

Shifting spaces: which disparity or dissimilarity metrics best summarise occupancy in multidimensional spaces?

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Supplementary material 4: full results

```
## Loading required package: knitr
## Loading required package: rmarkdown
## Loading required package: dispRity
## Registered S3 method overwritten by 'geiger':
##   method           from
##   unique.multiPhylo ape
## Loading required package: momo
```

Simulation data

This section contains all the results and calculations (and plots them). The whole analysis takes approximately 30 minutes to run (single core 2.2 GHz).

Metrics analysed

The metrics analysed are the Average squared pairwise distance (dtt::dtt), Average pairwise manhattan distance (dtt::dtt), Median pairwise distance, Median pairwise manhattan distance, Procrustes variances (geomorph::morpho.disparity), Median distance from centroid, Median manhattan distance from centroid, Sum of variances, Sum of ranges, Sum of quantiles, Product of variances, Product of ranges, Product of quantiles, Ellipsoid volume, nBall volume, Minimum spanning tree average length, Average minimum neighbours distance, Average minimum neighbours manhattan distance, Function diversity, Functional evenness, Functional dispersion, Average displacement, Average manhattan displacement, Median distance from centre, Median manhattan distance from centre.

Running the simulations for the 25 metrics

Running the empirical data for the 25 metrics

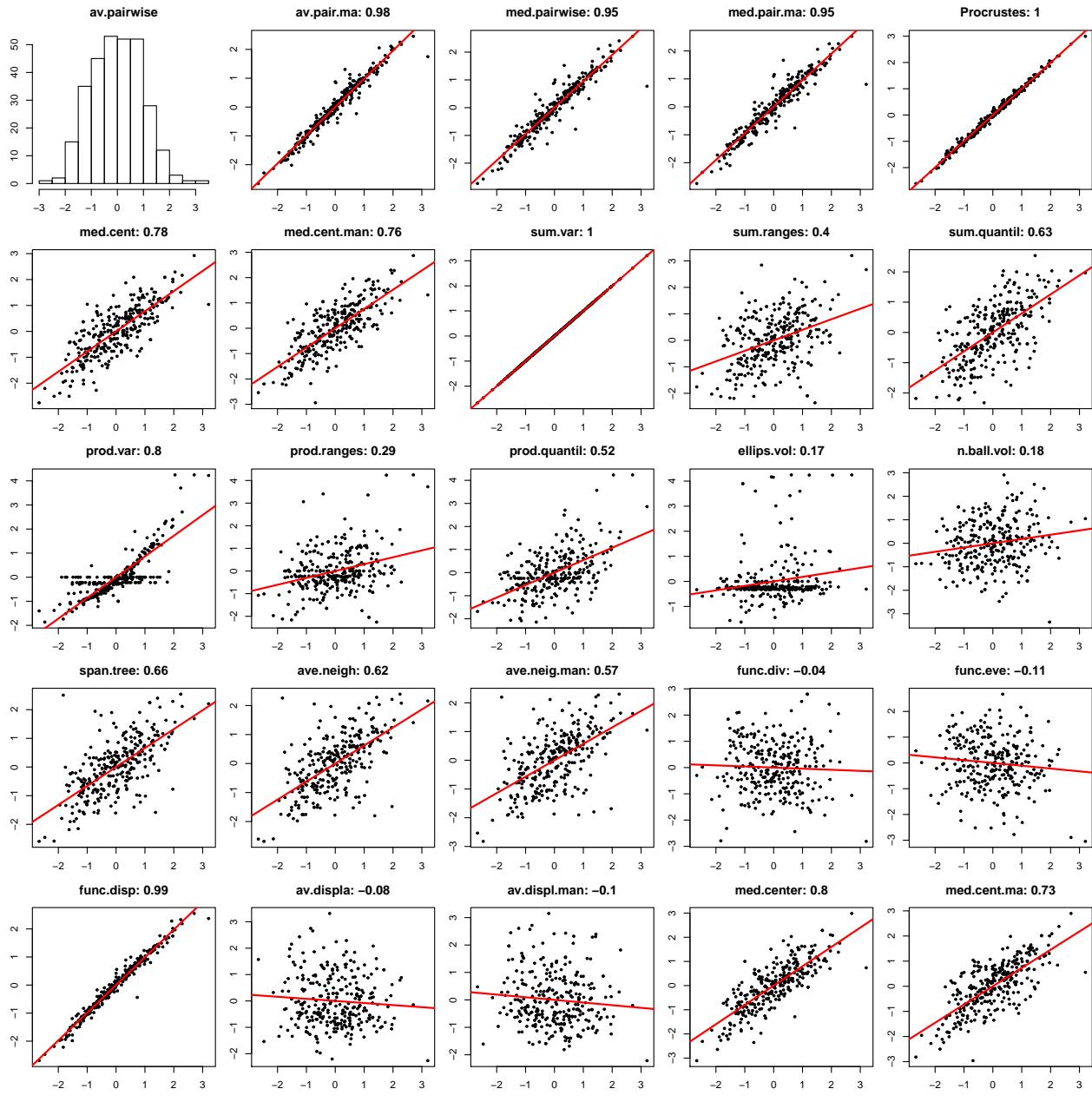
Load all the data

```
## Load all the data
all_metrics_remove_02 <- load.results("all_metrics_remove_02")
all_metrics_remove_05 <- load.results("all_metrics_remove_05")
all_metrics_remove_08 <- load.results("all_metrics_remove_08")
all_metrics_empirical_results <- load.results("all_metrics_empirical_results")
```

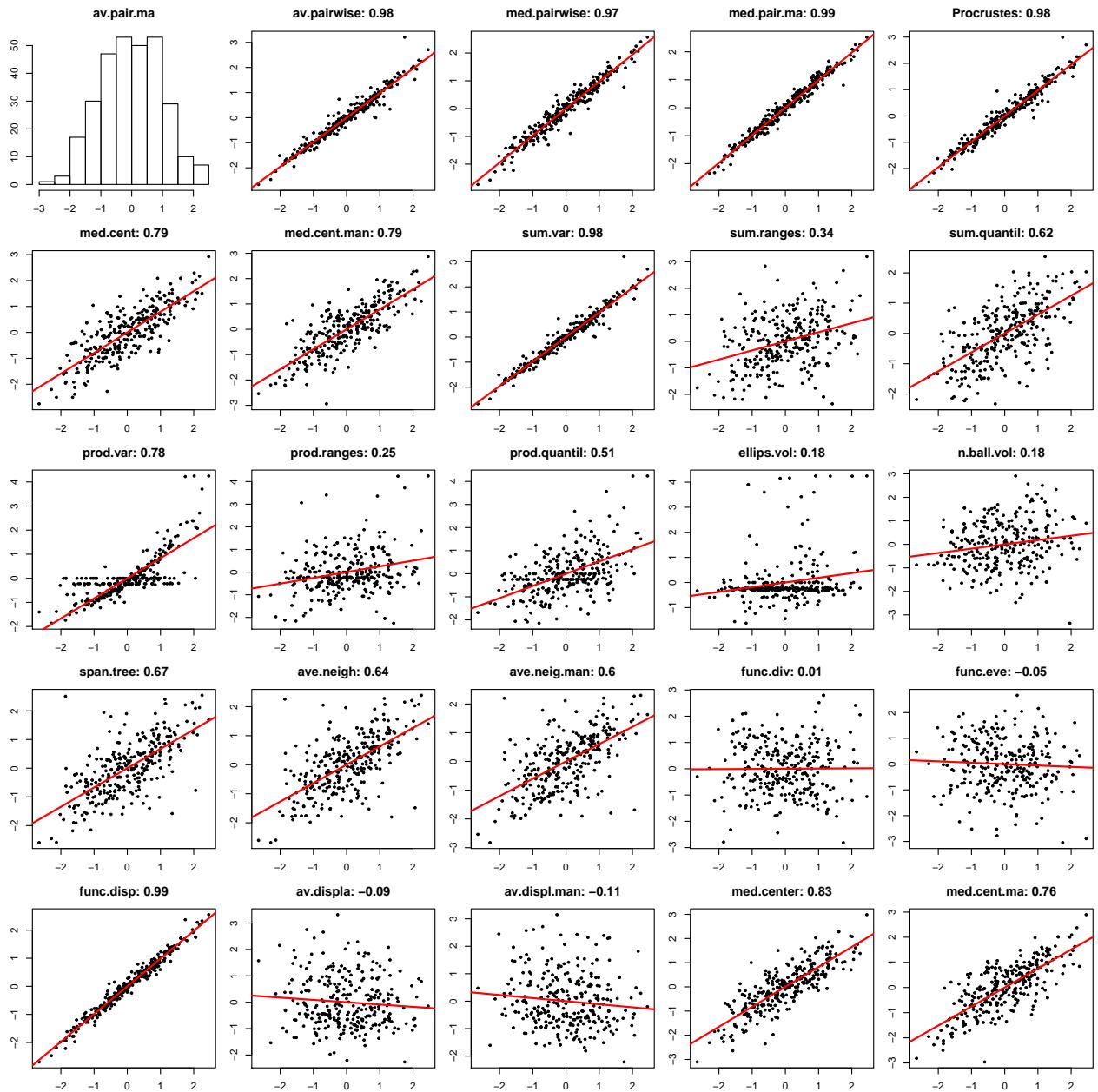
Metrics pairwise comparisons

```
## getting the results to loop through (independent of the removal)
results_pairwise <- all_metrics_remove_02

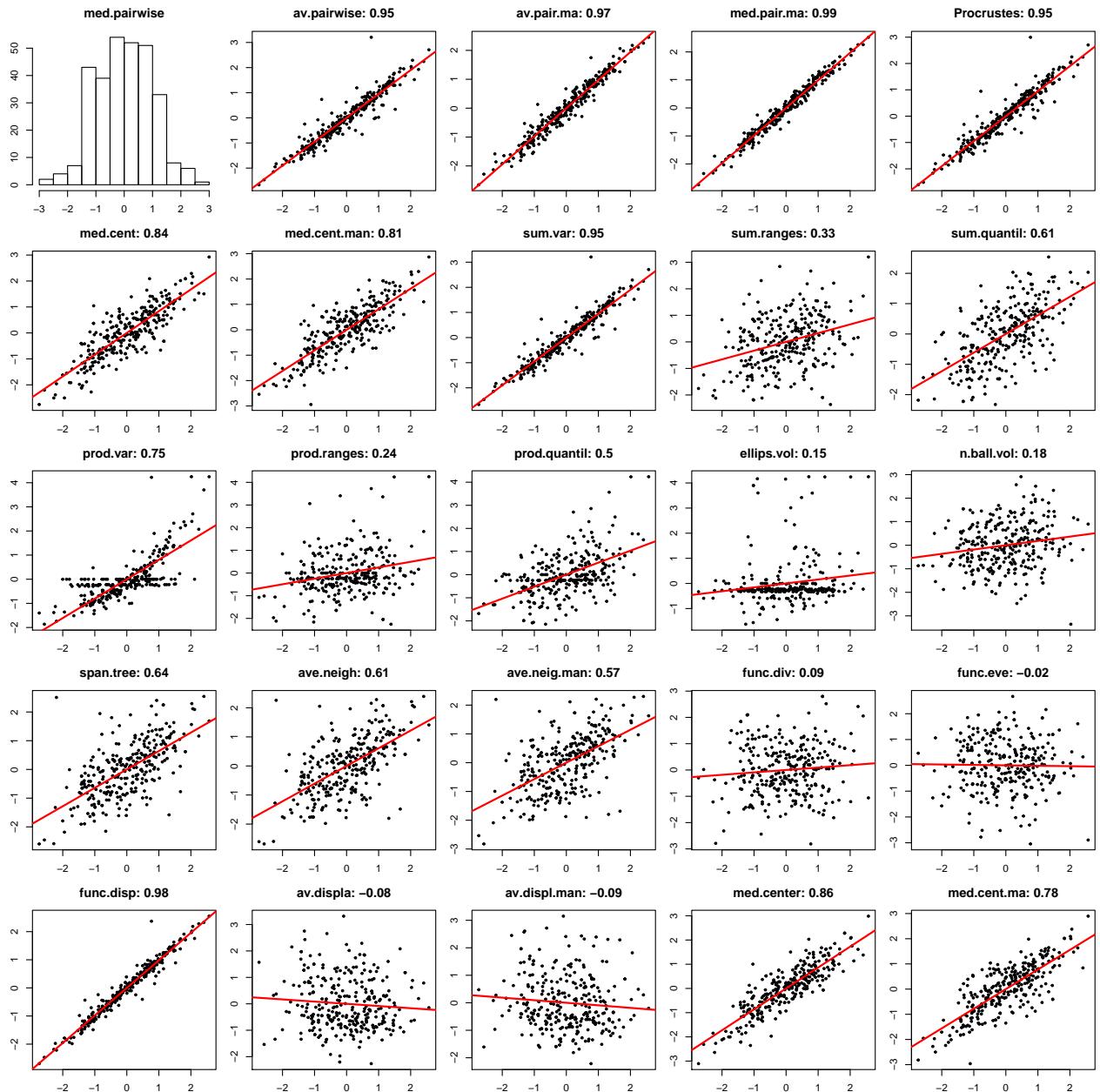
## Plotting the pairwise results
for(metric_ID in 1:length(all_metrics_names)) {
  pairwise.plot(results_pairwise, scale = TRUE, type = "base", plot = metric_ID)
  cat(paste0(all_metrics_names[metric_ID], "\n"))
}
```



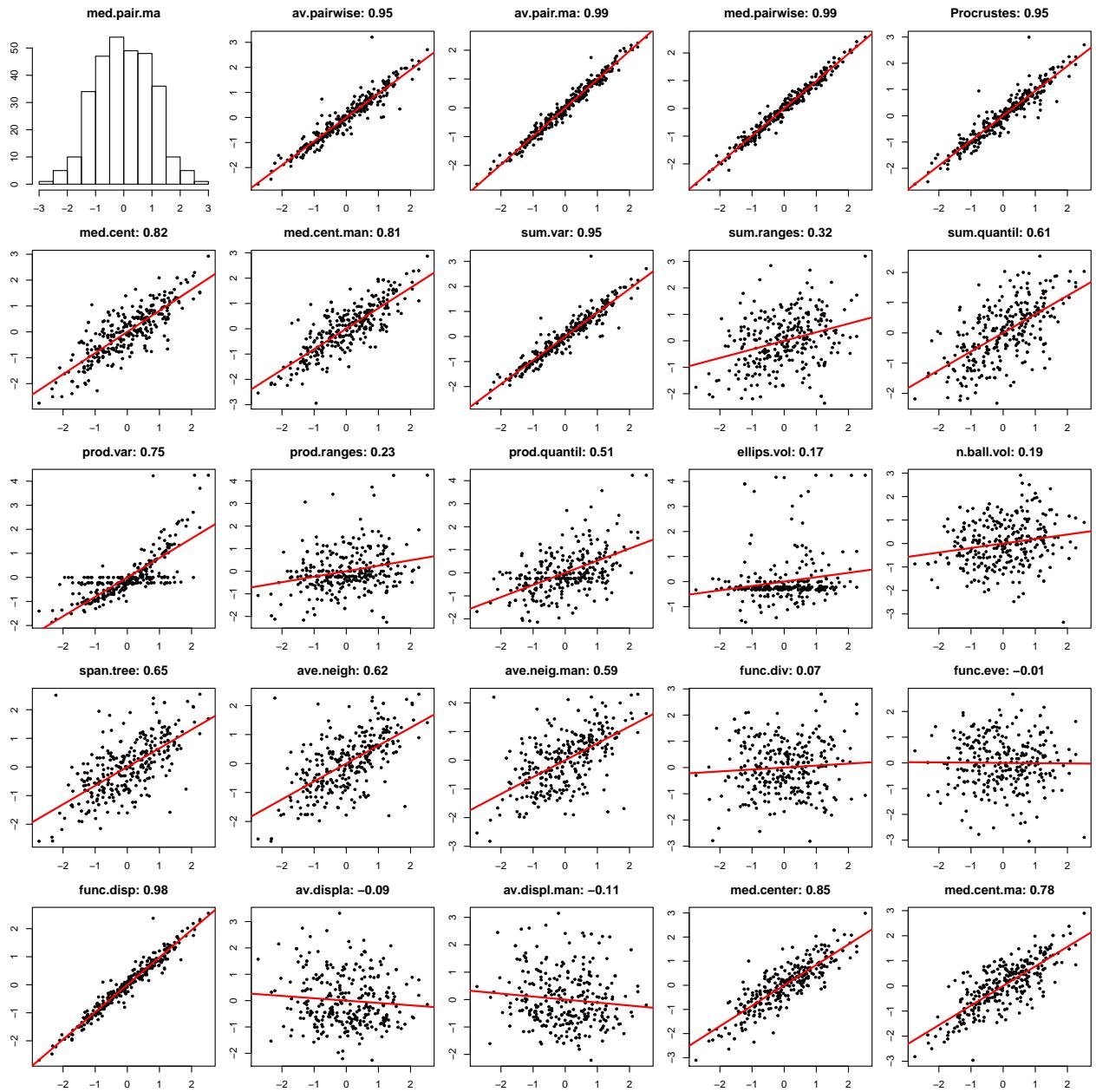
```
## Average squared pairwise distance (dtt::dtt)
```



