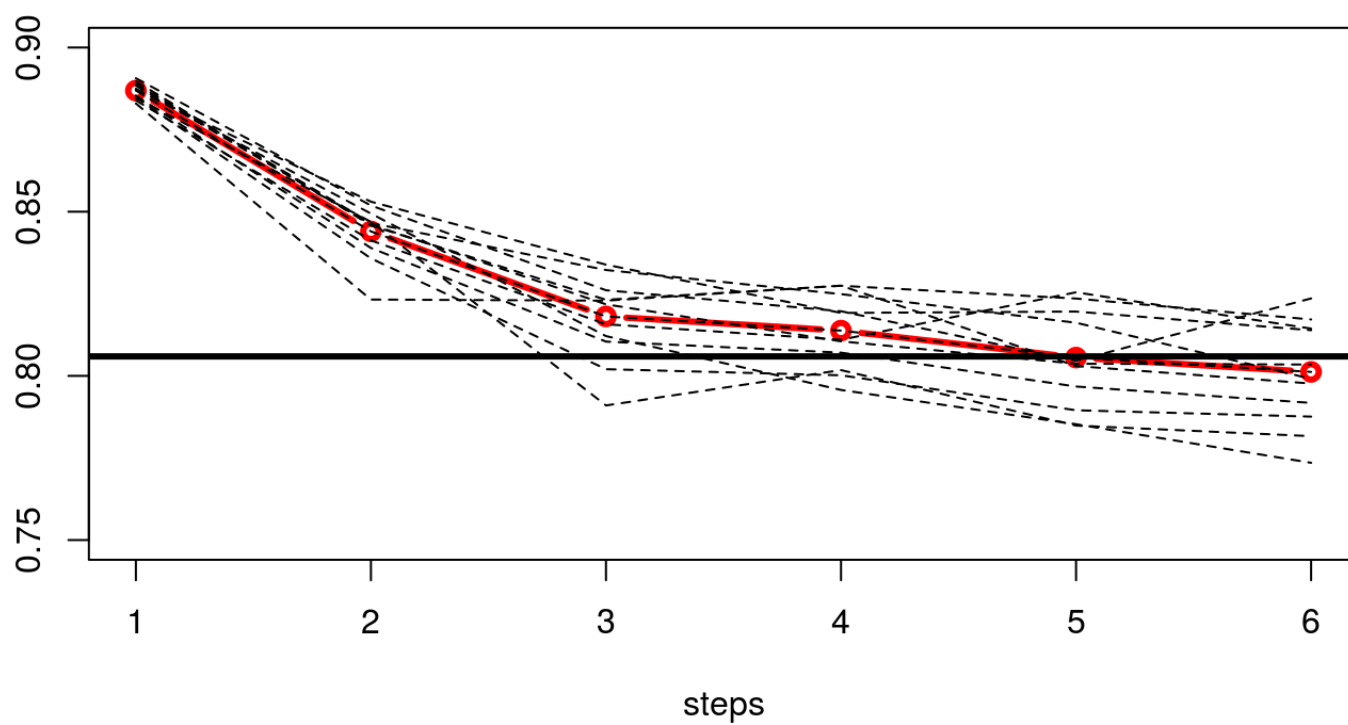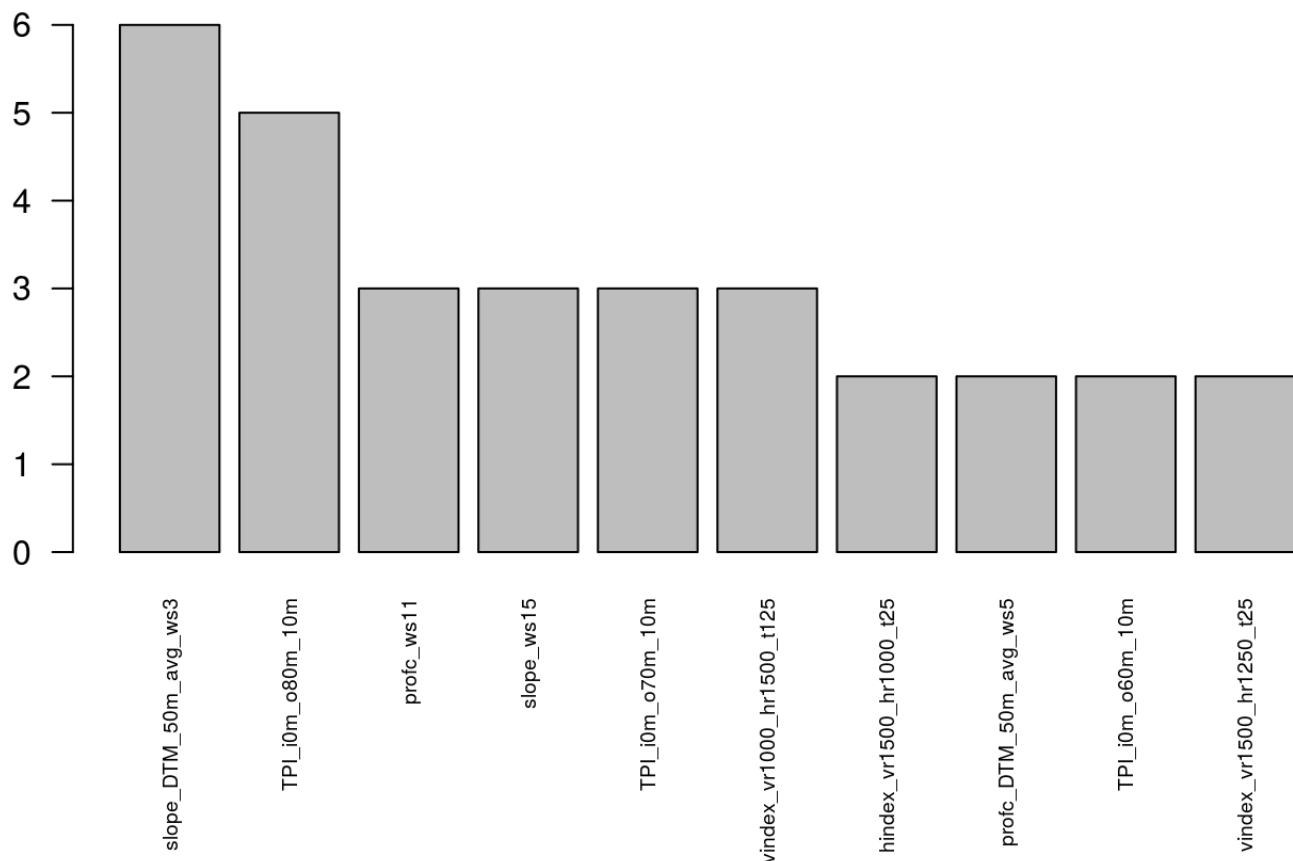
```
##                         k 1                        k 2
## 1        TPI_i0m_o70m_10m           TPI_i0m_o80m_10m
## 2                   Slope     slope_DTM_50m_avg_ws3
## 3 hindex_vr1500_hr1000_t25          TPI_i200m_o1100m
## 4   sindex_vr250_hr750_t125               aspect_ws11
## 5    planc_DTM_50m_avg_ws5 sindex_vr1500_hr1500_t150
## 6               profc_ws11                 slope_ws5
##                         k 3                        k 4
## 1        TPI_i0m_o80m_10m           TPI_i0m_o60m_10m
## 2    slope_DTM_50m_avg_ws3     slope_DTM_50m_avg_ws3
## 3          TPI_i150m_o1000m vindex_vr1500_hr1500_t175
## 4     minic_DTM_50m_avg_ws3                profc_ws11
## 5 vindex_vr1500_hr1250_t25 vindex_vr1000_hr1500_t125
## 6   sindex_vr250_hr750_t175  hindex_vr1500_hr750_t250
##                         k 5                        k 6
## 1        TPI_i0m_o80m_10m           TPI_i0m_o80m_10m
## 2    slope_DTM_50m_avg_ws5     slope_DTM_50m_avg_ws3
## 3 vindex_vr1000_hr1500_t175 sindex_vr1500_hr1500_t175
## 4  hindex_vr1000_hr750_t100                 longc_ws11
## 5               slope_ws15        Standardized_Height
## 6       TPI_i0m_o130m_10m                 crosc_ws7
##                         k 7                        k 8
## 1        TPI_i0m_o70m_10m           TPI_i0m_o70m_10m
## 2               slope_ws15     slope_DTM_50m_avg_ws3
## 3  vindex_vr1500_hr1250_t25    profc_DTM_50m_avg_ws7
## 4               profc_ws11 vindex_vr1500_hr1250_t50
## 5 vindex_vr1000_hr1500_t125  hindex_vr1500_hr500_t75
## 6   hindex_vr250_hr250_t100 vindex_vr1000_hr1500_t125
##                         k 9                       k 10
## 1        TPI_i0m_o60m_10m           TPI_i0m_o80m_10m
## 2               slope_ws15     slope_DTM_50m_avg_ws3
## 3   profc_DTM_50m_avg_ws5     profc_DTM_50m_avg_ws5
## 4 sindex_vr1250_hr500_t175 hindex_vr1500_hr1000_t25
## 5          TPI_i150m_o350m hindex_vr1500_hr500_t100
## 6               maxic_ws7     maxic_DTM_50m_avg_ws7
```

```
##                       allchosen Freq
## 23        slope_DTM_50m_avg_ws3    6
## 31           TPI_i0m_o80m_10m    5
## 16                   profc_ws11    3
## 25                   slope_ws15    3
## 30           TPI_i0m_o70m_10m    3
## 35 vindex_vr1000_hr1500_t125    3
## 4   hindex_vr1500_hr1000_t25    2
## 14      profc_DTM_50m_avg_ws5    2
## 29           TPI_i0m_o60m_10m    2
## 37  vindex_vr1500_hr1250_t25    2
```

```
## [1] "10fold cv-error:  0.485955056179775   for predictors TPI_i0m_o80m_10m AND slope_DT
M_50m_avg_ws3 AND sindex_vr1500_hr1500_t175 AND longc_ws11"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   9   0   1   0   0   0   0   0   1
##    LO   1  34   1  10   2   1   0   1   2
##    DA   2   3  21   4   4   0   0   1   3
##    FS   2   4   1  18   2   6   2   1   1
##    SF   0   0   0   0   0   0   0   0   0
##    BS   6  61  37  67  62 599  54  62 173
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   1   0   0   0   4   1  20   4
##    RI   1   2   0   2   2  20   5  20  83
```

```
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5506 , 0.0132 , 2.4
## [1] 95 % confidence limits for accuracy: 0.5244 ... 0.5767
## [1] User's accuracy
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.8182 0.6538 0.5526 0.4865    NaN 0.5343    NaN 0.6667 0.6148
## [1] Producer's reliability:
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4286 0.3238 0.3443 0.1782 0.0000 0.9508 0.0000 0.1905 0.3109
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.2827 , 0.017 , 6
## [1] 95 % confidence limits for kappa: 0.2491 ... 0.3163
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.8155 0.6263 0.5326 0.4473    NaN 0.1649    NaN 0.6401 0.5259
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1179 0.0703 0.0833 0.0873    NaN 0.0128    NaN 0.0922 0.0495
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 14.5 11.2 15.6 19.5  NaN  7.8  NaN 14.4  9.4
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4241 0.2982 0.3263 0.1563 0.0000 0.7687 0.0000 0.1731 0.2387
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1079 0.0450 0.0607 0.0369 0.0000 0.0380 0.0000 0.0368 0.0272
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.4 15.1 18.6 23.6  NaN  4.9  NaN 21.3 11.4
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0077 0.0365 0.0267 0.0260 0.0000 0.7872 0.0000 0.0211 0.0948
## [1] Reference class proportions:
##      FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4944 , 0.0118 , 2.4
## [1] 95% confidence limits for tau:0.4708...0.5179
## [1] "mean quality =  0.226780476701648"
## [1] "The quality of the modeled TP is  0.226780476701648"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
```

# Terrain parameter statistics for modeled topographic positions based on quality

```
classes <- levels(ST_mesored$preds_mGL1_Q)
preds <- "preds_mGL1_Q"
for (p in unique(c(terrain_meso_gl1,terrain_meso_gl1_wotpi,terrain_meso_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_mesored[ST_mesored[[preds]]==cl,])))
    print(summary(ST_mesored[ST_mesored[[preds]]==cl,p]))
  }
}
```

```
## [1] "FL  and  TPI_i0m_o70m_10m  ; n =  11"
##      Min.  1st Qu.   Median    Mean  3rd Qu.     Max.
## -20.6400  -2.0170   0.6593  -1.7120   2.0130   4.6740
## [1] "LO  and  TPI_i0m_o70m_10m  ; n =  52"
##      Min.  1st Qu.   Median    Mean  3rd Qu.     Max.
## -13.5300  -3.9910   0.2149  -0.3192   3.9740   8.1720
## [1] "DA  and  TPI_i0m_o70m_10m  ; n =  38"
##      Min.  1st Qu.   Median    Mean  3rd Qu.     Max.
## -19.0400  -2.9710  -0.4925  -0.1858   2.4920  19.7600
## [1] "FS  and  TPI_i0m_o70m_10m  ; n =  37"
##      Min.  1st Qu.   Median    Mean  3rd Qu.     Max.
## -14.1100  -1.8320   1.5810   0.6792   3.3540  12.9200
## [1] "SF  and  TPI_i0m_o70m_10m  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  TPI_i0m_o70m_10m  ; n =  1121"
##      Min.  1st Qu.   Median    Mean  3rd Qu.     Max.
## -22.9100  -2.3560   0.2242   0.3083   3.1260  21.4700
## [1] "SS  and  TPI_i0m_o70m_10m  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  TPI_i0m_o70m_10m  ; n =  30"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -7.4750 -0.8879  1.4710  2.3020  3.7890 18.9600