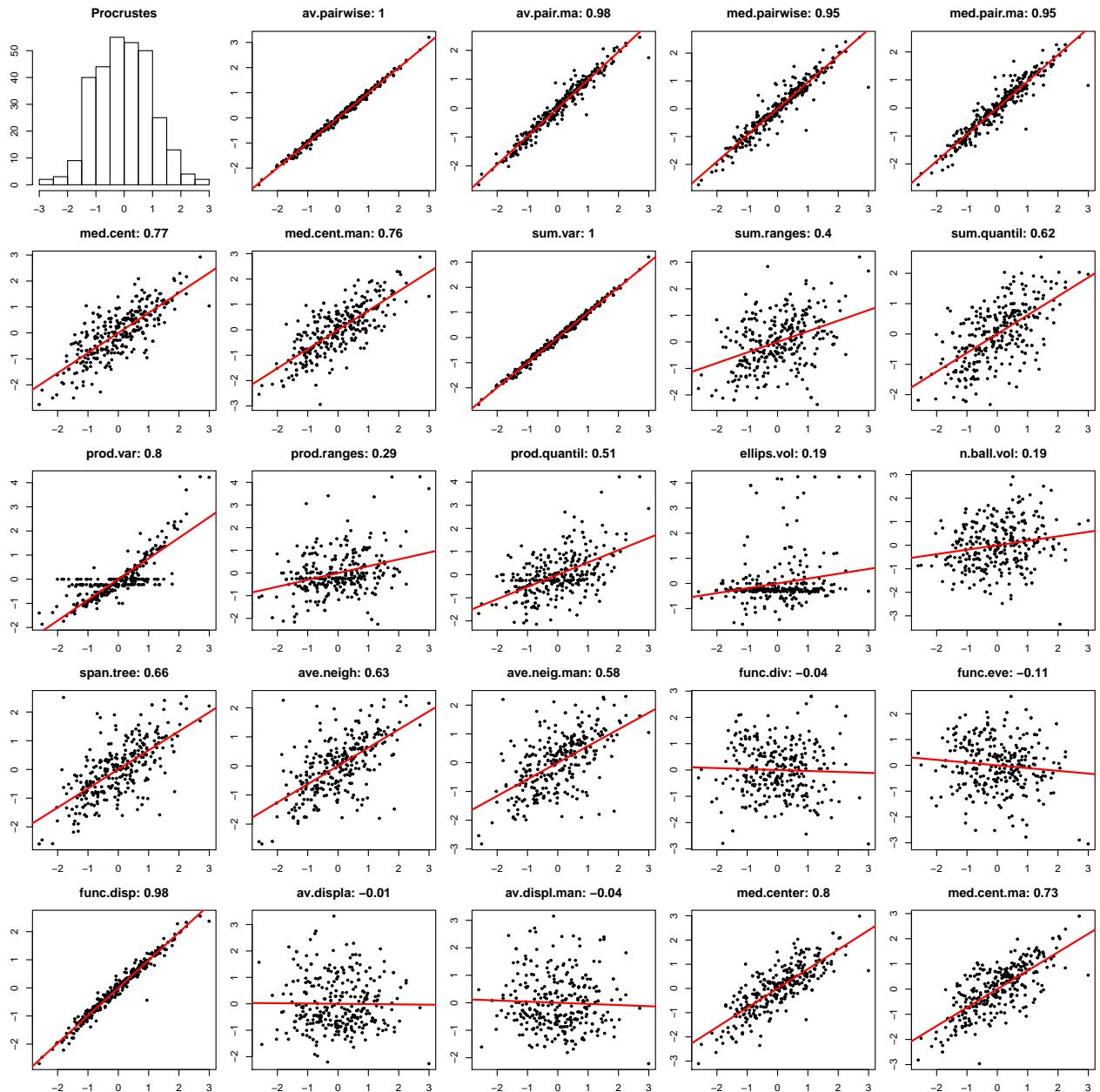
```
## Average pairwise manhattan distance (dtt::dtt)
```



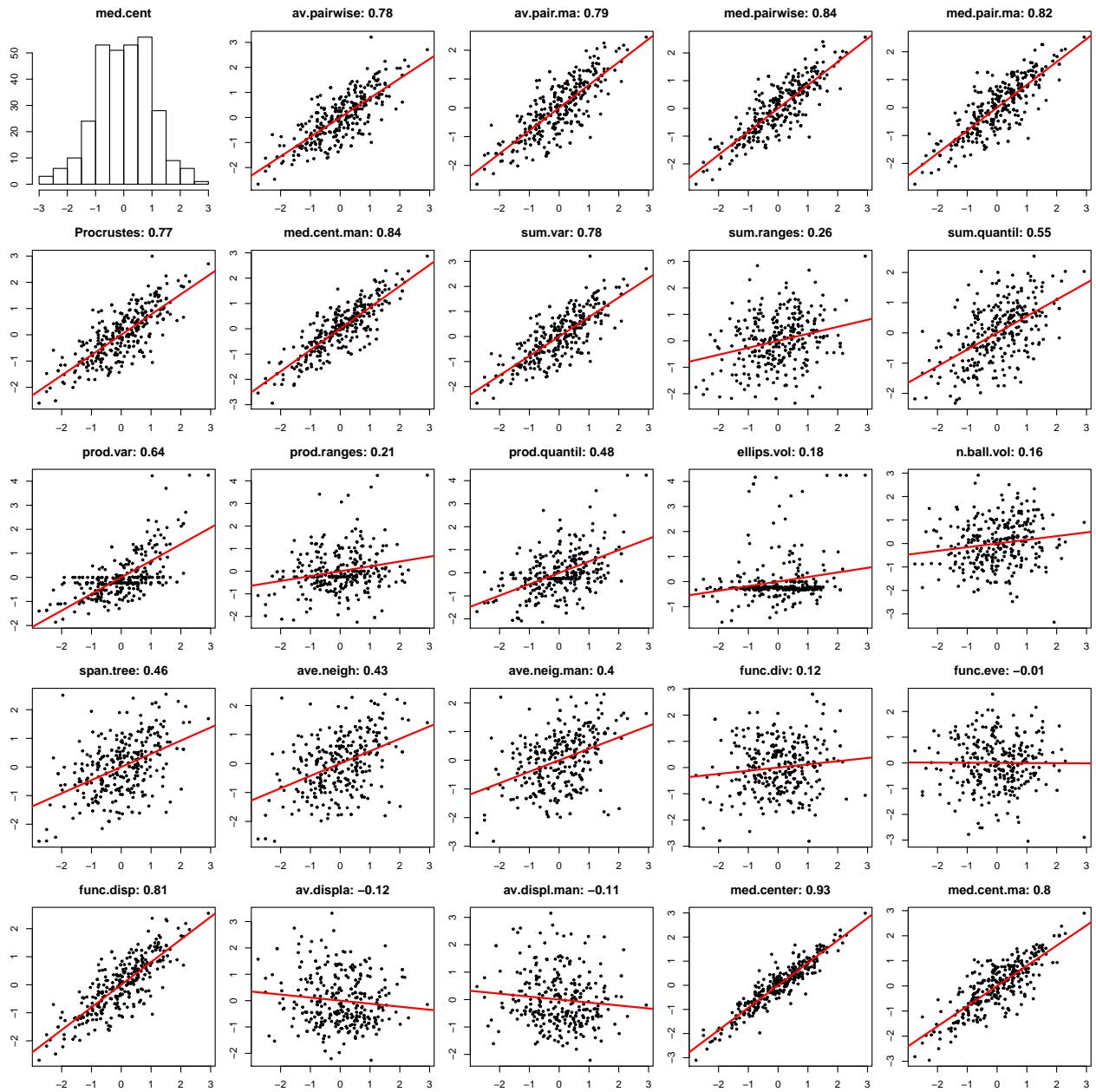
```
## Median pairwise distance
```



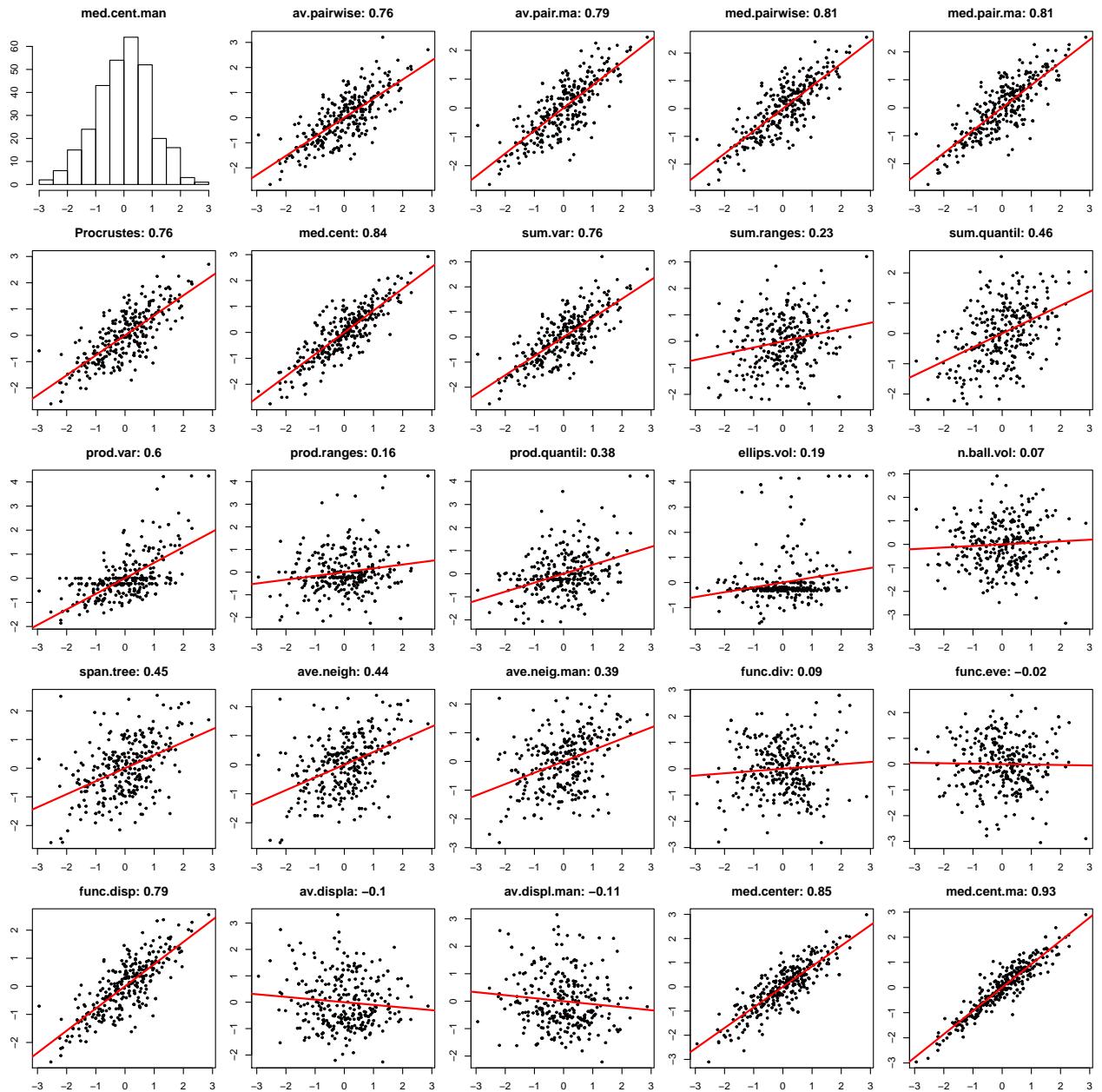
```
## Median pairwise manhattan distance
```



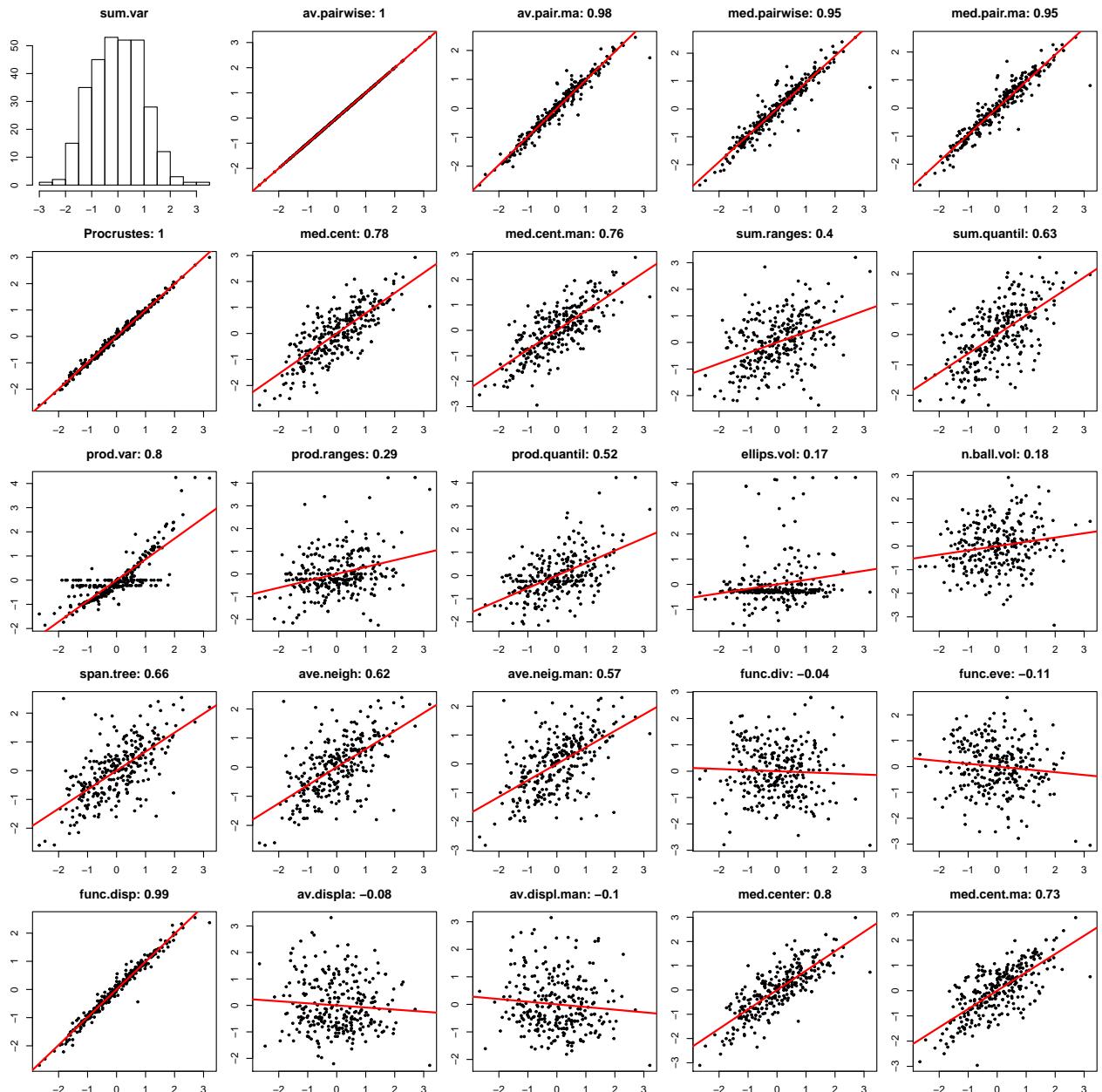
```
## Procrustes variances (geomorph::morpho.disparity)
```



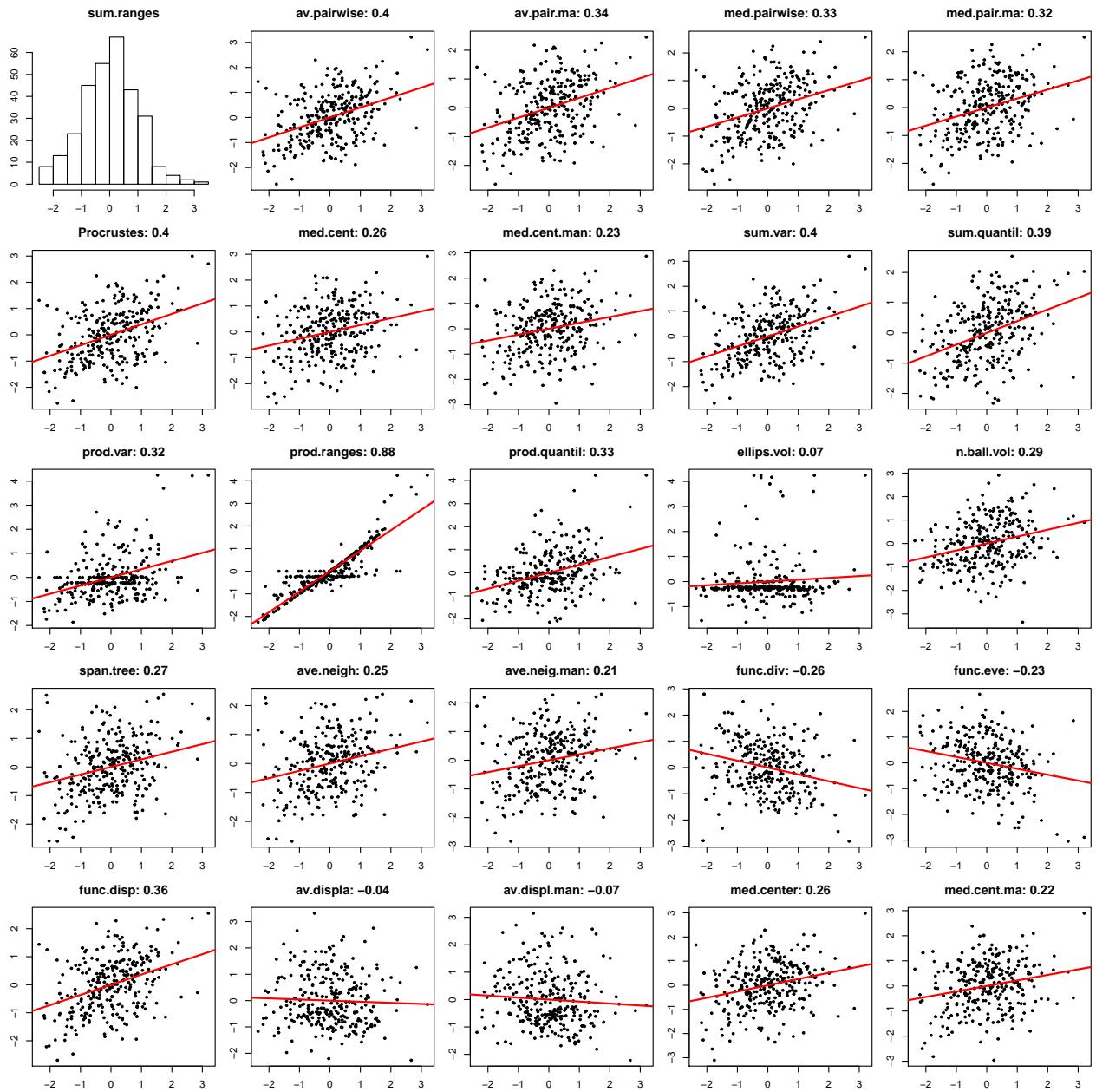
```
## Median distance from centroid
```