## [1] "RI  and  TPI_i0m_o70m_10m  ; n =  135"
##      Min.  1st Qu.   Median    Mean  3rd Qu.     Max.
## -13.0100  -2.1630   0.2437   0.5779   3.1420  16.5300
## [1] "FL  and  slope_DTM_50m_avg_ws3  ; n =  11"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   15.31   25.64   34.09   31.97   38.01   49.72
## [1] "LO  and  slope_DTM_50m_avg_ws3  ; n =  52"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   10.49   25.66   31.55   30.33   35.65   45.32
## [1] "DA  and  slope_DTM_50m_avg_ws3  ; n =  38"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.9188 18.6400 26.0800 25.7500 32.9500 47.1300
```

```
## [1] "FS  and  slope_DTM_50m_avg_ws3  ; n =  37"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   5.794  23.480  28.270  28.470  36.230  48.010
## [1] "SF  and  slope_DTM_50m_avg_ws3  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  slope_DTM_50m_avg_ws3  ; n =  1121"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1191 24.9700 30.7100 29.5300 35.2400 52.6800
## [1] "SS  and  slope_DTM_50m_avg_ws3  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  slope_DTM_50m_avg_ws3  ; n =  30"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   6.623  25.710  31.770  31.420  36.220  55.300
## [1] "RI  and  slope_DTM_50m_avg_ws3  ; n =  135"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.967  20.870  28.770  28.080  34.310  57.750
## [1] "FL  and  crosc_ws5  ; n =  11"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0425400 -0.0044510 -0.0006971 -0.0047610  0.0044520  0.0133700
## [1] "LO  and  crosc_ws5  ; n =  52"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0389100 -0.0043510  0.0001181 -0.0002685  0.0046560  0.0269700
## [1] "DA  and  crosc_ws5  ; n =  38"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0342300 -0.0072860  0.0010900 -0.0001211  0.0055130  0.0472700
## [1] "FS  and  crosc_ws5  ; n =  37"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0289700 -0.0026700  0.0006357  0.0009110  0.0062310  0.0208200
## [1] "SF  and  crosc_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  crosc_ws5  ; n =  1121"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0607900 -0.0031570  0.0006489  0.0010050  0.0055610  0.0465400
## [1] "SS  and  crosc_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  crosc_ws5  ; n =  30"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0248600 -0.0046080 -0.0008771  0.0003050  0.0031220  0.0343900
## [1] "RI  and  crosc_ws5  ; n =  135"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0274900 -0.0033030  0.0003435  0.0010220  0.0043010  0.0316500
## [1] "FL  and  minic_ws15  ; n =  11"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -1.895e-02 -4.500e-03 -2.401e-03 -4.271e-03 -1.233e-03 -6.784e-05
## [1] "LO  and  minic_ws15  ; n =  52"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
```

```
## -0.0109100 -0.0034590 -0.0012960 -0.0023280 -0.0003217  0.0037820
## [1] "DA  and  minic_ws15  ; n =  38"
##      Min.   1st Qu.   Median     Mean  3rd Qu.     Max.
## -0.013150 -0.004012 -0.002277 -0.003034 -0.000761  0.002014
## [1] "FS  and  minic_ws15  ; n =  37"
##       Min.   1st Qu.   Median      Mean  3rd Qu.      Max.
## -0.0123500 -0.0039670 -0.0018500 -0.0023350 -0.0004607  0.0024370
## [1] "SF  and  minic_ws15  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  minic_ws15  ; n =  1121"
##       Min.   1st Qu.    Median     Mean  3rd Qu.     Max.
## -0.022320 -0.003167 -0.001520 -0.002156 -0.000237  0.007515
## [1] "SS  and  minic_ws15  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  minic_ws15  ; n =  30"
##       Min.   1st Qu.     Median      Mean   3rd Qu.      Max.
## -0.0093710 -0.0028140 -0.0009124 -0.0013380  0.0006480  0.0029860
## [1] "RI  and  minic_ws15  ; n =  135"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0127200 -0.0030230 -0.0013640 -0.0018450 -0.0002379  0.0047050
## [1] "FL  and  maxic_ws5  ; n =  11"
##      Min.   1st Qu.    Median     Mean  3rd Qu.     Max.
## 0.0007516 0.0022030 0.0085480 0.0078020 0.0129200 0.0157900
## [1] "LO  and  maxic_ws5  ; n =  52"
##      Min.   1st Qu.   Median     Mean  3rd Qu.     Max.
## -0.007299  0.001180  0.005767  0.007040  0.011340  0.028890
## [1] "DA  and  maxic_ws5  ; n =  38"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0095670  0.0004725  0.0034300  0.0069660  0.0091590  0.0640400
## [1] "FS  and  maxic_ws5  ; n =  37"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0165500  0.0007997  0.0036190  0.0073880  0.0111500  0.0367100
## [1] "SF  and  maxic_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  maxic_ws5  ; n =  1121"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0186200  0.0009368  0.0042620  0.0063810  0.0096820  0.0597100
## [1] "SS  and  maxic_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  maxic_ws5  ; n =  30"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0051110 -0.0002392  0.0021950  0.0081580  0.0090150  0.0448000
## [1] "RI  and  maxic_ws5  ; n =  135"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0119600  0.0001745  0.0033720  0.0052470  0.0086940  0.0343000
## [1] "FL  and  TPI_i0m_o80m_10m  ; n =  11"
```

```
##       Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -24.5500  -3.0380   0.9881  -2.2940   1.8470   4.9540
## [1] "LO  and  TPI_i0m_o80m_10m  ; n =  52"
##       Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -15.0800  -4.8660   0.8022  -0.3026   4.9390   9.5230
## [1] "DA  and  TPI_i0m_o80m_10m  ; n =  38"
##       Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -21.9700  -3.4720  -0.8316  -0.3090   2.5220  22.7700
## [1] "FS  and  TPI_i0m_o80m_10m  ; n =  37"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##   -14.94   -2.10    2.04    0.82    3.89    16.01
## [1] "SF  and  TPI_i0m_o80m_10m  ; n =  0"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##
## [1] "BS  and  TPI_i0m_o80m_10m  ; n =  1121"
##       Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -26.2500  -2.7680   0.2235   0.3431   3.7120  24.8800
## [1] "SS  and  TPI_i0m_o80m_10m  ; n =  0"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##
## [1] "SH  and  TPI_i0m_o80m_10m  ; n =  30"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##   -8.641  -1.222   1.602   2.819   4.303   23.100
## [1] "RI  and  TPI_i0m_o80m_10m  ; n =  135"
##       Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -15.7500  -2.5280   0.3939   0.6520   3.8550  19.3200
## [1] "FL  and  sindex_vr1500_hr1500_t175  ; n =  11"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##  0.0000  0.0000  0.0000  0.4545  1.0000  1.0000
## [1] "LO  and  sindex_vr1500_hr1500_t175  ; n =  52"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##  0.0000  0.0000  0.6261  0.5080  1.0000  1.0000
## [1] "DA  and  sindex_vr1500_hr1500_t175  ; n =  38"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##  0.0000  0.0000  0.0000  0.2895  1.0000  1.0000
## [1] "FS  and  sindex_vr1500_hr1500_t175  ; n =  37"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##  0.0000  0.0000  0.0000  0.4322  1.0000  1.0000
## [1] "SF  and  sindex_vr1500_hr1500_t175  ; n =  0"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##
## [1] "BS  and  sindex_vr1500_hr1500_t175  ; n =  1121"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##  0.0000  0.0000  0.0000  0.3865  1.0000  1.0000
## [1] "SS  and  sindex_vr1500_hr1500_t175  ; n =  0"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##
## [1] "SH  and  sindex_vr1500_hr1500_t175  ; n =  30"
##     Min. 1st Qu.  Median    Mean 3rd Qu.     Max.
##  0.0000  0.0000  0.0000  0.2333  0.0000  1.0000
```

```
## [1] "RI  and  sindex_vr1500_hr1500_t175  ; n =  135"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.2798  1.0000  1.0000
## [1] "FL  and  longc_ws11  ; n =  11"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0035480 -0.0005174  0.0006502  0.0006710  0.0019860  0.0041440
## [1] "LO  and  longc_ws11  ; n =  52"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0134700 -0.0025010 -0.0005358 -0.0007141  0.0023770  0.0071340
## [1] "DA  and  longc_ws11  ; n =  38"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0109200 -0.0028880 -0.0010830 -0.0004203  0.0020180  0.0166900
## [1] "FS  and  longc_ws11  ; n =  37"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0121700 -0.0026950 -0.0003926 -0.0006177  0.0022910  0.0085140
## [1] "SF  and  longc_ws11  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  longc_ws11  ; n =  1121"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0206400 -0.0019850 -0.0002526 -0.0002765  0.0015380  0.0204100
## [1] "SS  and  longc_ws11  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  longc_ws11  ; n =  30"
##       Min.    1st Qu.     Median      Mean    3rd Qu.       Max.
## -0.007901 -0.002200  0.000861  0.001247  0.002398  0.020040
## [1] "RI  and  longc_ws11  ; n =  135"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0106500 -0.0017970 -0.0004440 -0.0002435  0.0016500  0.0098010
```

# Terrain parameter statistics for modeled topographic positions based on Overall accuracy

```
classes <- levels(ST_mesored$preds_mGL1_A)
preds <- "preds_mGL1_A"
for (p in unique(c(terrain_meso_gl1,terrain_meso_gl1_wotpi,terrain_meso_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_mesored[ST_mesored[[preds]]==cl,])))
    print(summary(ST_mesored[ST_mesored[[preds]]==cl,p]))  }
}
```

```
## [1] "FL  and  TPI_i0m_o70m_10m  ; n =  20"
##     Min.  1st Qu.   Median     Mean 3rd Qu.     Max.
## -20.6400  -3.3610   0.4697  -1.0410   2.0240   6.6650
## [1] "LO  and  TPI_i0m_o70m_10m  ; n =  58"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -13.53000  -2.93900   0.41830  -0.04539   3.46000   8.17200
```

```
## [1] "DA  and  TPI_i0m_o70m_10m ; n =  38"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -14.920  -3.421  -0.279  -0.305   2.020  14.060
## [1] "FS  and  TPI_i0m_o70m_10m ; n =  12"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -7.3780 -0.8026  1.8240  1.3070  3.0380  8.3330
## [1] "SF  and  TPI_i0m_o70m_10m ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  TPI_i0m_o70m_10m ; n =  1117"
##     Min.  1st Qu.   Median    Mean 3rd Qu.     Max.
## -22.9100  -2.4120   0.2292   0.3392   3.1520  21.4700
## [1] "SS  and  TPI_i0m_o70m_10m ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  TPI_i0m_o70m_10m ; n =  6"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -6.664  -1.860   2.194   1.482   2.524  11.750
## [1] "RI  and  TPI_i0m_o70m_10m ; n =  173"
##     Min.  1st Qu.   Median    Mean 3rd Qu.     Max.
## -19.0400  -1.9280   0.2284   0.6177   3.2260  18.9600
## [1] "FL  and  slope_DTM_50m_avg_ws3 ; n =  20"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   12.48   19.96   29.26   28.47   37.42   49.72
## [1] "LO  and  slope_DTM_50m_avg_ws3 ; n =  58"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   10.49   27.00   31.27   30.95   35.55   45.32
## [1] "DA  and  slope_DTM_50m_avg_ws3 ; n =  38"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.189  17.850  23.010  24.430  32.880  41.940
## [1] "FS  and  slope_DTM_50m_avg_ws3 ; n =  12"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   17.19   23.30   25.95   27.91   35.85   37.78
## [1] "SF  and  slope_DTM_50m_avg_ws3 ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  slope_DTM_50m_avg_ws3 ; n =  1117"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1449 25.1500 30.8400 29.6300 35.2500 57.7500
## [1] "SS  and  slope_DTM_50m_avg_ws3 ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  slope_DTM_50m_avg_ws3 ; n =  6"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   22.06   25.68   29.92   30.38   34.24   40.41
## [1] "RI  and  slope_DTM_50m_avg_ws3 ; n =  173"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1191 22.6000 28.7700 28.2900 34.7700 55.3000
## [1] "FL  and  crosc_ws5 ; n =  20"
##     Min.   1st Qu.   Median    Mean   3rd Qu.    Max.
```

```
## -0.042540 -0.004102 -0.000960 -0.003206  0.003986  0.013370
## [1] "LO  and  crosc_ws5  ; n =  58"
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.038910 -0.002634  0.002079  0.001094  0.005728  0.026970
## [1] "DA  and  crosc_ws5  ; n =  38"
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.034230 -0.008272  0.000988 -0.001873  0.004235  0.023280
## [1] "FS  and  crosc_ws5  ; n =  12"
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.008447 -0.002382 -0.001016  0.001100  0.001701  0.020820
## [1] "SF  and  crosc_ws5  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  crosc_ws5  ; n =  1117"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0607900 -0.0030240  0.0006422  0.0011060  0.0056810  0.0472700
## [1] "SS  and  crosc_ws5  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  crosc_ws5  ; n =  6"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0088170 -0.0060140 -0.0032480 -0.0022750  0.0006708  0.0066250
## [1] "RI  and  crosc_ws5  ; n =  173"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0298100 -0.0039870  0.0001911  0.0004249  0.0042670  0.0336800
## [1] "FL  and  minic_ws15  ; n =  20"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0189500 -0.0035360 -0.0020370 -0.0027940 -0.0005639  0.0037820
## [1] "LO  and  minic_ws15  ; n =  58"
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.010910 -0.003906 -0.001526 -0.002525 -0.000569  0.002953
## [1] "DA  and  minic_ws15  ; n =  38"
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.011060 -0.003212 -0.002090 -0.002481 -0.000665  0.002641
## [1] "FS  and  minic_ws15  ; n =  12"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0060110 -0.0024520 -0.0012060 -0.0016910 -0.0005365  0.0016430
## [1] "SF  and  minic_ws15  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  minic_ws15  ; n =  1117"
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.022320 -0.003200 -0.001515 -0.002159 -0.000237  0.007515
## [1] "SS  and  minic_ws15  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  minic_ws15  ; n =  6"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0049170 -0.0013720 -0.0006511 -0.0008905  0.0004537  0.0016670
## [1] "RI  and  minic_ws15  ; n =  173"
```

```
##      Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0135400 -0.0030610 -0.0013960 -0.0019800 -0.0001869  0.0042370
## [1] "FL  and  maxic_ws5  ; n =  20"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.007299  0.001800  0.006406  0.006348  0.011050  0.015790
## [1] "LO  and  maxic_ws5  ; n =  58"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.009567  0.001818  0.005617  0.007364  0.011420  0.036710
## [1] "DA  and  maxic_ws5  ; n =  38"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.005541  0.001747  0.004371  0.006665  0.009159  0.044500
## [1] "FS  and  maxic_ws5  ; n =  12"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 9.305e-05 2.234e-03 7.284e-03 9.947e-03 1.240e-02 2.960e-02
## [1] "SF  and  maxic_ws5  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  maxic_ws5  ; n =  1117"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0186200  0.0008072  0.0041740  0.0063510  0.0098140  0.0640400
## [1] "SS  and  maxic_ws5  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  maxic_ws5  ; n =  6"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.005060 -0.003524  0.004461  0.004919  0.010610  0.019170
## [1] "RI  and  maxic_ws5  ; n =  173"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0119600  0.0000437  0.0033720  0.0060460  0.0083480  0.0522000
## [1] "FL  and  TPI_i0m_o80m_10m  ; n =  20"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
## -24.5500  -3.8110   0.1582  -1.3040   2.1350   8.9630
## [1] "LO  and  TPI_i0m_o80m_10m  ; n =  58"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -15.08000  -3.29900   0.80220  -0.09257   3.97100   9.52300
## [1] "DA  and  TPI_i0m_o80m_10m  ; n =  38"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
## -16.2300  -3.6760  -0.4349  -0.3763   2.3350  16.2500
## [1] "FS  and  TPI_i0m_o80m_10m  ; n =  12"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##  -8.577  -1.191   2.480   1.698   4.045   9.894