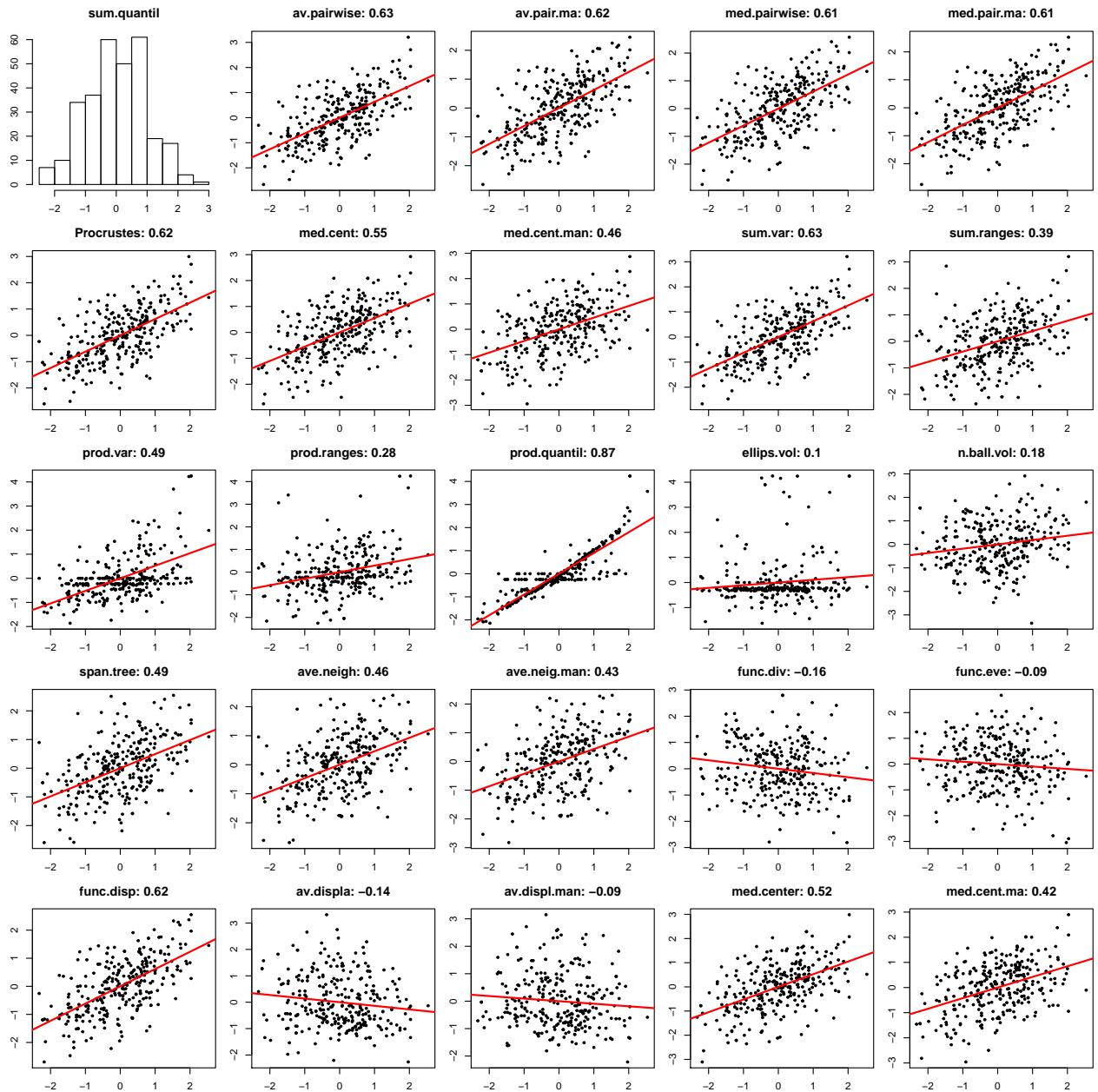


```
## Median manhattan distance from centroid
```