## [1] "SF  and  TPI_i0m_o80m_10m  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  TPI_i0m_o80m_10m  ; n =  1117"
##     Min.  1st Qu.  Median    Mean 3rd Qu.    Max.
## -26.2500  -2.8320   0.2386   0.3864   3.8050  24.8800
## [1] "SS  and  TPI_i0m_o80m_10m  ; n =  0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
```

```
## [1] "SH  and   TPI_i0m_o80m_10m ; n =  6"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -7.570  -1.476   2.775   2.158   3.912  13.570
## [1] "RI  and   TPI_i0m_o80m_10m ; n =  173"
##     Min.  1st Qu.   Median    Mean 3rd Qu.     Max.
## -21.9700  -2.0090   0.3770   0.6682   3.8100  23.1000
## [1] "FL  and   sindex_vr1500_hr1500_t175  ; n =   20"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     0.0     0.0     0.0     0.4     1.0     1.0
## [1] "LO  and   sindex_vr1500_hr1500_t175  ; n =   58"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.9658  0.5242  1.0000  1.0000
## [1] "DA  and   sindex_vr1500_hr1500_t175  ; n =   38"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.3806  1.0000  1.0000
## [1] "FS  and   sindex_vr1500_hr1500_t175  ; n =   12"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.3333  1.0000  1.0000
## [1] "SF  and   sindex_vr1500_hr1500_t175  ; n =   0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and   sindex_vr1500_hr1500_t175  ; n =   1117"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.3853  1.0000  1.0000
## [1] "SS  and   sindex_vr1500_hr1500_t175  ; n =   0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and   sindex_vr1500_hr1500_t175  ; n =   6"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.1667  0.0000  1.0000
## [1] "RI  and   sindex_vr1500_hr1500_t175  ; n =   173"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.2786  1.0000  1.0000
## [1] "FL  and   longc_ws11  ; n =   20"
##       Min.    1st Qu.    Median     Mean    3rd Qu.      Max.
## -0.0070110 -0.0012290  0.0005252  0.0003782  0.0021600  0.0071340
## [1] "LO  and   longc_ws11  ; n =   58"
##       Min.    1st Qu.    Median     Mean    3rd Qu.      Max.
## -0.0134700 -0.0032200 -0.0008473 -0.0011130  0.0021240  0.0059350
## [1] "DA  and   longc_ws11  ; n =   38"
##       Min.    1st Qu.    Median     Mean    3rd Qu.      Max.
## -0.0109200 -0.0027950 -0.0010200 -0.0005375  0.0020180  0.0093620
## [1] "FS  and   longc_ws11  ; n =   12"
##       Min.    1st Qu.    Median     Mean    3rd Qu.      Max.
## -0.0067360 -0.0012380  0.0001953  0.0012450  0.0038240  0.0096960
## [1] "SF  and   longc_ws11  ; n =   0"
##    Min. 1st Qu. Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and   longc_ws11  ; n =   1117"
##       Min.    1st Qu.    Median     Mean    3rd Qu.      Max.
```

```
## -0.0206400 -0.0019990 -0.0002218 -0.0002842  0.0015700  0.0204100
## [1] "SS  and  longc_ws11  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  longc_ws11  ; n =  6"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0079010 -0.0022360  0.0008395  0.0001614  0.0017510  0.0083960
## [1] "RI  and  longc_ws11  ; n =  173"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -1.065e-02 -1.764e-03 -4.907e-04  2.904e-05  1.821e-03  2.004e-02
```

```
print(paste("############and without tpis######################"))
```

```
## [1] "############and without tpis####################"
```

```
classes <- levels(ST_mesored$preds_mGL1_Awotpi)
preds <- "preds_mGL1_Q"
for (p in unique(c(terrain_meso_gl1,terrain_meso_gl1_wotpi,terrain_meso_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_mesored[ST_mesored[[preds]]==cl,])))
    print(summary(ST_mesored[ST_mesored[[preds]]==cl,p]))  }
}
```

```
## [1] "FL  and  TPI_i0m_o70m_10m  ; n =  11"
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -20.6400  -2.0170   0.6593  -1.7120   2.0130   4.6740
## [1] "LO  and  TPI_i0m_o70m_10m  ; n =  52"
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -13.5300  -3.9910   0.2149  -0.3192   3.9740   8.1720
## [1] "DA  and  TPI_i0m_o70m_10m  ; n =  38"
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -19.0400  -2.9710  -0.4925  -0.1858   2.4920  19.7600
## [1] "FS  and  TPI_i0m_o70m_10m  ; n =  37"
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -14.1100  -1.8320   1.5810   0.6792   3.3540  12.9200
## [1] "SF  and  TPI_i0m_o70m_10m  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  TPI_i0m_o70m_10m  ; n =  1121"
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -22.9100  -2.3560   0.2242   0.3083   3.1260  21.4700
## [1] "SS  and  TPI_i0m_o70m_10m  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  TPI_i0m_o70m_10m  ; n =  30"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -7.4750 -0.8879  1.4710   2.3020  3.7890 18.9600
## [1] "RI  and  TPI_i0m_o70m_10m  ; n =  135"
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -13.0100  -2.1630   0.2437  0.5779  3.1420  16.5300
## [1] "FL  and  slope_DTM_50m_avg_ws3  ; n =  11"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   15.31   25.64   34.09   31.97   38.01   49.72
## [1] "LO  and  slope_DTM_50m_avg_ws3  ; n =  52"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   10.49   25.66   31.55   30.33   35.65   45.32
## [1] "DA  and  slope_DTM_50m_avg_ws3  ; n =  38"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.9188 18.6400 26.0800 25.7500 32.9500 47.1300
## [1] "FS  and  slope_DTM_50m_avg_ws3  ; n =  37"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   5.794  23.480  28.270  28.470  36.230  48.010
## [1] "SF  and  slope_DTM_50m_avg_ws3  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  slope_DTM_50m_avg_ws3  ; n =  1121"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1191 24.9700 30.7100 29.5300 35.2400 52.6800
## [1] "SS  and  slope_DTM_50m_avg_ws3  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  slope_DTM_50m_avg_ws3  ; n =  30"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   6.623  25.710  31.770  31.420  36.220  55.300
## [1] "RI  and  slope_DTM_50m_avg_ws3  ; n =  135"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.967  20.870  28.770  28.080  34.310  57.750
## [1] "FL  and  crosc_ws5  ; n =  11"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0425400 -0.0044510 -0.0006971 -0.0047610  0.0044520  0.0133700
## [1] "LO  and  crosc_ws5  ; n =  52"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0389100 -0.0043510  0.0001181 -0.0002685  0.0046560  0.0269700
## [1] "DA  and  crosc_ws5  ; n =  38"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0342300 -0.0072860  0.0010900 -0.0001211  0.0055130  0.0472700
## [1] "FS  and  crosc_ws5  ; n =  37"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0289700 -0.0026700  0.0006357  0.0009110  0.0062310  0.0208200
## [1] "SF  and  crosc_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  crosc_ws5  ; n =  1121"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0607900 -0.0031570  0.0006489  0.0010050  0.0055610  0.0465400
## [1] "SS  and  crosc_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
```

```
## [1] "SH  and  crosc_ws5  ; n =  30"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0248600 -0.0046080 -0.0008771  0.0003050  0.0031220  0.0343900
## [1] "RI  and  crosc_ws5  ; n =  135"
##         Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
## -0.0274900 -0.0033030  0.0003435  0.0010220  0.0043010  0.0316500
## [1] "FL  and  minic_ws15  ; n =  11"
##        Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
## -1.895e-02 -4.500e-03 -2.401e-03 -4.271e-03 -1.233e-03 -6.784e-05
## [1] "LO  and  minic_ws15  ; n =  52"
##         Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
## -0.0109100 -0.0034590 -0.0012960 -0.0023280 -0.0003217  0.0037820
## [1] "DA  and  minic_ws15  ; n =  38"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.013150 -0.004012 -0.002277 -0.003034 -0.000761  0.002014
## [1] "FS  and  minic_ws15  ; n =  37"
##         Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
## -0.0123500 -0.0039670 -0.0018500 -0.0023350 -0.0004607  0.0024370
## [1] "SF  and  minic_ws15  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  minic_ws15  ; n =  1121"
##        Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.022320 -0.003167 -0.001520 -0.002156 -0.000237  0.007515
## [1] "SS  and  minic_ws15  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  minic_ws15  ; n =  30"
##         Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
## -0.0093710 -0.0028140 -0.0009124 -0.0013380  0.0006480  0.0029860
## [1] "RI  and  minic_ws15  ; n =  135"
##         Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
## -0.0127200 -0.0030230 -0.0013640 -0.0018450 -0.0002379  0.0047050
## [1] "FL  and  maxic_ws5  ; n =  11"
##        Min.    1st Qu.     Median       Mean    3rd Qu.      Max.
## 0.0007516 0.0022030 0.0085480 0.0078020 0.0129200 0.0157900
## [1] "LO  and  maxic_ws5  ; n =  52"
##       Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.007299  0.001180  0.005767  0.007040  0.011340  0.028890
## [1] "DA  and  maxic_ws5  ; n =  38"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0095670  0.0004725  0.0034300  0.0069660  0.0091590  0.0640400
## [1] "FS  and  maxic_ws5  ; n =  37"
##        Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
## -0.0165500  0.0007997  0.0036190  0.0073880  0.0111500  0.0367100
## [1] "SF  and  maxic_ws5  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  maxic_ws5  ; n =  1121"
##        Min.    1st Qu.     Median       Mean    3rd Qu.        Max.
```

```
## -0.0186200  0.0009368  0.0042620  0.0063810  0.0096820  0.0597100
## [1] "SS  and  maxic_ws5  ; n =   0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  maxic_ws5  ; n =  30"
##       Min.    1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0051110 -0.0002392  0.0021950  0.0081580  0.0090150  0.0448000
## [1] "RI  and  maxic_ws5  ; n =  135"
##       Min.    1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0119600  0.0001745  0.0033720  0.0052470  0.0086940  0.0343000
## [1] "FL  and  TPI_i0m_o80m_10m  ; n =  11"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -24.5500  -3.0380   0.9881  -2.2940   1.8470   4.9540
## [1] "LO  and  TPI_i0m_o80m_10m  ; n =  52"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -15.0800  -4.8660   0.8022  -0.3026   4.9390   9.5230
## [1] "DA  and  TPI_i0m_o80m_10m  ; n =  38"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -21.9700  -3.4720  -0.8316  -0.3090   2.5220  22.7700
## [1] "FS  and  TPI_i0m_o80m_10m  ; n =  37"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -14.94   -2.10    2.04    0.82    3.89   16.01
## [1] "SF  and  TPI_i0m_o80m_10m  ; n =   0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  TPI_i0m_o80m_10m  ; n =  1121"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -26.2500  -2.7680   0.2235   0.3431   3.7120  24.8800
## [1] "SS  and  TPI_i0m_o80m_10m  ; n =   0"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  TPI_i0m_o80m_10m  ; n =  30"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -8.641  -1.222   1.602   2.819   4.303  23.100
## [1] "RI  and  TPI_i0m_o80m_10m  ; n =  135"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -15.7500  -2.5280   0.3939   0.6520   3.8550  19.3200
## [1] "FL  and  sindex_vr1500_hr1500_t175  ; n =  11"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.4545  1.0000  1.0000
## [1] "LO  and  sindex_vr1500_hr1500_t175  ; n =  52"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.6261  0.5080  1.0000  1.0000
## [1] "DA  and  sindex_vr1500_hr1500_t175  ; n =  38"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.2895  1.0000  1.0000
## [1] "FS  and  sindex_vr1500_hr1500_t175  ; n =  37"
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.4322  1.0000  1.0000
## [1] "SF  and  sindex_vr1500_hr1500_t175  ; n =   0"
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  sindex_vr1500_hr1500_t175  ; n =  1121"
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.3865  1.0000  1.0000
## [1] "SS  and  sindex_vr1500_hr1500_t175  ; n =  0"
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  sindex_vr1500_hr1500_t175  ; n =  30"
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.2333  0.0000  1.0000
## [1] "RI  and  sindex_vr1500_hr1500_t175  ; n =  135"
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.2798  1.0000  1.0000
## [1] "FL  and  longc_ws11  ; n =  11"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0035480 -0.0005174  0.0006502  0.0006710  0.0019860  0.0041440
## [1] "LO  and  longc_ws11  ; n =  52"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0134700 -0.0025010 -0.0005358 -0.0007141  0.0023770  0.0071340
## [1] "DA  and  longc_ws11  ; n =  38"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0109200 -0.0028880 -0.0010830 -0.0004203  0.0020180  0.0166900
## [1] "FS  and  longc_ws11  ; n =  37"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0121700 -0.0026950 -0.0003926 -0.0006177  0.0022910  0.0085140
## [1] "SF  and  longc_ws11  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "BS  and  longc_ws11  ; n =  1121"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0206400 -0.0019850 -0.0002526 -0.0002765  0.0015380  0.0204100
## [1] "SS  and  longc_ws11  ; n =  0"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##
## [1] "SH  and  longc_ws11  ; n =  30"
##      Min.    1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.007901 -0.002200  0.000861  0.001247  0.002398  0.020040
## [1] "RI  and  longc_ws11  ; n =  135"
##        Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0106500 -0.0017970 -0.0004440 -0.0002435  0.0016500  0.0098010
```