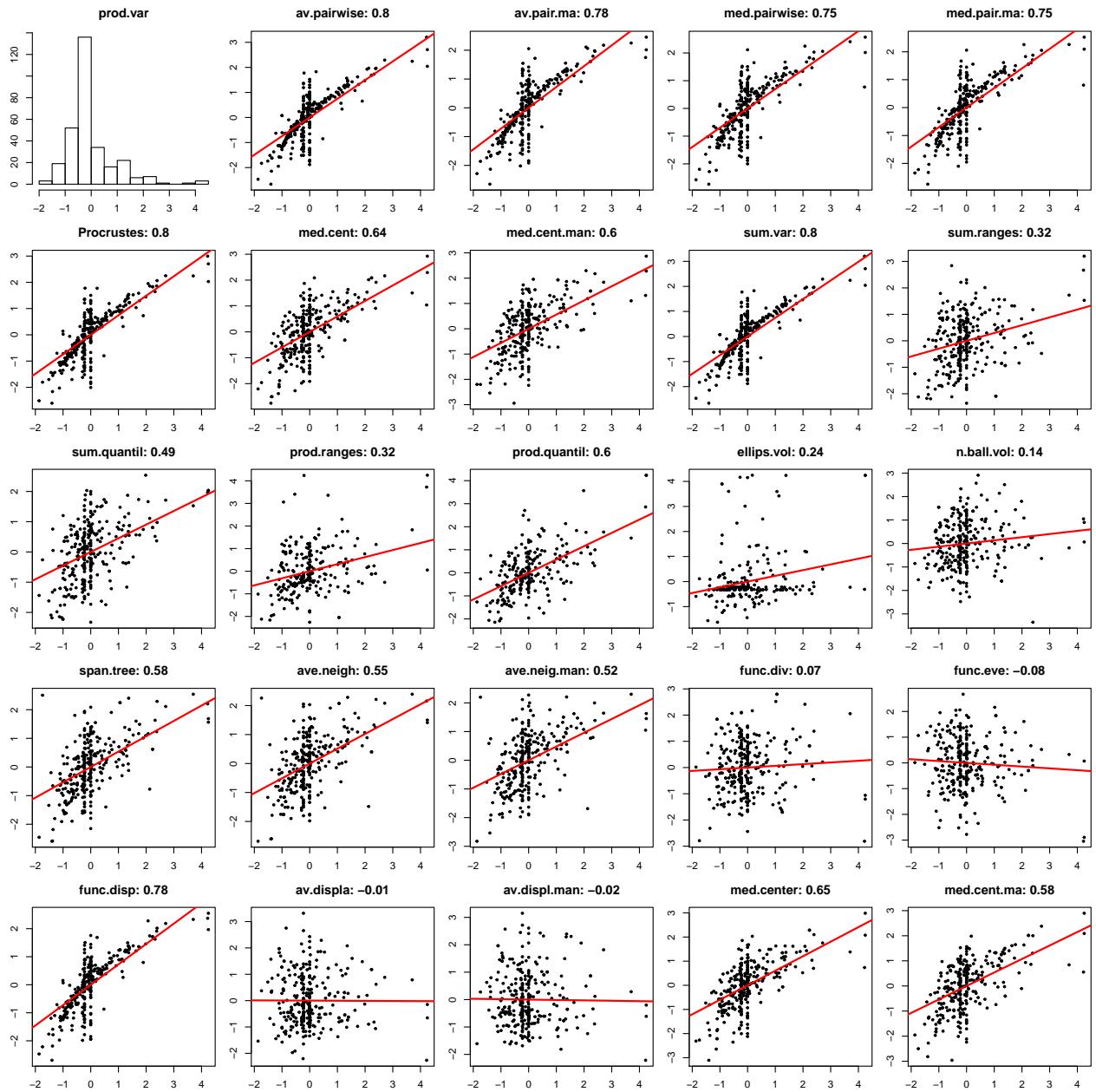


```
## Sum of variances
```

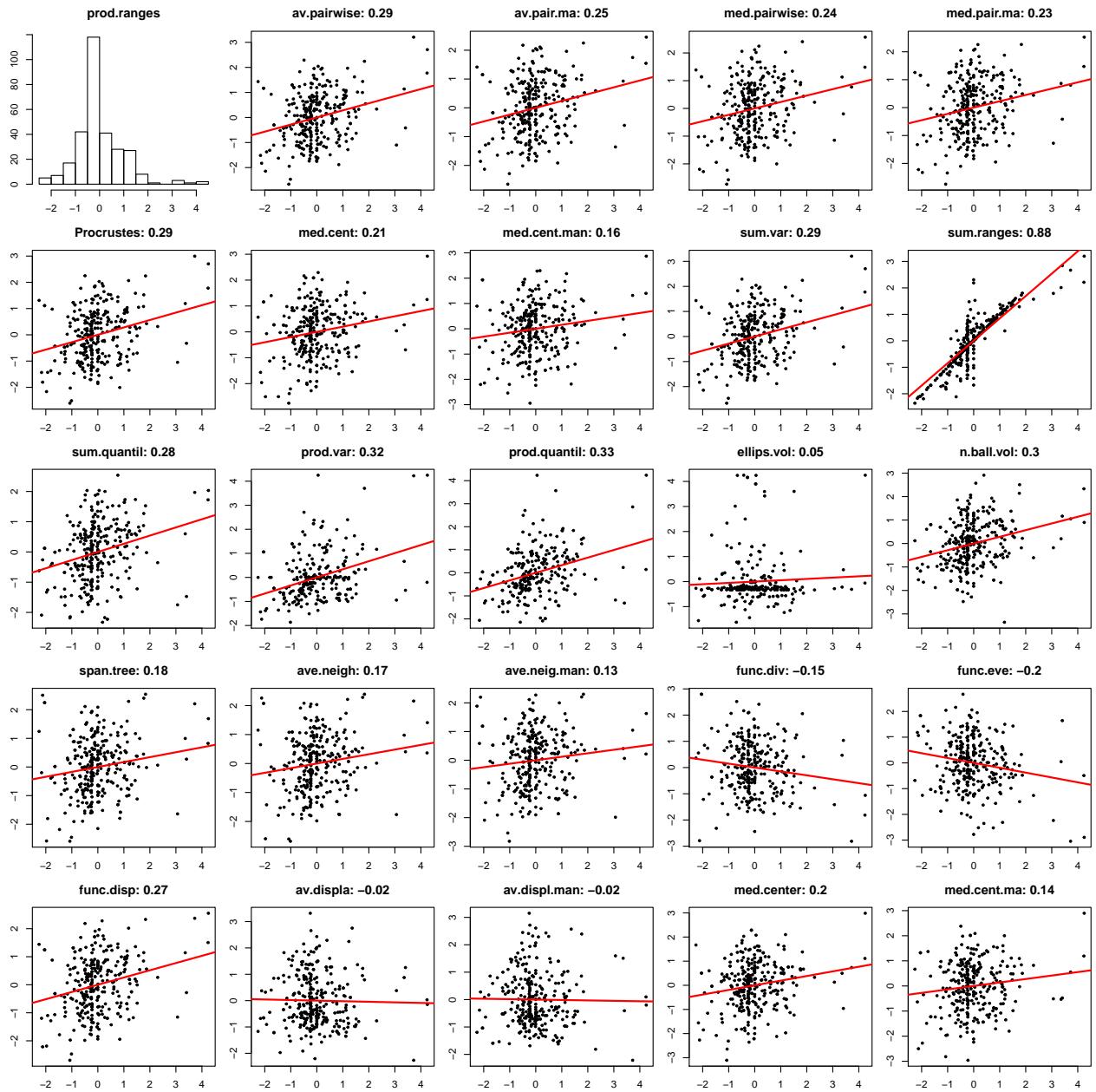




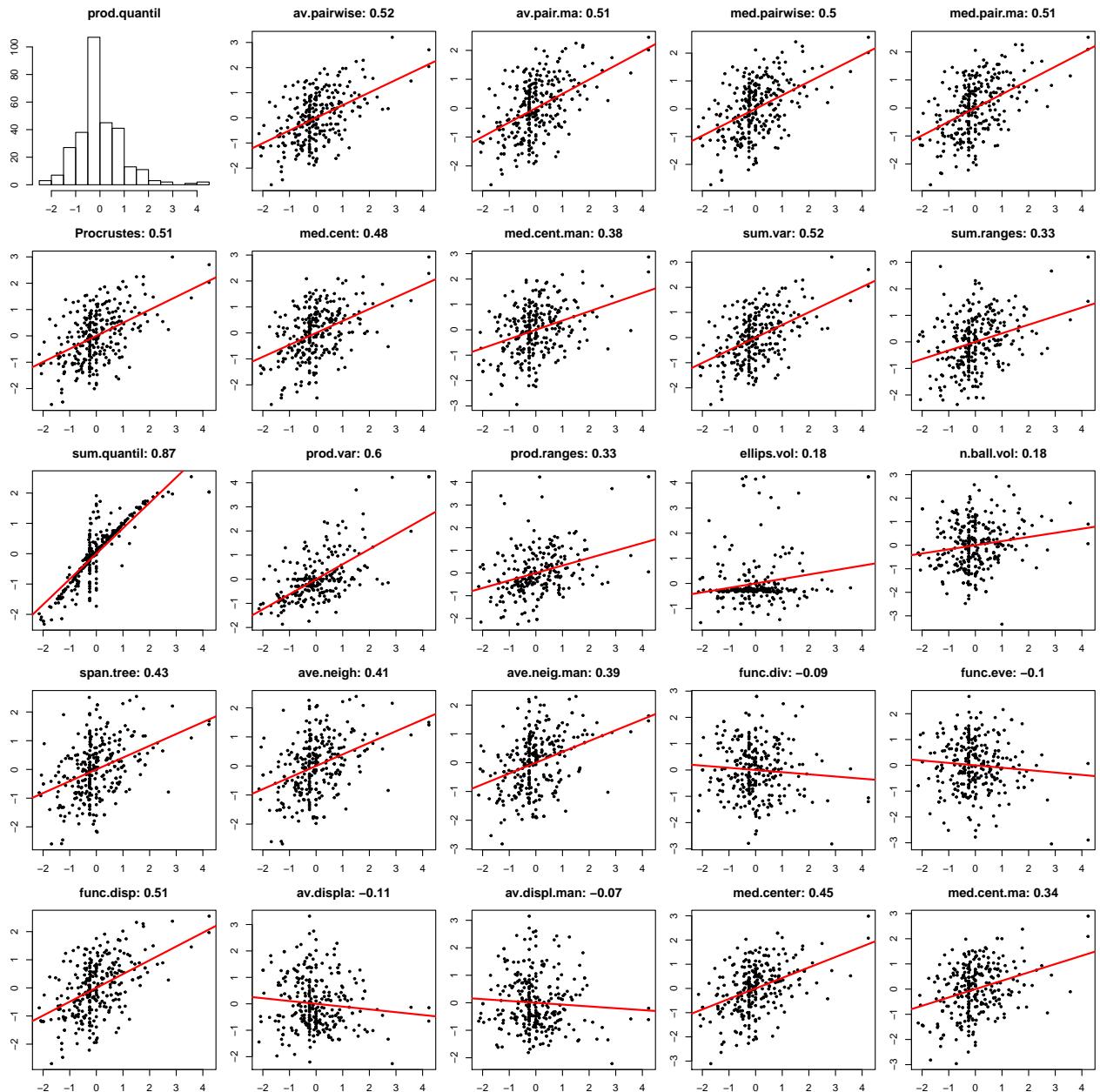
Sum of quantiles



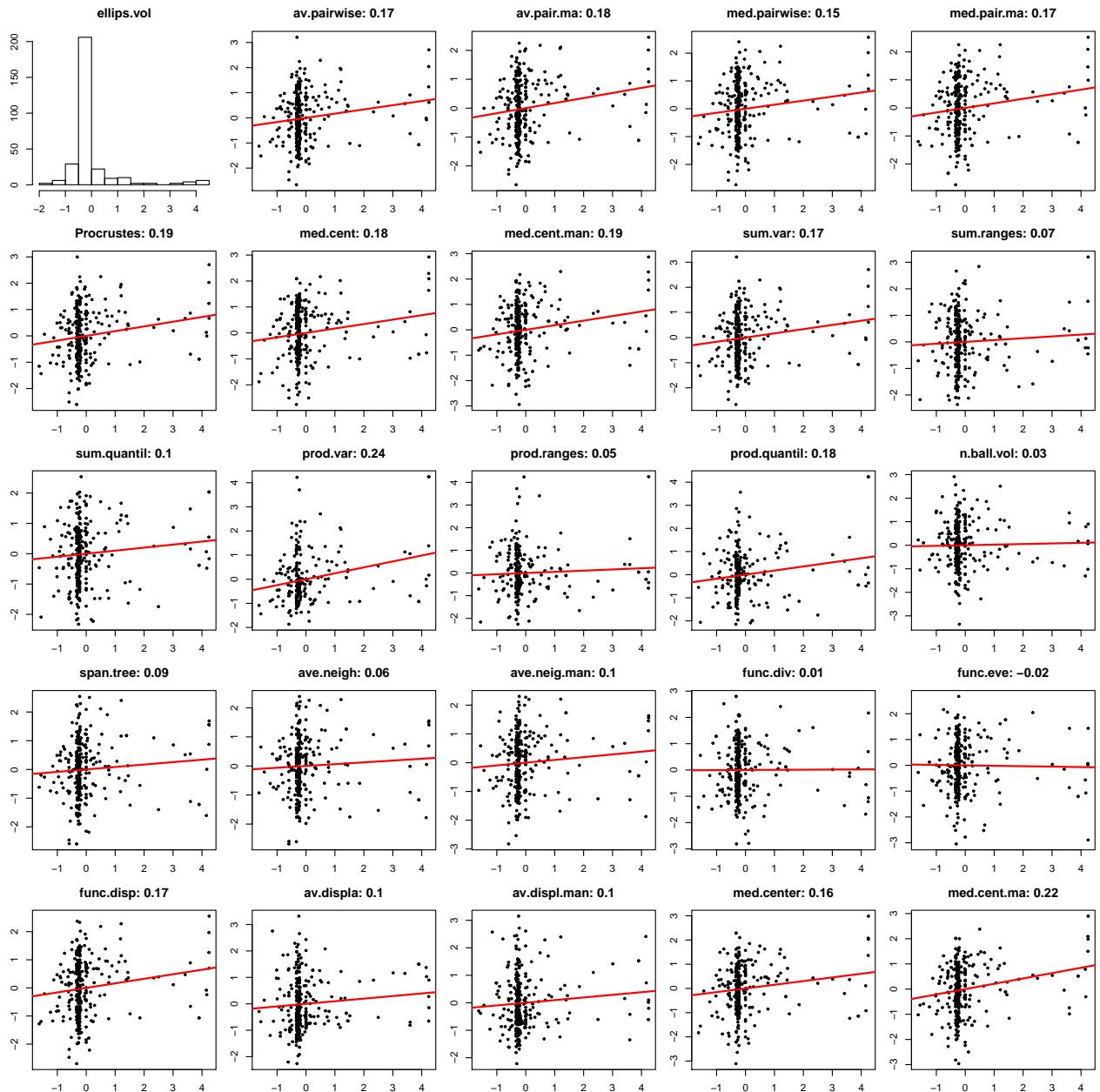
```
## Product of variances
```



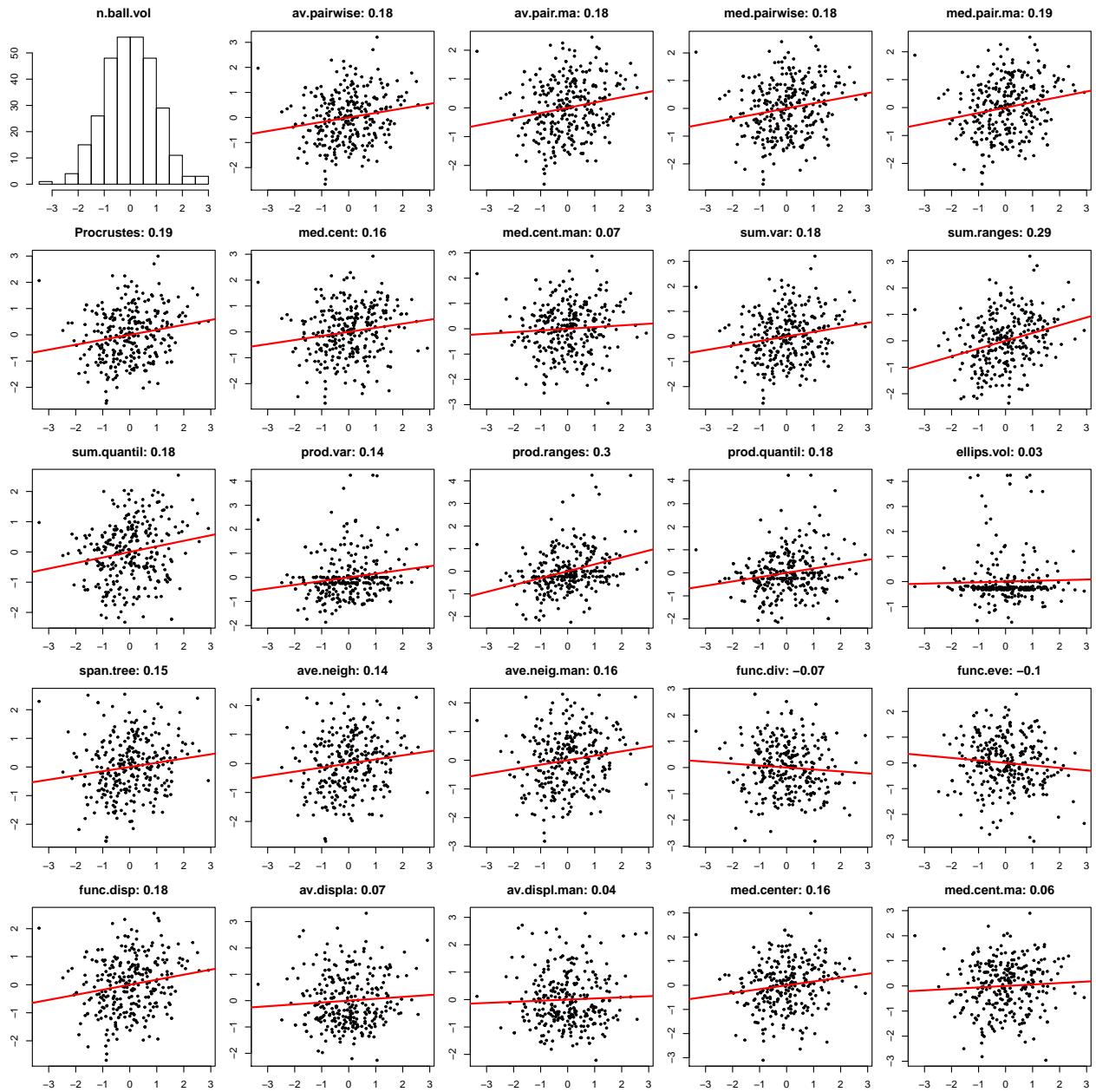
```
## Product of ranges
```



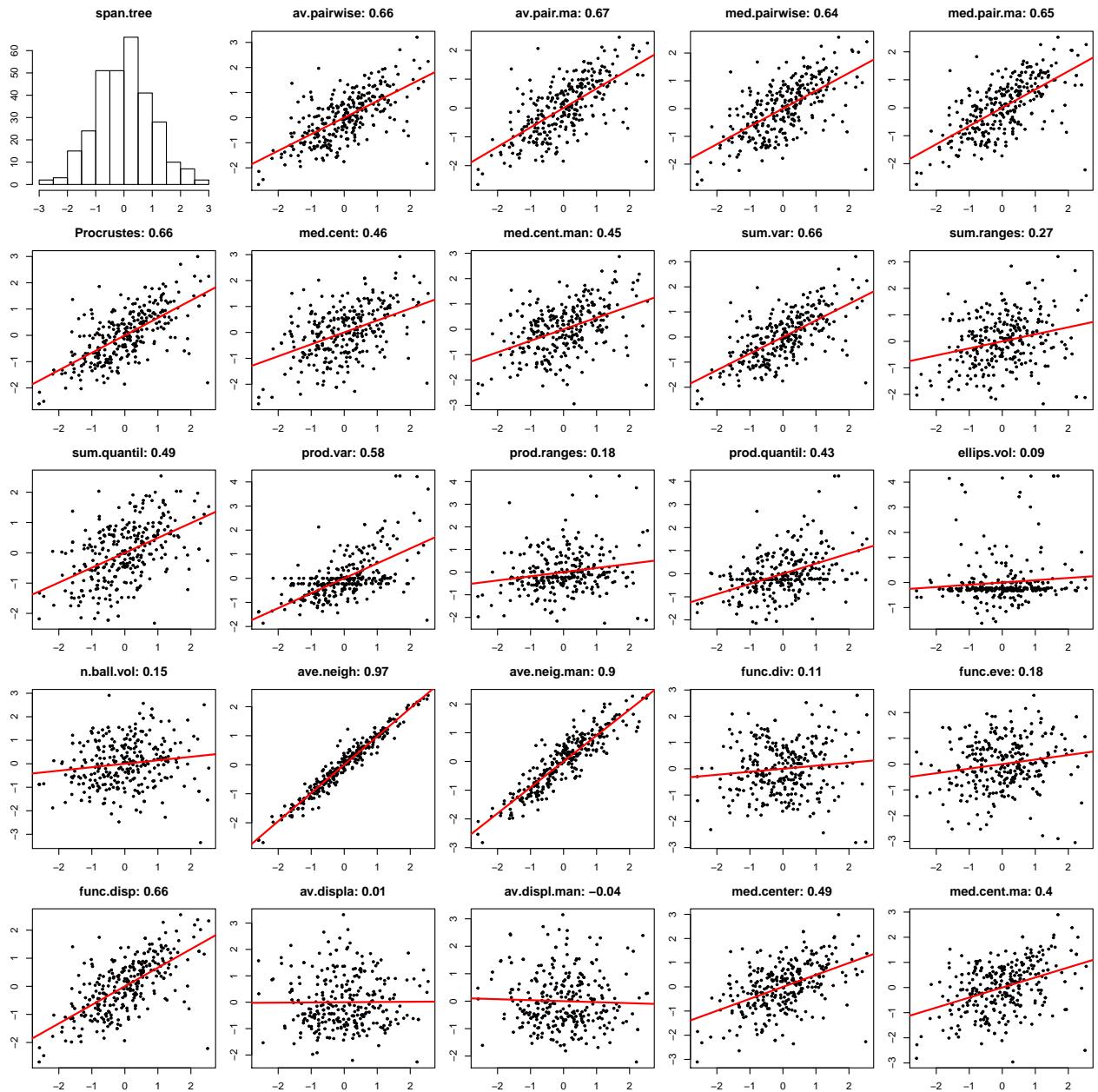
```
## Product of quantiles
```



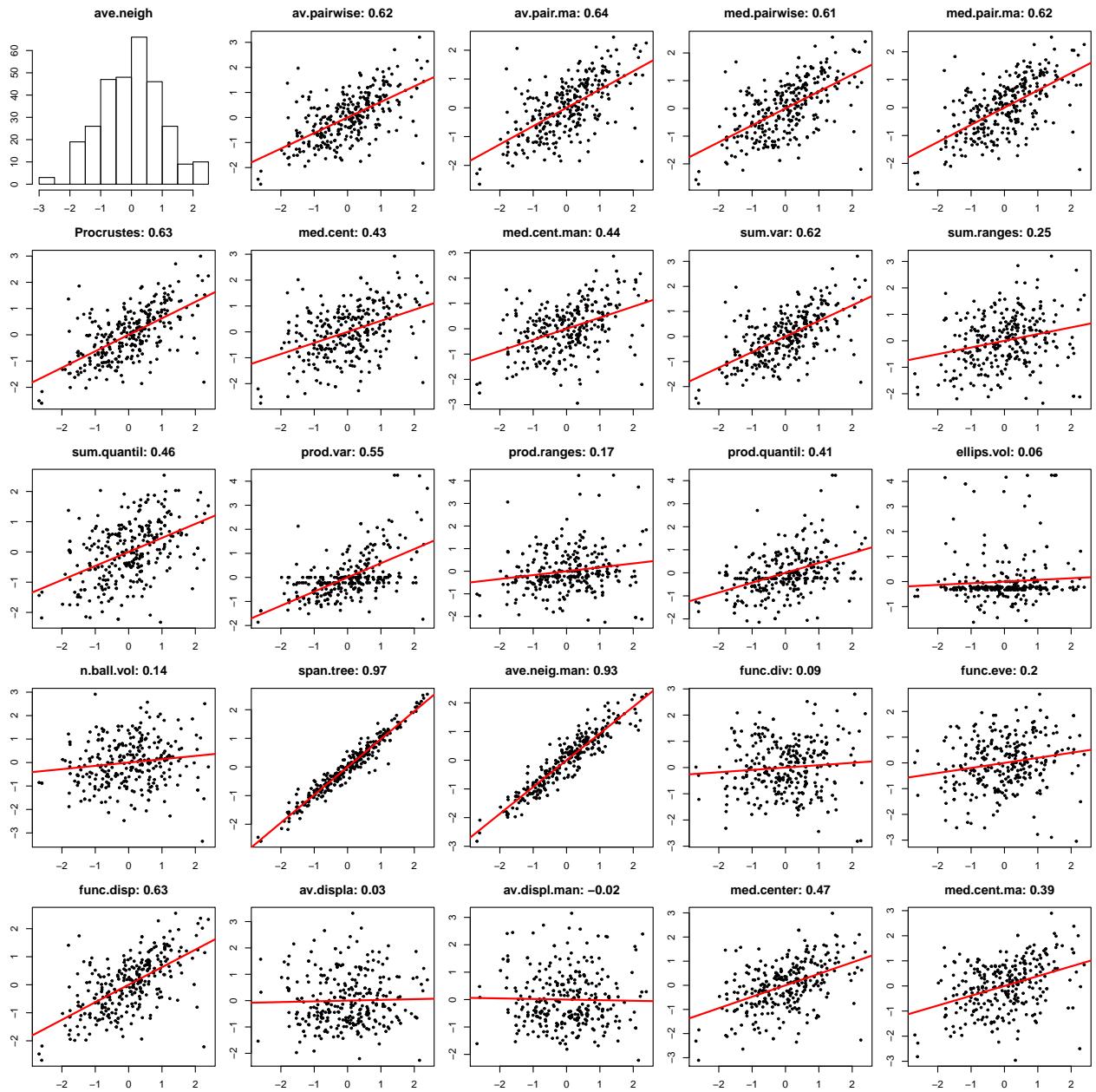
```
## Ellipsoid volume
```



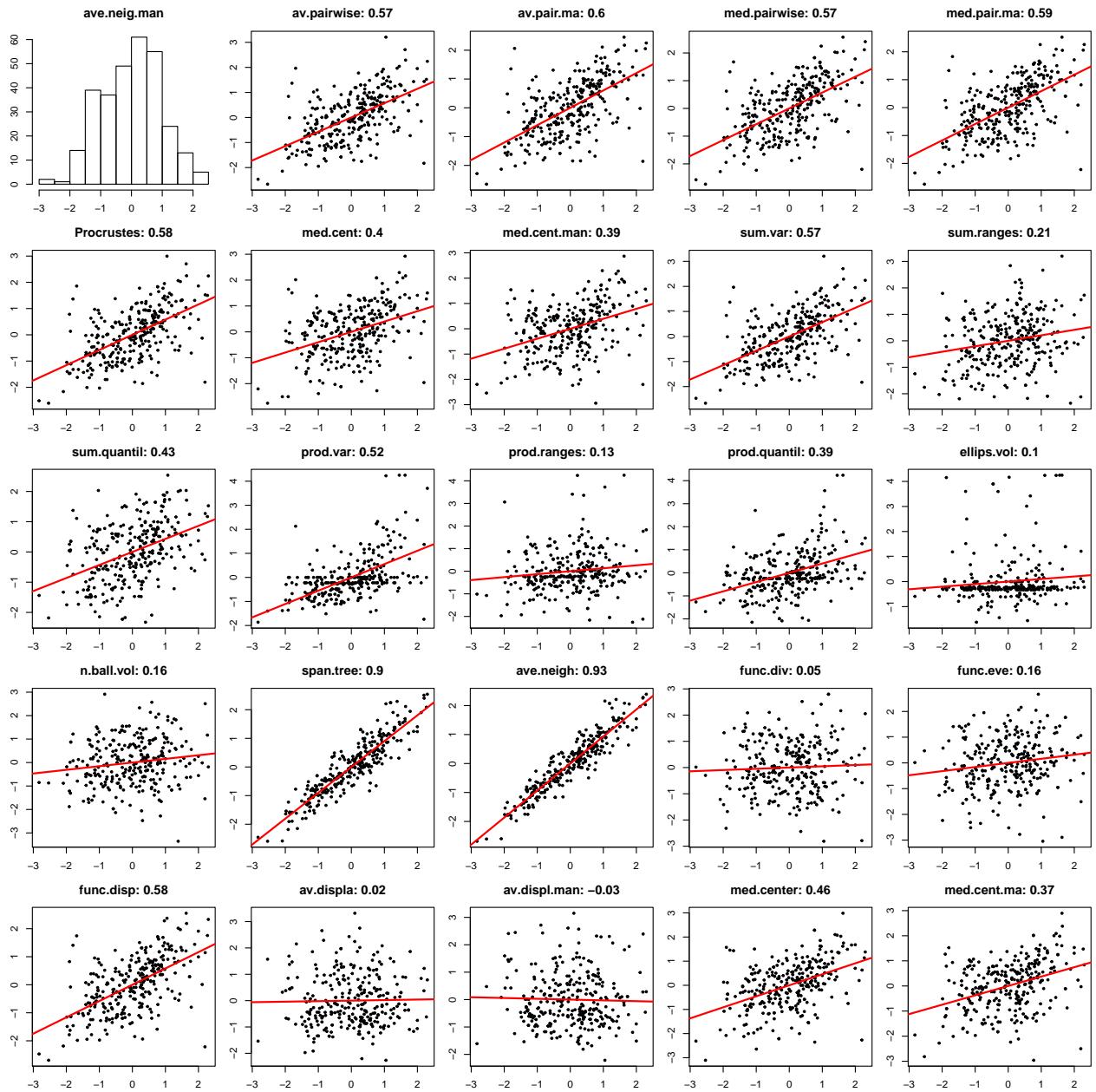
```
## nBall volume
```



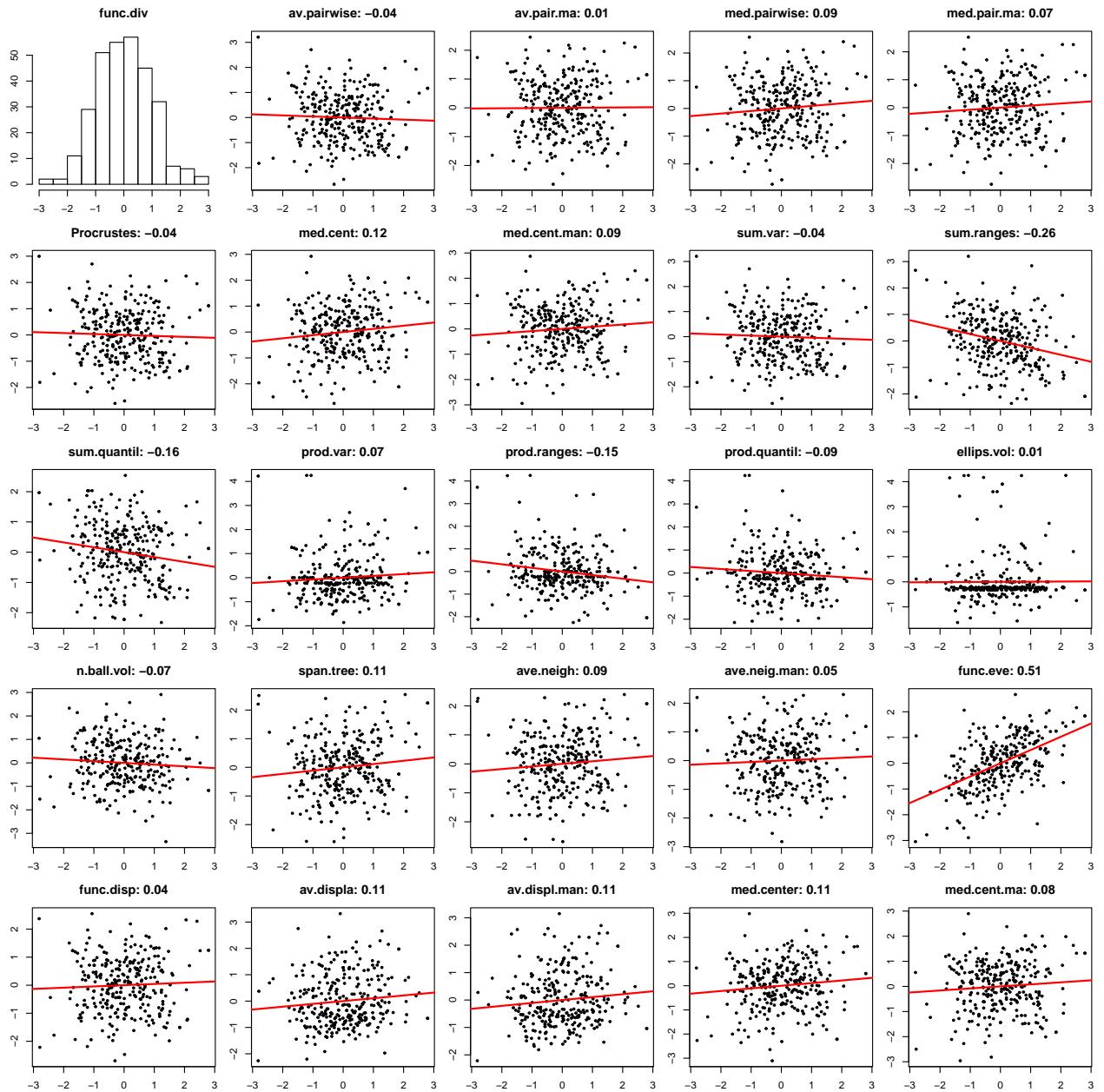
```
## Minimum spanning tree average length
```



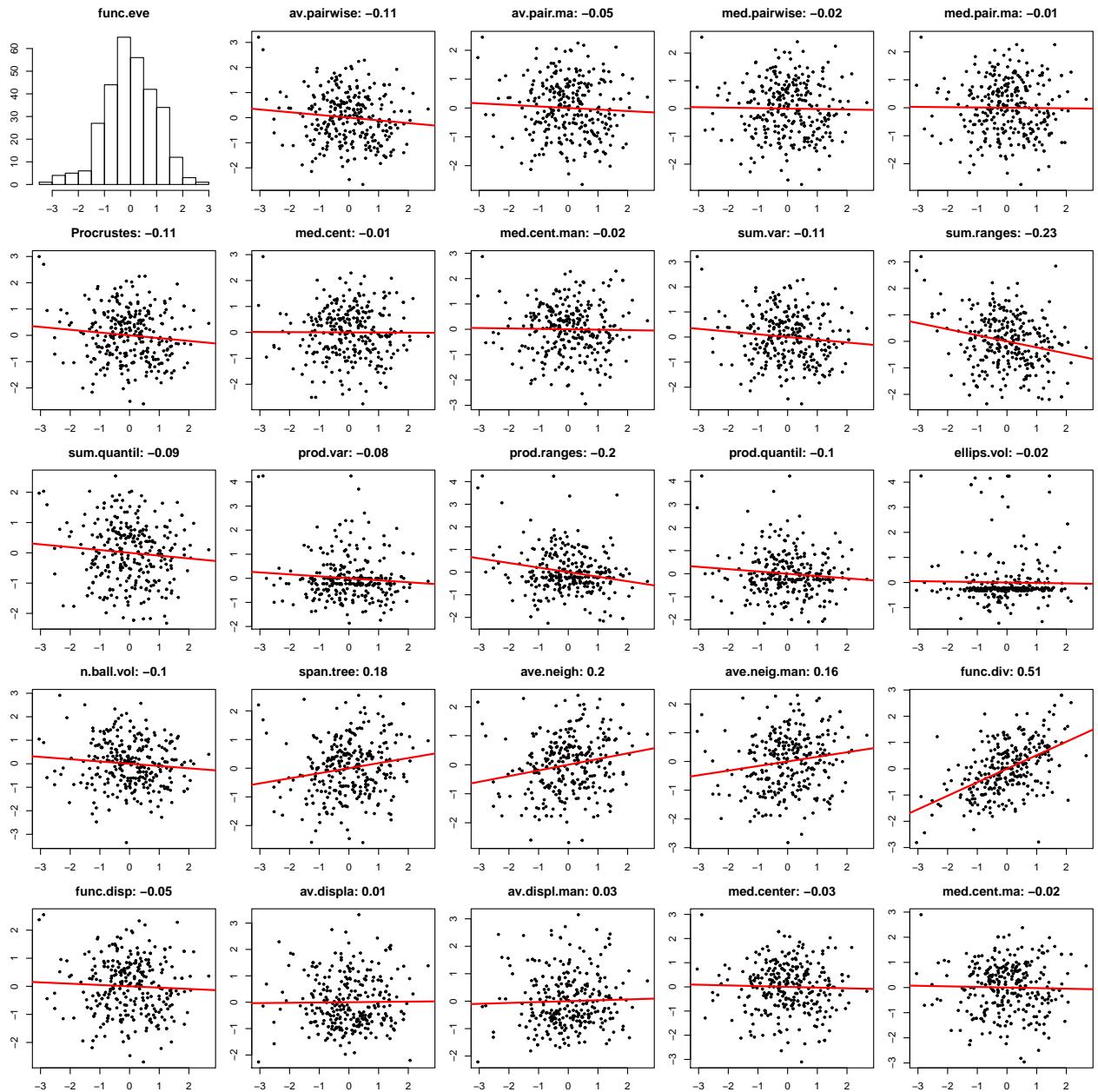
```
## Average minimum neighbours distance
```



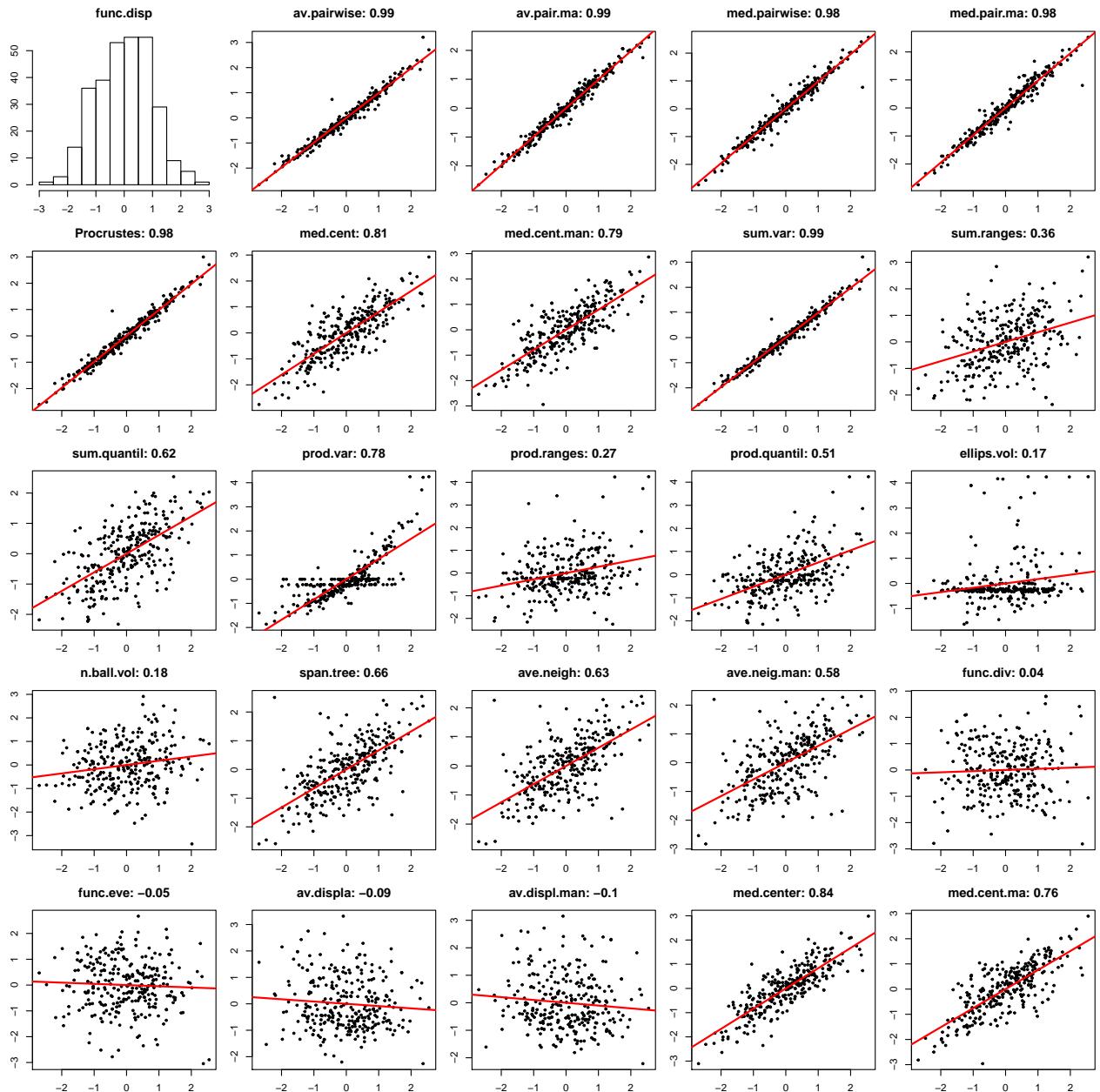
```
## Average minimum neighbours manhattan distance
```