# Terrain parameter statistics for surveyed topographic positions

```
classes <- levels(ST_mesored$Def_red_mes)
preds <- "Def_red_mes"
for (p in unique(c(terrain_meso_gl1,terrain_meso_gl1_wotpi,terrain_meso_gl1_quality))){
  for (cl in classes){
    print(paste(cl, " and ",p," ; n = ",nrow(ST_mesored[ST_mesored[[preds]]==cl,])))
    print(summary(ST_mesored[ST_mesored[[preds]]==cl,p]))  }
}
```

```
## [1] "Eben  and  TPI_i0m_o70m_10m  ; n =  21"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -17.8500  -2.1170  -0.2448  -1.6170   0.2230   2.1520
## [1] "HVF  and  TPI_i0m_o70m_10m  ; n =  72"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -19.7600  -1.8180   0.2470  -0.3966   1.2710  10.1800
## [1] "HVS  and  TPI_i0m_o70m_10m  ; n =  62"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -11.9500  -2.8330   0.8199   0.1907   3.3160  11.8700
## [1] "Mittelhang  and  TPI_i0m_o70m_10m  ; n =  630"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -11.0000  -2.0430   0.1143   0.2263   2.2500  19.7600
## [1] "Oberhang  and  TPI_i0m_o70m_10m  ; n =  105"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -10.5100   0.7073   3.9550   4.4630   6.7330  21.4700
## [1] "Ruecken  and  TPI_i0m_o70m_10m  ; n =  267"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -17.6500   0.2011   3.5300   3.6200   7.1990  20.0900
## [1] "Schwemmschutt  and  TPI_i0m_o70m_10m  ; n =  61"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -13.0100  -1.9550  -0.7015  -1.4340   0.3631   4.1370
## [1] "Tief  and  TPI_i0m_o70m_10m  ; n =  105"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -22.9100 -10.1600  -3.4340  -5.5710  -0.8174   9.5430
## [1] "Unterhang  and  TPI_i0m_o70m_10m  ; n =  101"
##     Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -20.6400  -6.9620  -3.0850  -3.7560  -0.2356   9.7940
## [1] "Eben  and  slope_DTM_50m_avg_ws3  ; n =  21"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1449  5.2260   9.2590 13.6000 16.0200 38.1000
## [1] "HVF  and  slope_DTM_50m_avg_ws3  ; n =  72"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   5.363  18.010  26.110  25.080  30.500  45.900
## [1] "HVS  and  slope_DTM_50m_avg_ws3  ; n =  62"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   16.94   29.50   36.11   34.70   39.51   57.75
## [1] "Mittelhang  and  slope_DTM_50m_avg_ws3  ; n =  630"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1191 27.0900 32.0700 31.2200 35.6000 48.0900
## [1] "Oberhang  and  slope_DTM_50m_avg_ws3  ; n =  105"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##    1.096  20.870  28.540  28.390  34.890  55.300
## [1] "Ruecken  and  slope_DTM_50m_avg_ws3  ; n =  267"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    1.189  25.350  30.840  30.250  36.310  49.950
## [1] "Schwemmschutt  and  slope_DTM_50m_avg_ws3  ; n =  61"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    1.133  13.300  26.350  24.430  34.160  48.150
## [1] "Tief  and  slope_DTM_50m_avg_ws3  ; n =  105"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.9188 20.6000 26.0700 25.4700 31.6900 45.1400
## [1] "Unterhang  and  slope_DTM_50m_avg_ws3  ; n =  101"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    6.623  20.340  27.200  26.390  32.540  45.460
## [1] "Eben  and  crosc_ws5  ; n =  21"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0094740 -0.0038790 -0.0007523 -0.0014590  0.0009307  0.0040470
## [1] "HVF  and  crosc_ws5  ; n =  72"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0453100 -0.0026410  0.0002525 -0.0003808  0.0029810  0.0137600
## [1] "HVS  and  crosc_ws5  ; n =  62"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -1.894e-02 -4.444e-03 -1.930e-04  3.797e-05  4.968e-03  3.226e-02
## [1] "Mittelhang  and  crosc_ws5  ; n =  630"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0297900 -0.0029700  0.0003329  0.0005221  0.0040670  0.0472700
## [1] "Oberhang  and  crosc_ws5  ; n =  105"
##     Min.   1st Qu.    Median     Mean  3rd Qu.     Max.
## -0.025860 -0.001738  0.002611  0.004048  0.008055  0.046540
## [1] "Ruecken  and  crosc_ws5  ; n =  267"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -0.0444200  0.0002666  0.0066000  0.0067150  0.0140200  0.0392200
## [1] "Schwemmschutt  and  crosc_ws5  ; n =  61"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -1.439e-02 -2.917e-03 -3.769e-04 -6.509e-05  1.765e-03  2.314e-02
## [1] "Tief  and  crosc_ws5  ; n =  105"
##     Min.   1st Qu.    Median     Mean  3rd Qu.     Max.
## -0.060790 -0.017490 -0.004805 -0.009188  0.001118  0.030220
## [1] "Unterhang  and  crosc_ws5  ; n =  101"
##     Min.   1st Qu.    Median     Mean  3rd Qu.     Max.
## -0.042540 -0.007588 -0.001569 -0.002830  0.002811  0.024410
## [1] "Eben  and  minic_ws15  ; n =  21"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -1.986e-02 -1.718e-03 -3.140e-04 -2.117e-03 -6.229e-05  3.475e-04
## [1] "HVF  and  minic_ws15  ; n =  72"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -7.876e-03 -2.299e-03 -1.290e-03 -1.479e-03 -9.166e-05  2.862e-03
## [1] "HVS  and  minic_ws15  ; n =  62"
##       Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -9.623e-03 -3.561e-03 -1.319e-03 -1.933e-03  3.059e-05  4.750e-03
## [1] "Mittelhang  and  minic_ws15  ; n =  630"
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0127200 -0.0029130 -0.0014440 -0.0017660 -0.0004075  0.0049640
## [1] "Oberhang  and  minic_ws15 ; n =  105"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0052860 -0.0012030 -0.0004193 -0.0002085  0.0010060  0.0075150
## [1] "Ruecken  and  minic_ws15 ; n =  267"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0142200 -0.0022910 -0.0008561 -0.0012120  0.0004546  0.0059250
## [1] "Schwemmschutt  and  minic_ws15 ; n =  61"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0215900 -0.0034460 -0.0016700 -0.0029680 -0.0007281  0.0006262
## [1] "Tief  and  minic_ws15 ; n =  105"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0223200 -0.0086330 -0.0046960 -0.0058070 -0.0019090  0.0009631