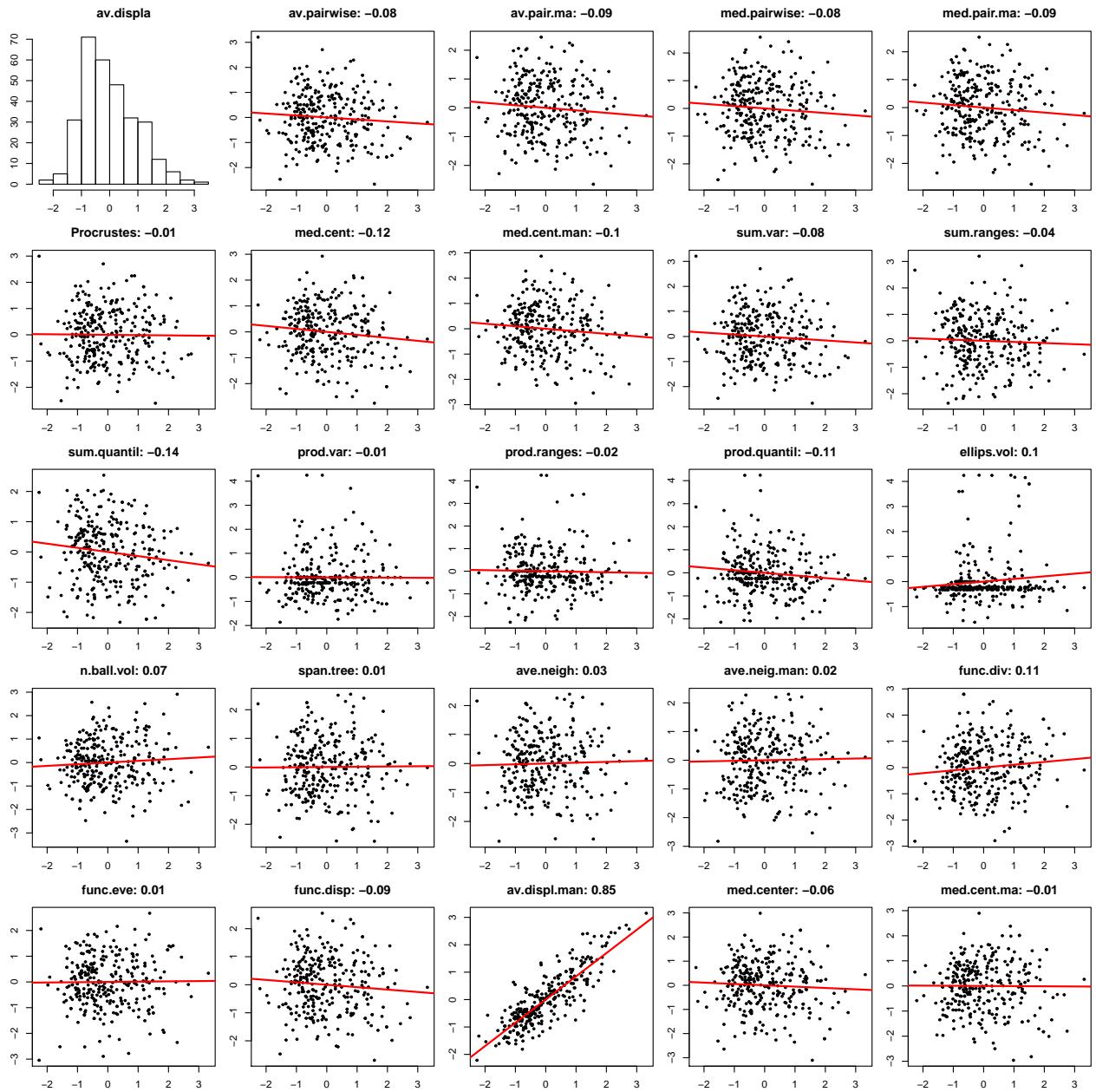
```
## Function diversity
```



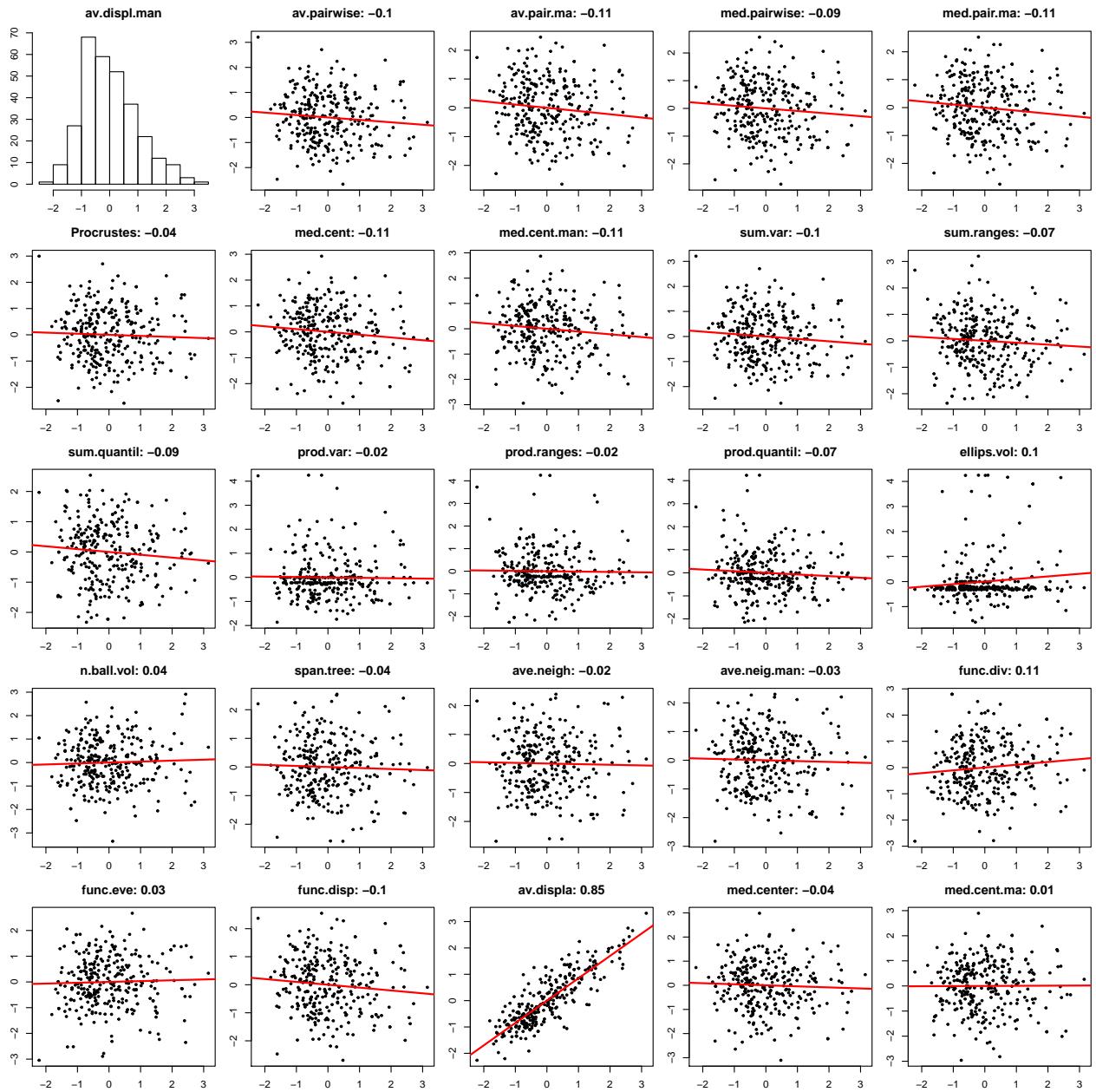
Functional evenness



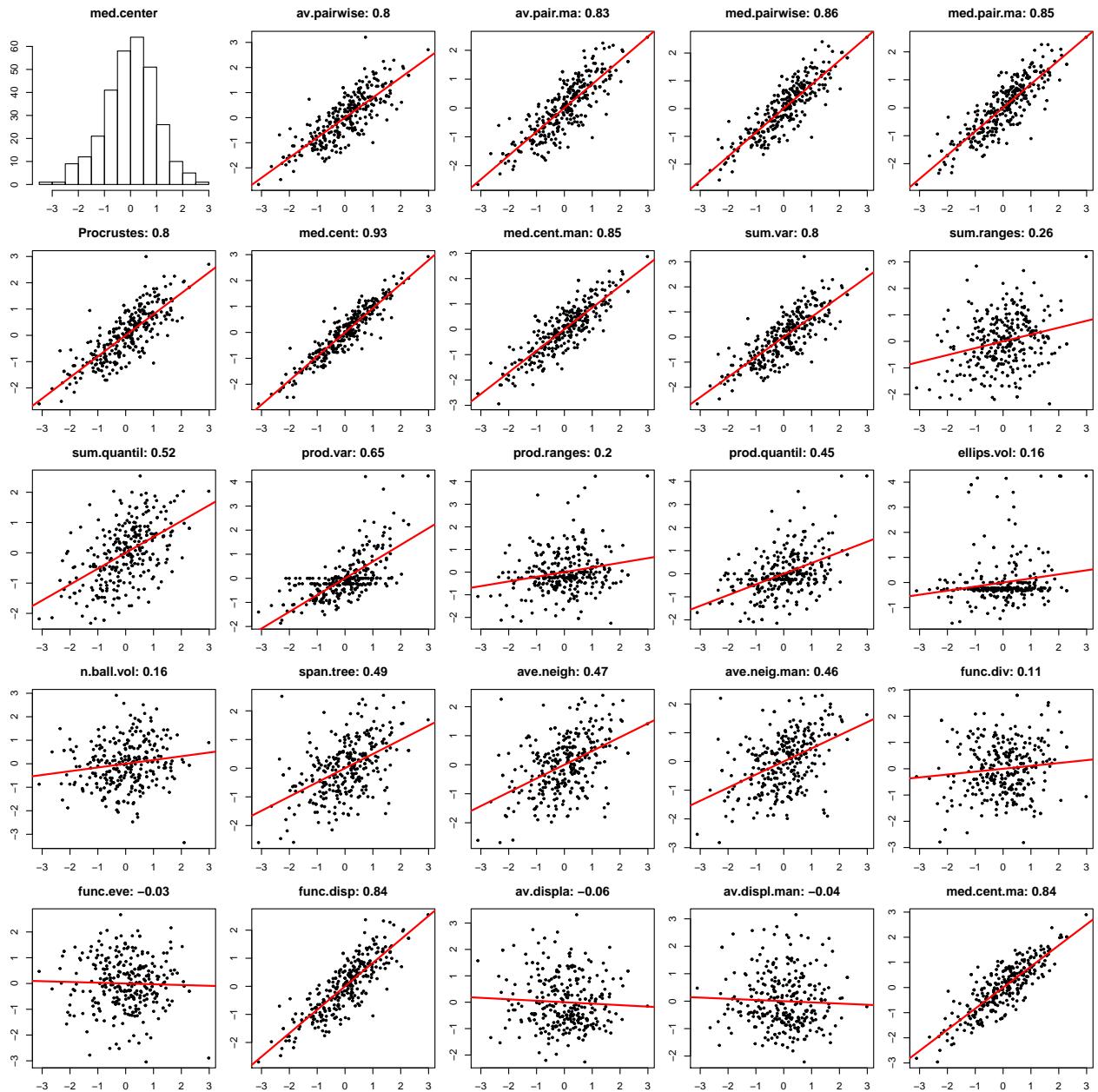
```
## Functional dispersion
```



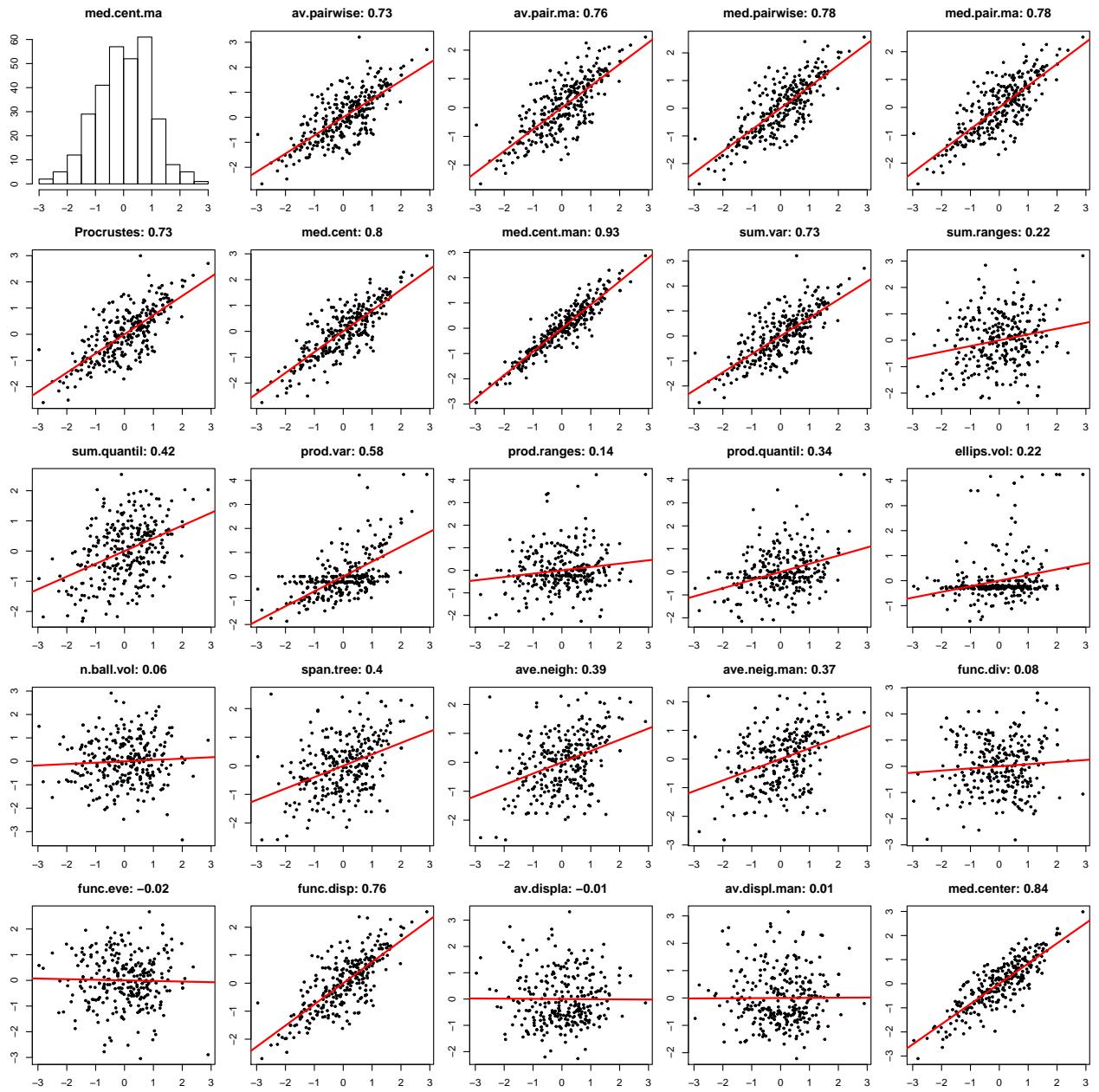
Average displacement



```
## Average manhattan displacement
```



```
## Median distance from centre
```



```
## Median manhattan distance from centre
```

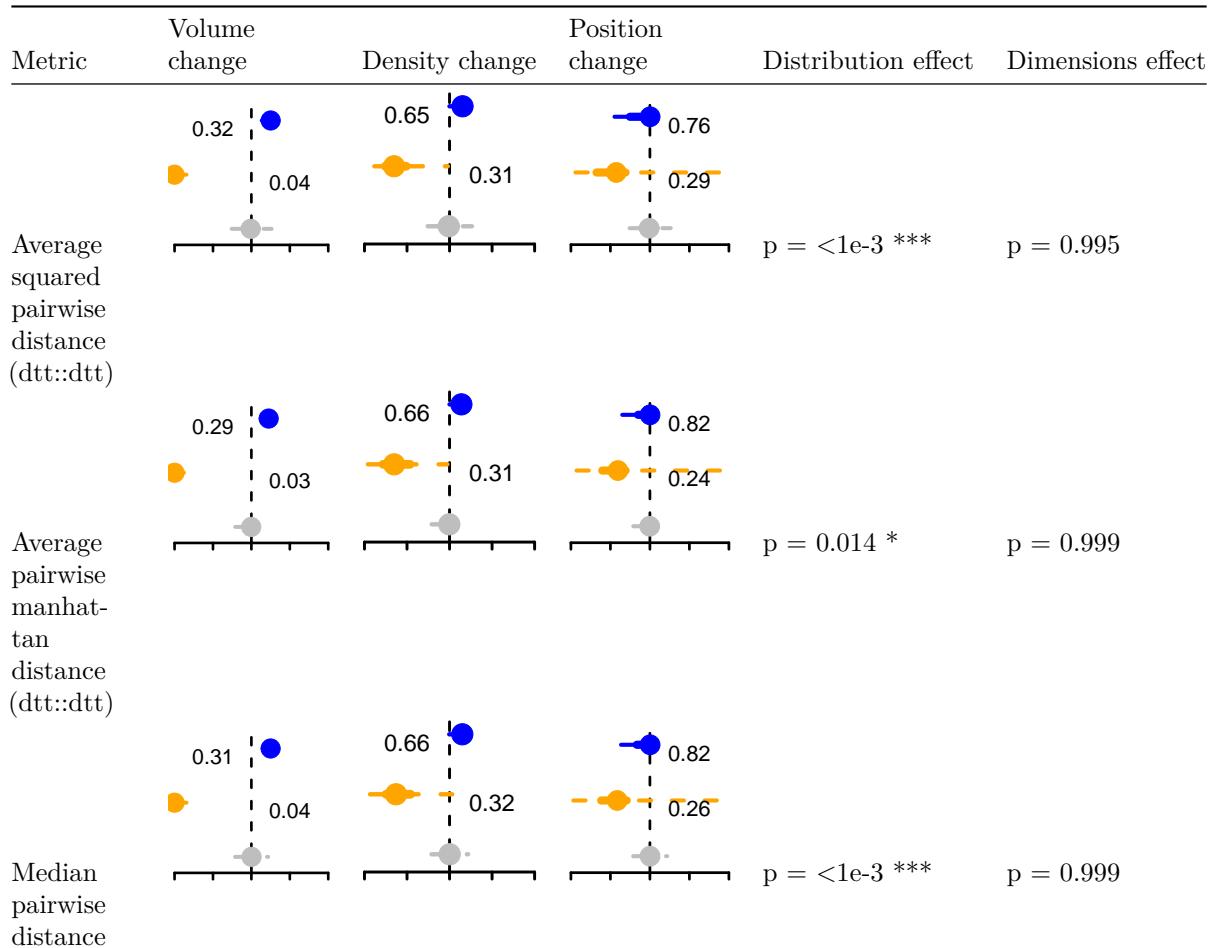
The metrics analysed are the av.pairwise: Average squared pairwise distance (dtt::dtt); av.pair.ma: Average pairwise manhattan distance (dtt::dtt); med.pairwise: Median pairwise distance; med.pair.ma: Median pairwise manhattan distance; Procrustes: Procrustes variances (geomorph::morpho.disparity); med.cent: Median distance from centroid; med.cent.man: Median manhattan distance from centroid; sum.var: Sum of variances; sum.ranges: Sum of ranges; sum.quantil: Sum of quantiles; prod.var: Product of variances; prod.ranges: Product of ranges; prod.quantil: Product of quantiles; ellips.vol: Ellipsoid volume; n.ball.vol: nBall volume; span.tree: Minimum spanning tree average length; ave.neigh: Average minimum neighbours distance; ave.neig.man: Average minimum neighbours manhattan distance; func.div: Function diversity; func.eve: Functional evenness; func.disp: Functional dispersion; av.displa: Average displacement; av.displ.man: Average manhattan displacement; med.center: Median distance from centre; med.cent.ma: Median manhattan distance from centre.

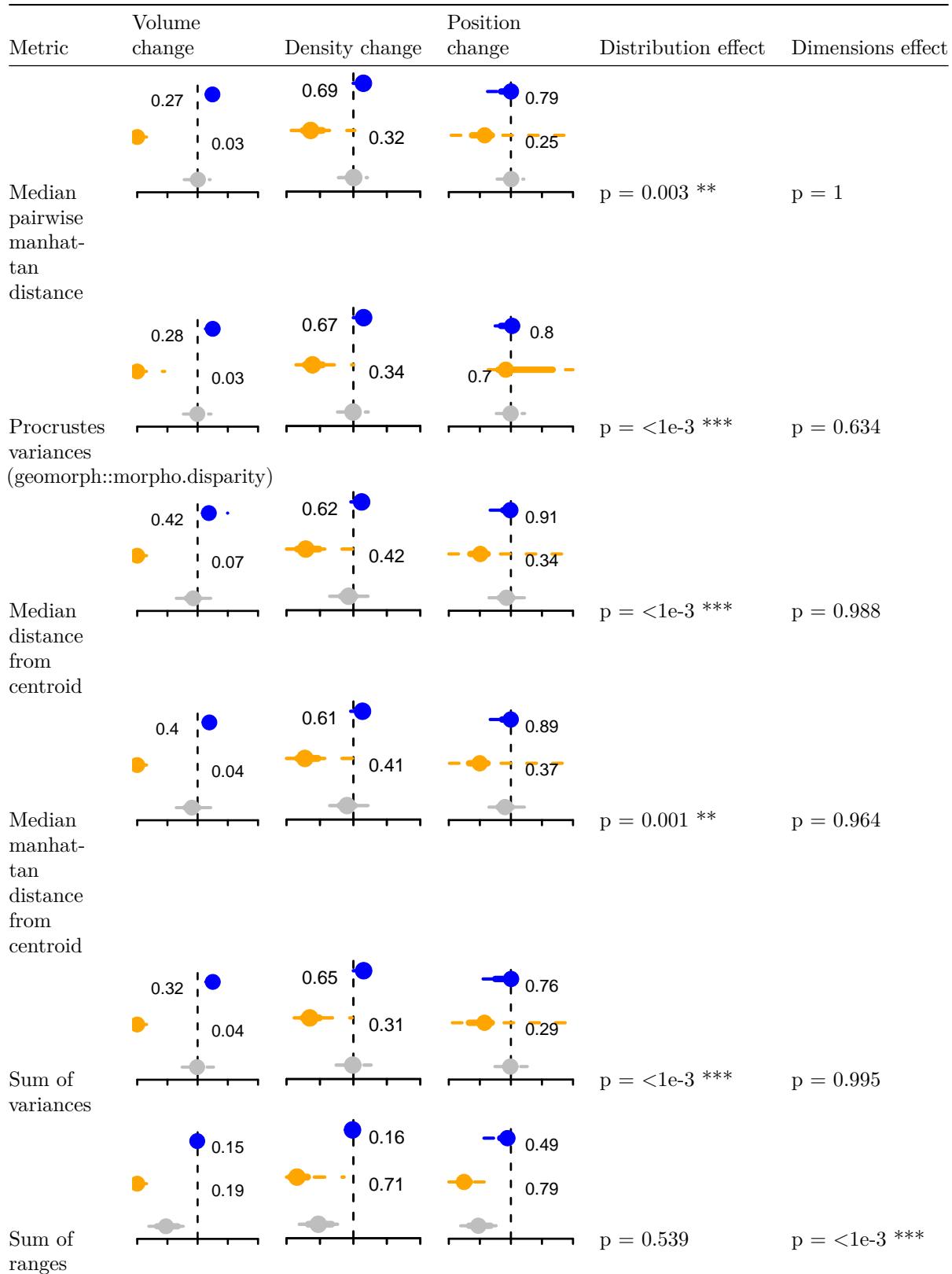
Space shifting all metrics

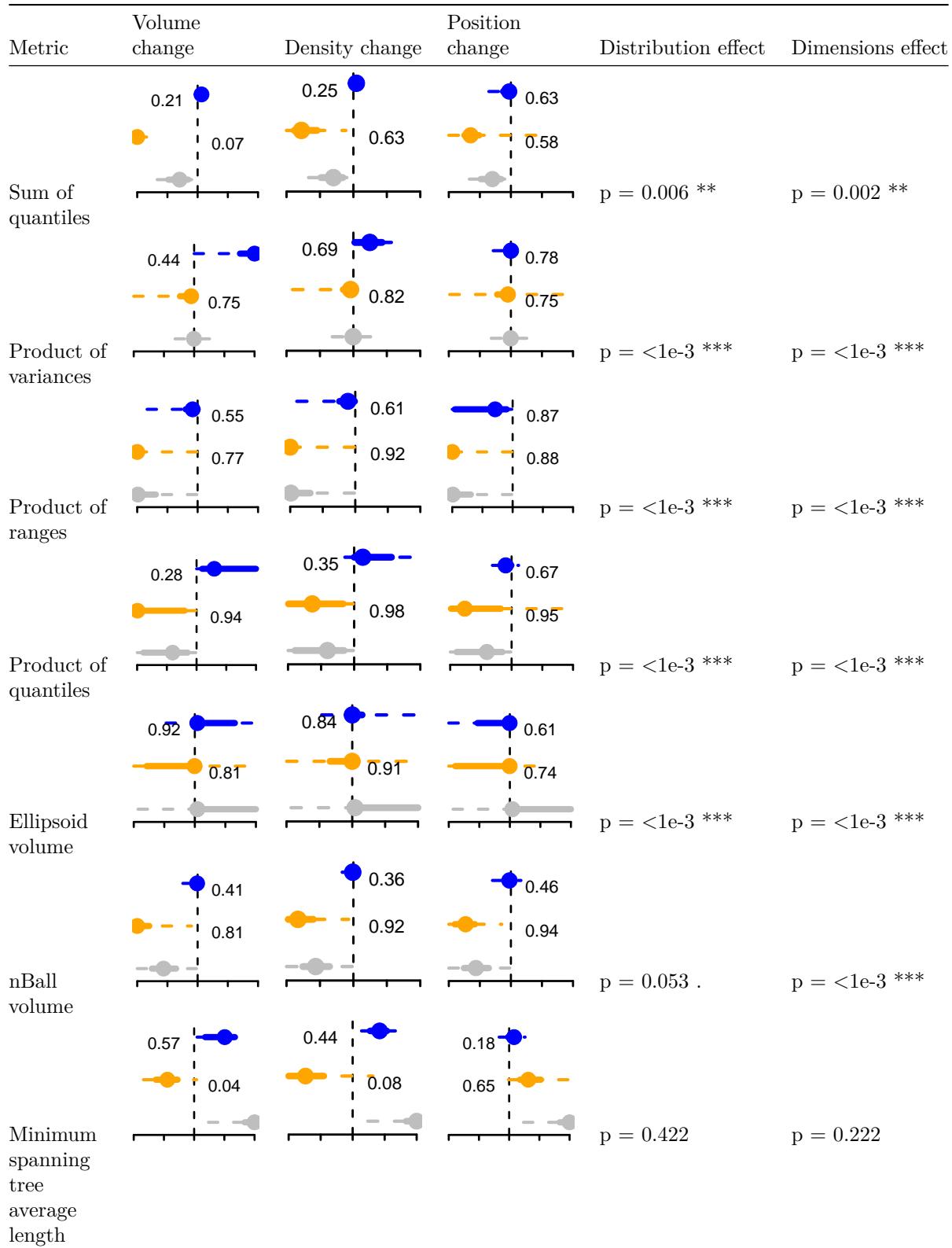
```
## The metrics names (shortened vector)
name <- all_metrics_names

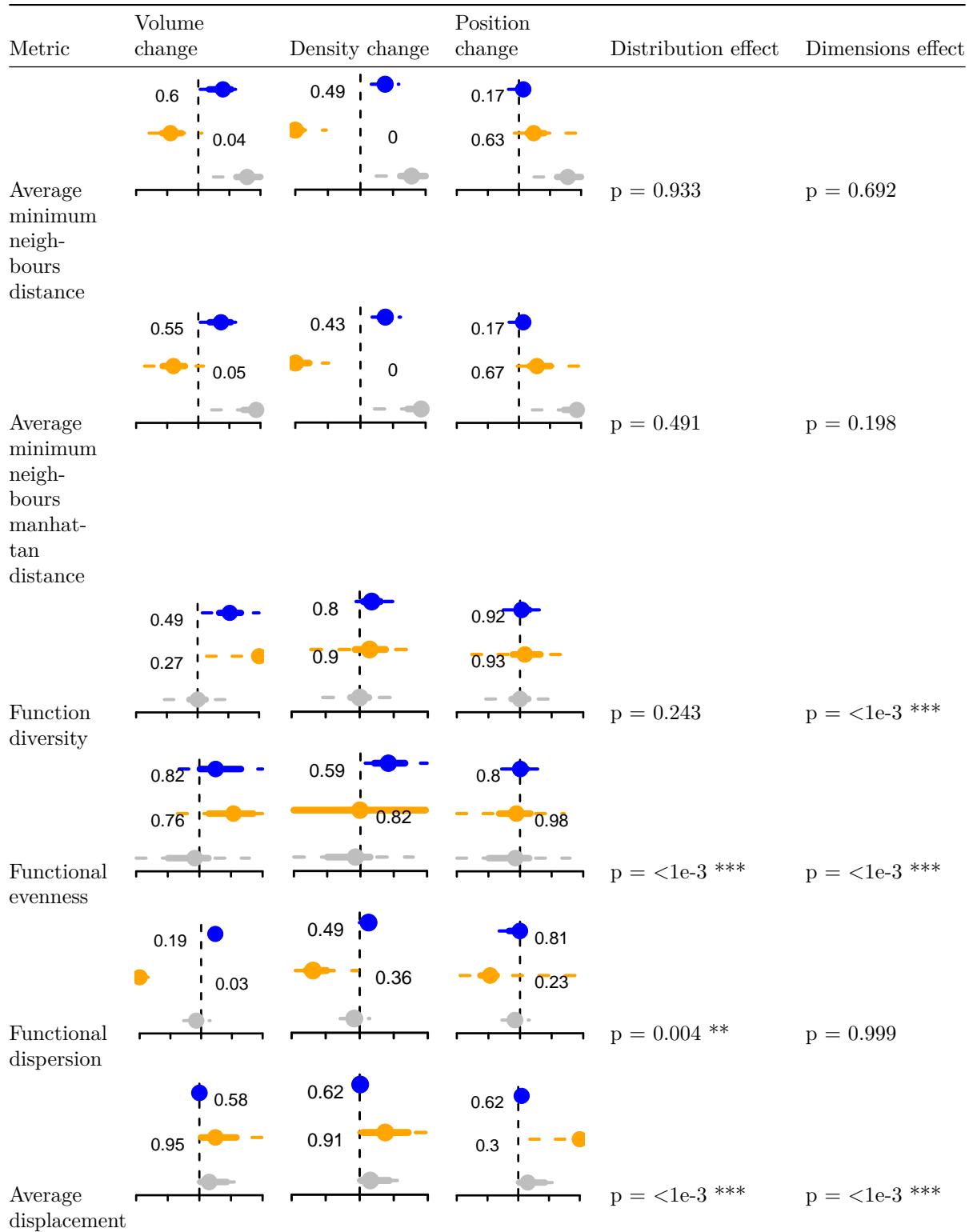
## Making a list of parameters for each mini plot
plot.param <- list(scaler = 3,
                     bg.col = "black",
                     col = c("grey", "orange", "blue"),
                     quantiles = c(95, 50),
                     cent.tend = median,
                     pch = 19,
                     metric.max = length(all_metrics),
                     cex = 2)
```