## [1] "Unterhang  and  minic_ws15 ; n =  101"
##     Min.  1st Qu.    Median      Mean  3rd Qu.      Max.
## -0.018950 -0.008053 -0.004100 -0.005506 -0.002648  0.001542
## [1] "Eben  and  maxic_ws5 ; n =  21"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -7.571e-03 -4.137e-04  6.640e-07  3.251e-04  2.003e-03  5.282e-03
## [1] "HVF  and  maxic_ws5 ; n =  72"
##     Min.  1st Qu.    Median      Mean  3rd Qu.      Max.
## -0.018620  0.001069  0.002979  0.003762  0.006716  0.018820
## [1] "HVS  and  maxic_ws5 ; n =  62"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0078680  0.0005163  0.0047550  0.0057790  0.0088180  0.0366600
## [1] "Mittelhang  and  maxic_ws5 ; n =  630"
##     Min.  1st Qu.    Median      Mean  3rd Qu.      Max.
## -0.009567  0.000797  0.003409  0.004894  0.007572  0.064040
## [1] "Oberhang  and  maxic_ws5 ; n =  105"
##     Min.  1st Qu.    Median      Mean  3rd Qu.      Max.
## -0.007299  0.003333  0.008972  0.011520  0.014660  0.056840
## [1] "Ruecken  and  maxic_ws5 ; n =  267"
##     Min.  1st Qu.    Median      Mean  3rd Qu.      Max.
## -0.018180  0.004478  0.010790  0.012230  0.017770  0.059710
## [1] "Schwemmschutt  and  maxic_ws5 ; n =  61"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0075870 -0.0003564  0.0012850  0.0025680  0.0040540  0.0239500
## [1] "Tief  and  maxic_ws5 ; n =  105"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -1.034e-02 -4.608e-05  2.557e-03  3.848e-03  6.176e-03  3.061e-02
## [1] "Unterhang  and  maxic_ws5 ; n =  101"
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -0.0119600 -0.0007109  0.0023500  0.0033860  0.0068600  0.0318600
## [1] "Eben  and  TPI_i0m_o80m_10m ; n =  21"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -22.9100  -2.6900  -0.3458  -1.9930   0.2235   2.5570
## [1] "HVF  and  TPI_i0m_o80m_10m ; n =  72"
##     Min.  1st Qu.    Median      Mean  3rd Qu.      Max.
## -20.00000  -2.17200  -0.00932  -0.32040   1.59500  12.08000
```

```
## [1] "HVS  and  TPI_i0m_o80m_10m ; n =  62"
##     Min.  1st Qu.   Median    Mean 3rd Qu.    Max.
## -13.3100  -3.0760   0.8723  0.3579  4.4520  13.4400
## [1] "Mittelhang  and  TPI_i0m_o80m_10m ; n =  630"
##     Min.  1st Qu.   Median    Mean 3rd Qu.    Max.
## -13.2500  -2.3460   0.1657  0.2782  2.6190  22.7700
## [1] "Oberhang  and  TPI_i0m_o80m_10m ; n =  105"
##     Min.  1st Qu.   Median    Mean 3rd Qu.    Max.
## -10.7500   0.9921   5.1320  5.4680  8.2920  24.8800
## [1] "Ruecken  and  TPI_i0m_o80m_10m ; n =  267"
##     Min.  1st Qu.   Median    Mean 3rd Qu.    Max.
## -18.7200   0.1621   3.9240  4.1230  8.1940  22.3100
## [1] "Schwemmschutt  and  TPI_i0m_o80m_10m ; n =  61"
##     Min.  1st Qu.   Median    Mean 3rd Qu.    Max.
## -17.1800  -2.4480  -1.0900  -1.9080   0.5105   4.2720
## [1] "Tief  and  TPI_i0m_o80m_10m ; n =  105"
##     Min.  1st Qu.   Median    Mean 3rd Qu.    Max.
## -26.2500 -12.0700  -4.0320  -6.4990  -0.8197  10.0800
## [1] "Unterhang  and  TPI_i0m_o80m_10m ; n =  101"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -24.770  -8.105   -4.003  -4.693  -1.014  12.170
## [1] "Eben  and  sindex_vr1500_hr1500_t175 ; n =  21"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.2381  0.0000  1.0000
## [1] "HVF  and  sindex_vr1500_hr1500_t175 ; n =  72"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.4074  1.0000  1.0000
## [1] "HVS  and  sindex_vr1500_hr1500_t175 ; n =  62"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.1978  0.0000  1.0000
## [1] "Mittelhang  and  sindex_vr1500_hr1500_t175 ; n =  630"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.4088  1.0000  1.0000
## [1] "Oberhang  and  sindex_vr1500_hr1500_t175 ; n =  105"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.3959  1.0000  1.0000
## [1] "Ruecken  and  sindex_vr1500_hr1500_t175 ; n =  267"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.4308  1.0000  1.0000
## [1] "Schwemmschutt  and  sindex_vr1500_hr1500_t175 ; n =  61"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.1551  0.0000  1.0000
## [1] "Tief  and  sindex_vr1500_hr1500_t175 ; n =  105"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.4572  1.0000  1.0000
## [1] "Unterhang  and  sindex_vr1500_hr1500_t175 ; n =  101"
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.1809  0.0000  1.0000
## [1] "Eben  and  longc_ws11 ; n =  21"
##       Min.   1st Qu.    Median    Mean   3rd Qu.    Max.
```

```
## -1.585e-02 -1.395e-03 -4.827e-05 -1.242e-03  2.377e-04  3.105e-03
## [1] "HVF  and  longc_ws11  ; n =  72"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0103400 -0.0020040 -0.0004174 -0.0006243  0.0013890  0.0069300
## [1] "HVS  and  longc_ws11  ; n =  62"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -1.551e-02 -2.814e-03  3.126e-05 -5.499e-05  3.065e-03  8.668e-03
## [1] "Mittelhang  and  longc_ws11  ; n =  630"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0136100 -0.0019220 -0.0004085 -0.0003844  0.0010950  0.0179600
## [1] "Oberhang  and  longc_ws11  ; n =  105"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0041900  0.0004342  0.0029660  0.0035640  0.0059350  0.0204100
## [1] "Ruecken  and  longc_ws11  ; n =  267"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0203000 -0.0013000  0.0005898  0.0007400  0.0028390  0.0135700
## [1] "Schwemmschutt  and  longc_ws11  ; n =  61"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0206400 -0.0025690 -0.0007964 -0.0023950 -0.0001388  0.0028440
## [1] "Tief  and  longc_ws11  ; n =  105"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0190400 -0.0028570 -0.0007710 -0.0014200  0.0007727  0.0117200
## [1] "Unterhang  and  longc_ws11  ; n =  101"
##       Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
## -0.0192600 -0.0057880 -0.0026330 -0.0033060 -0.0007994  0.0054350
```