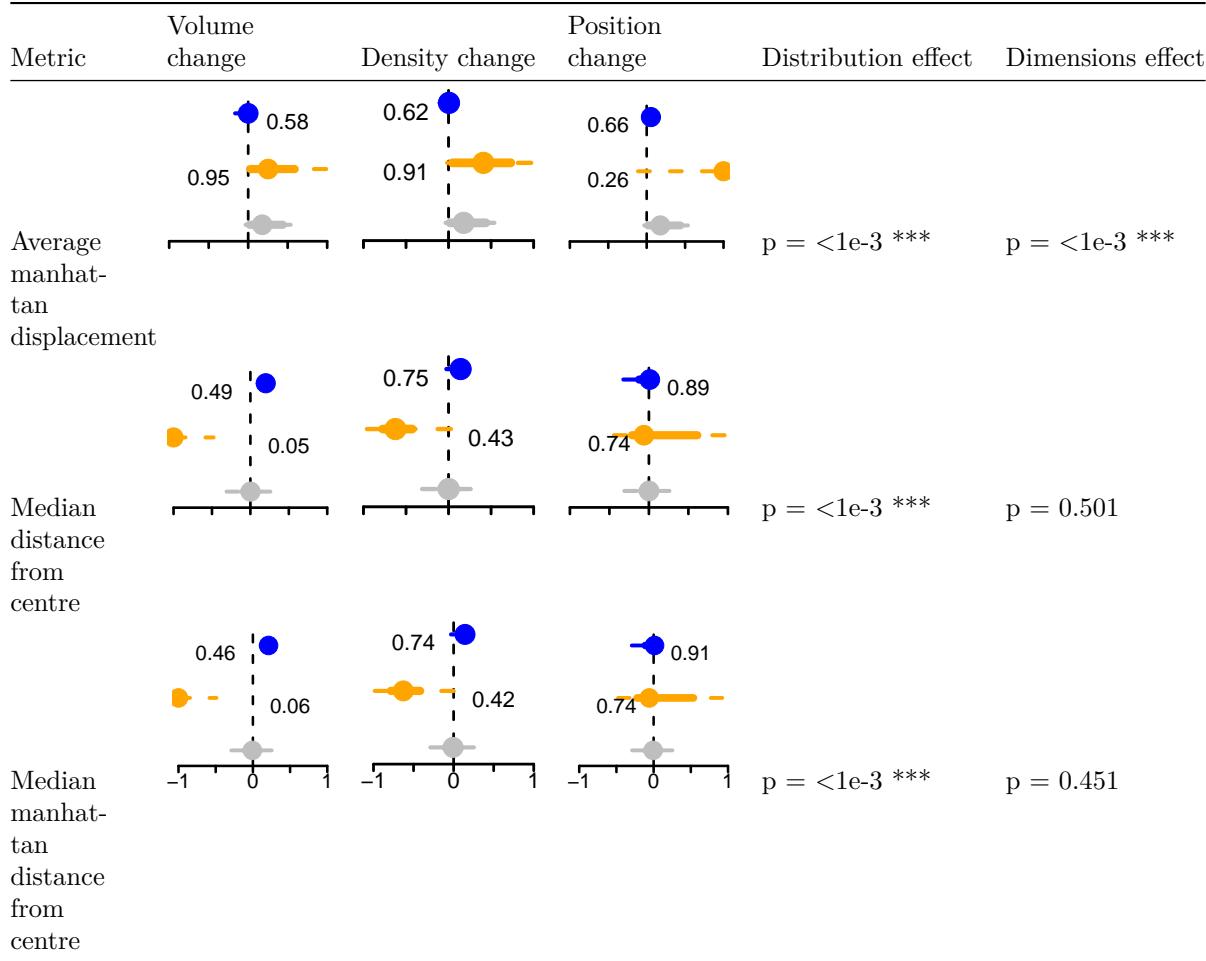
All metrics results 20% removal



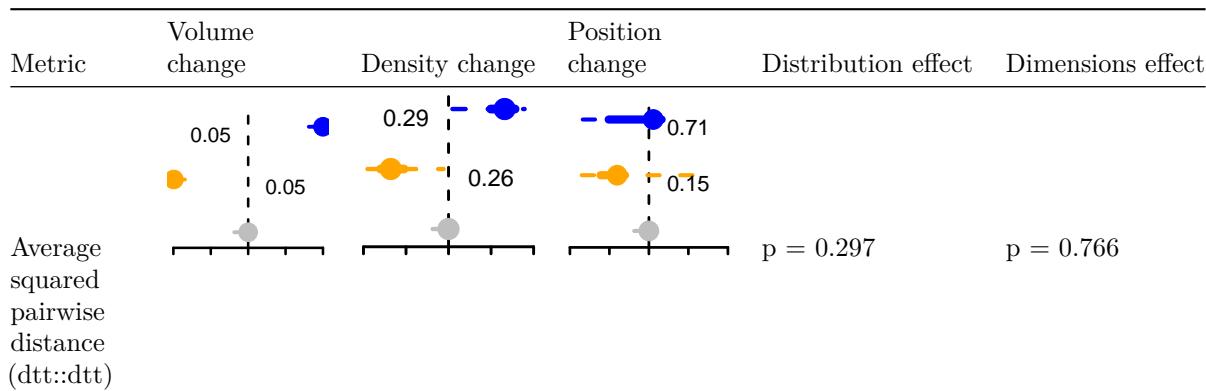


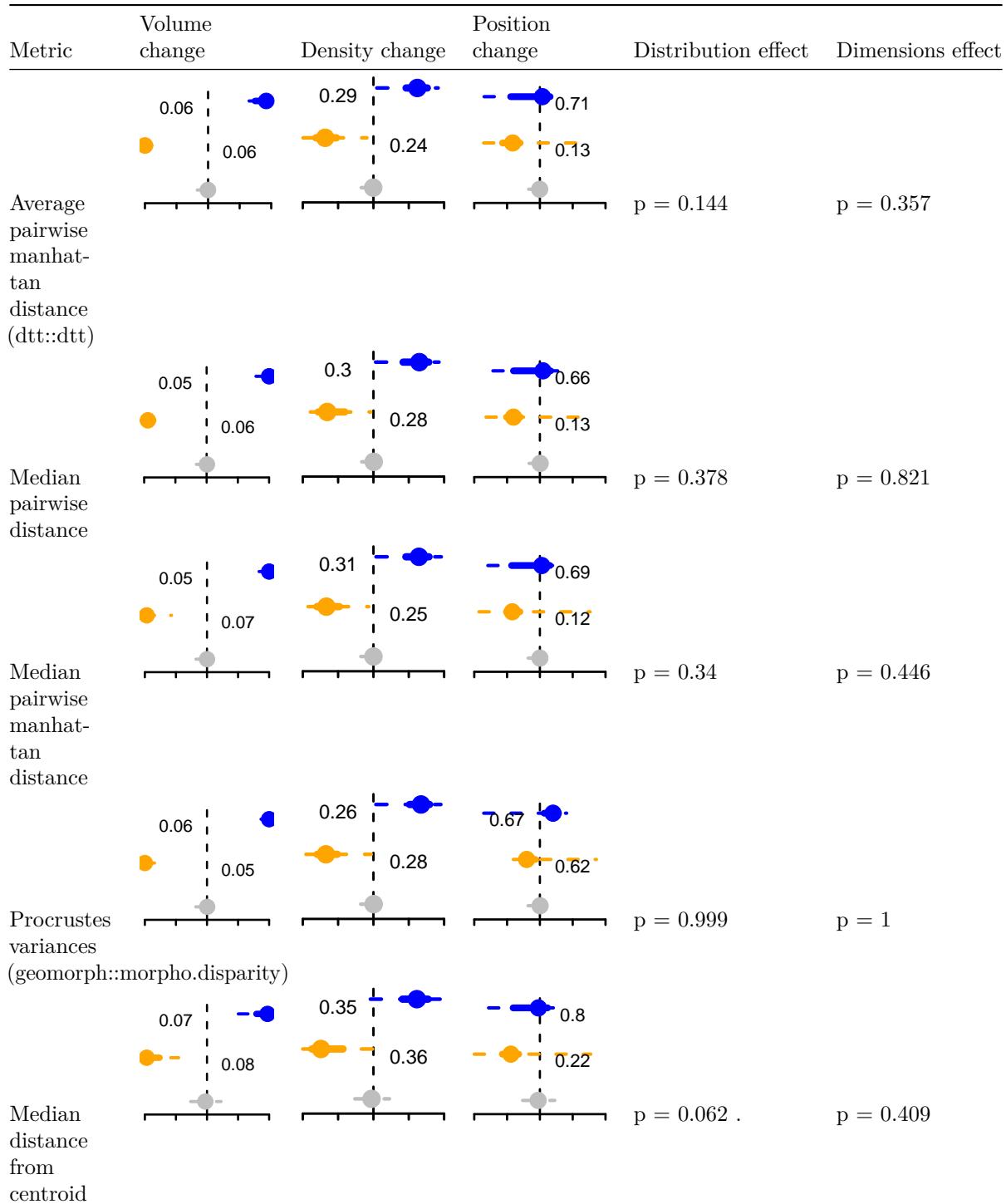


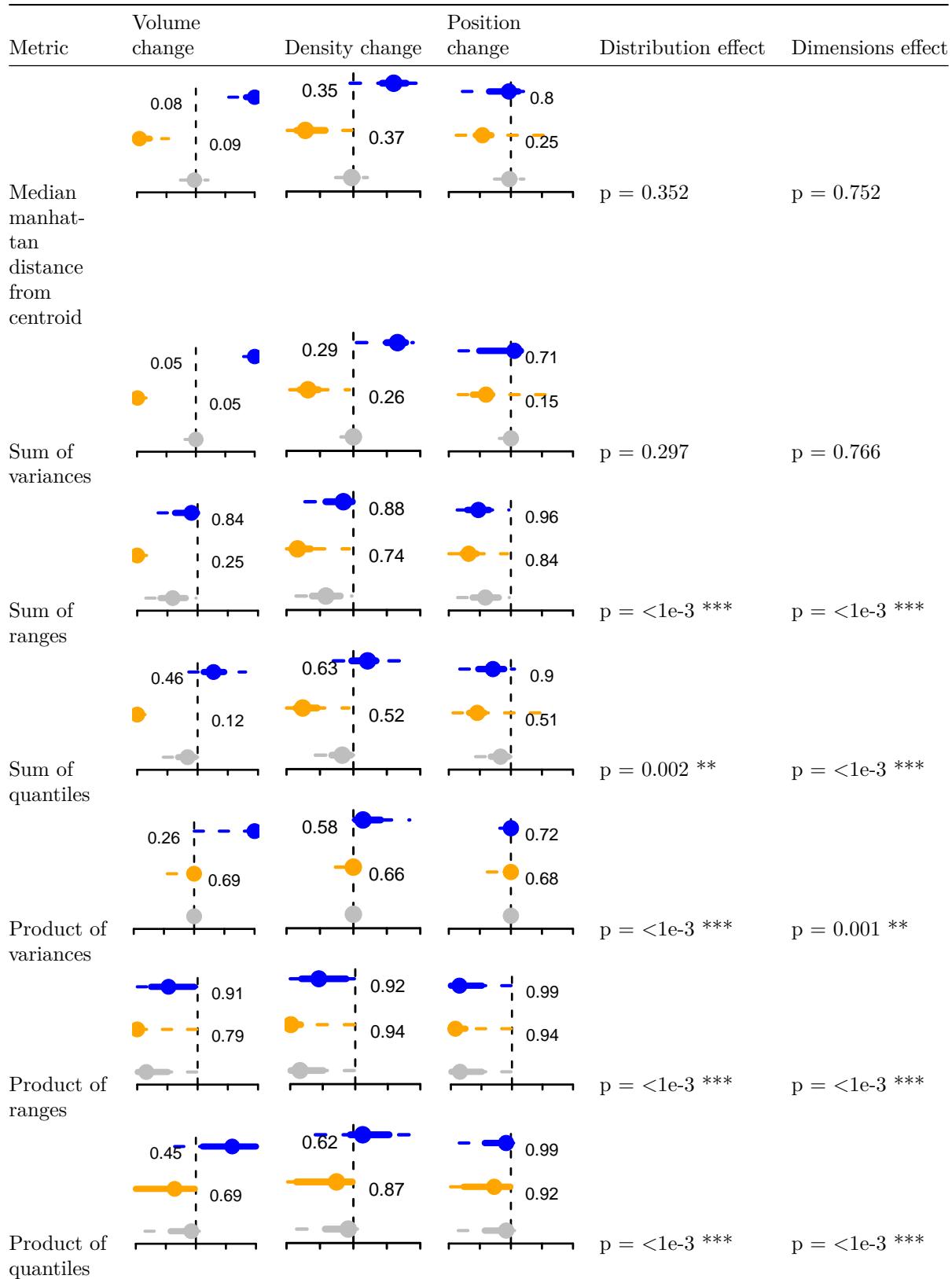


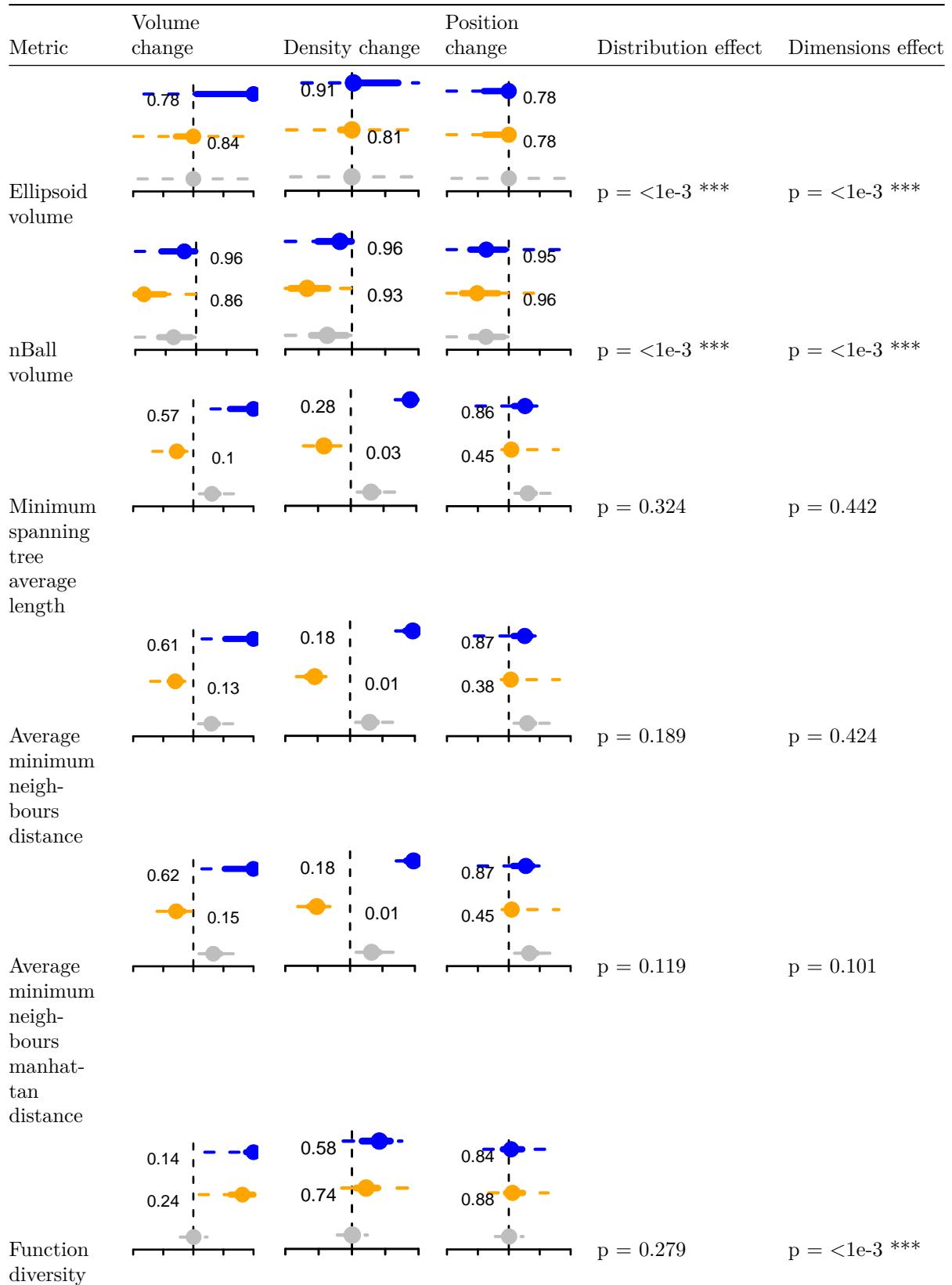


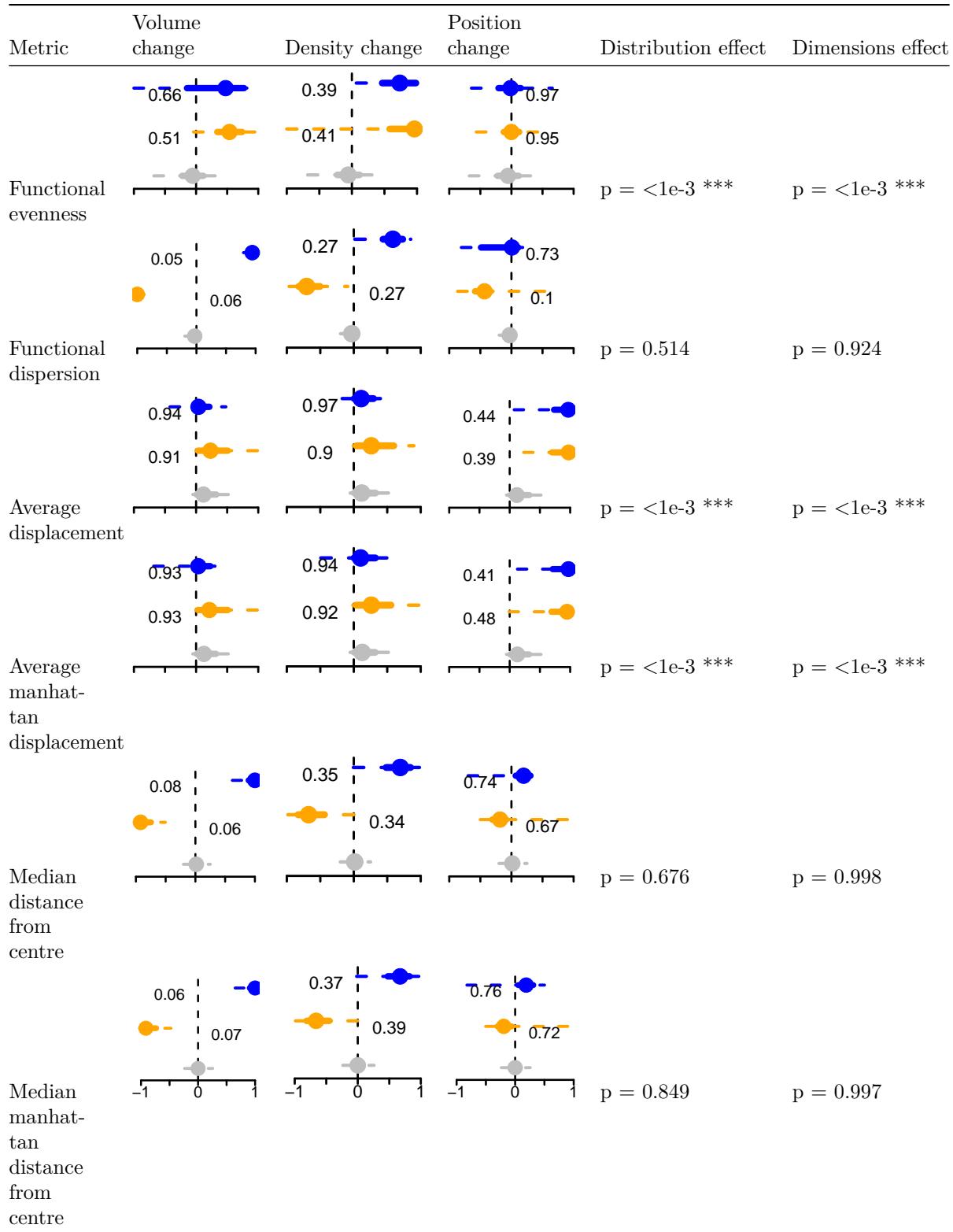
All metrics results 50% removal



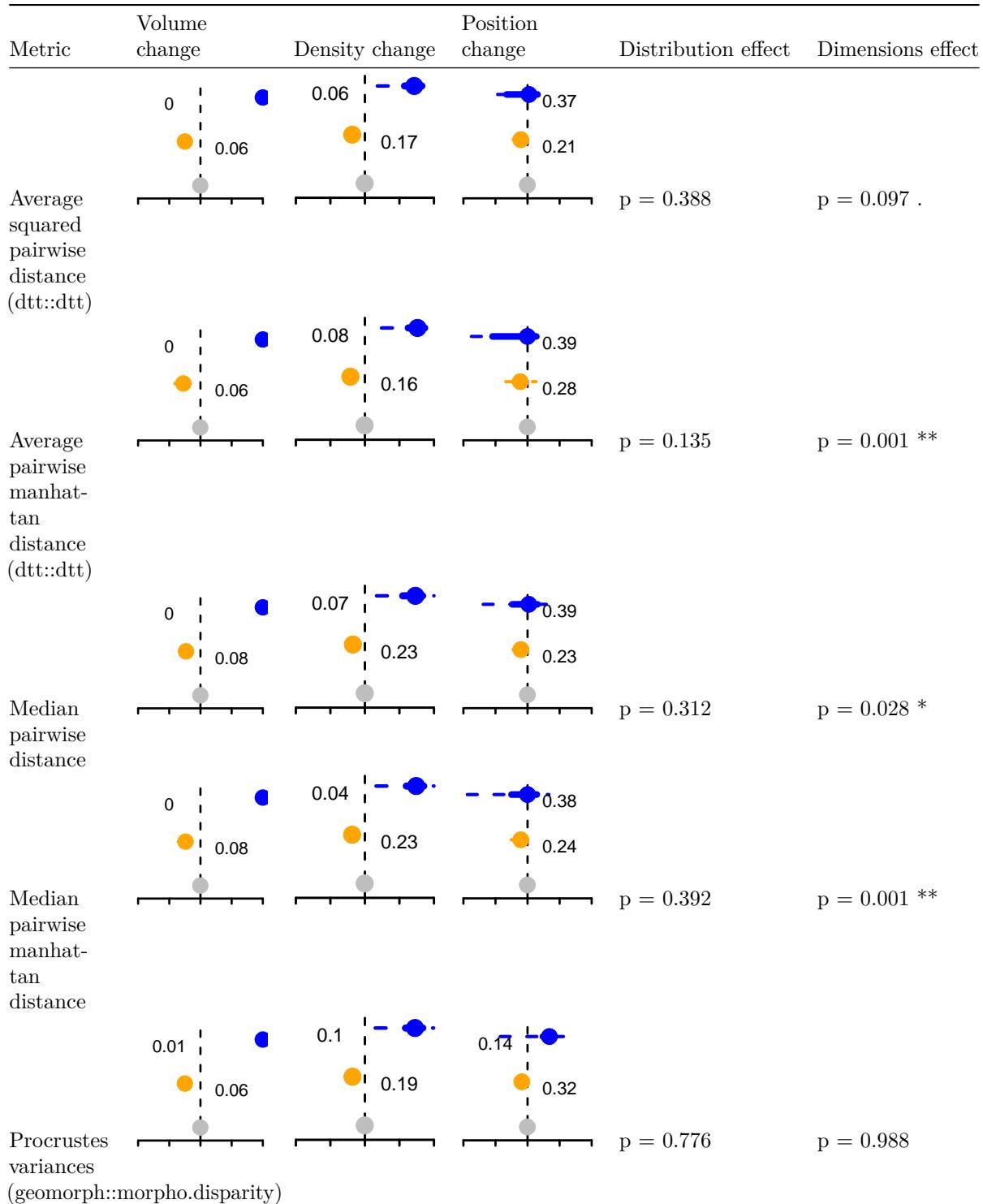


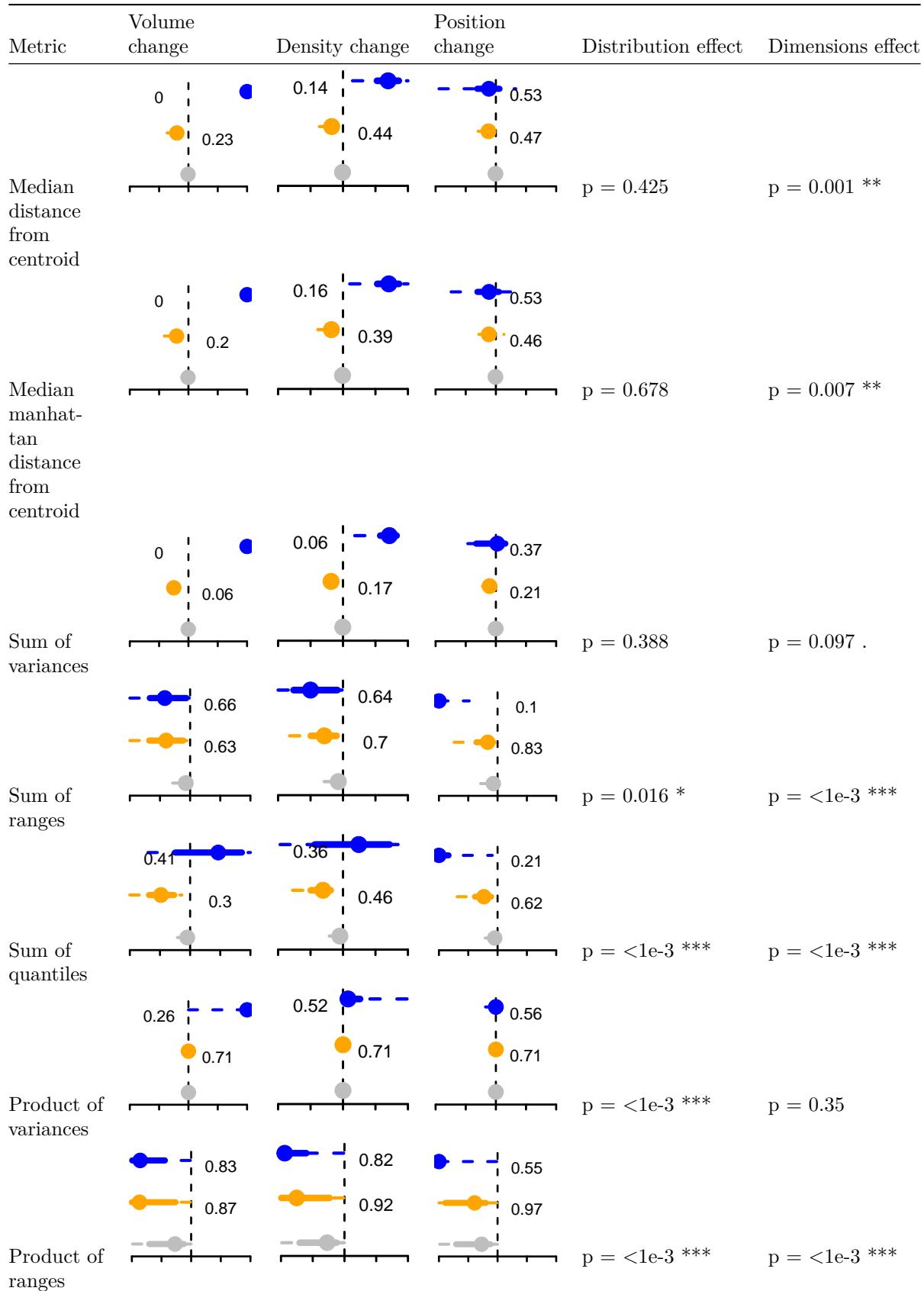


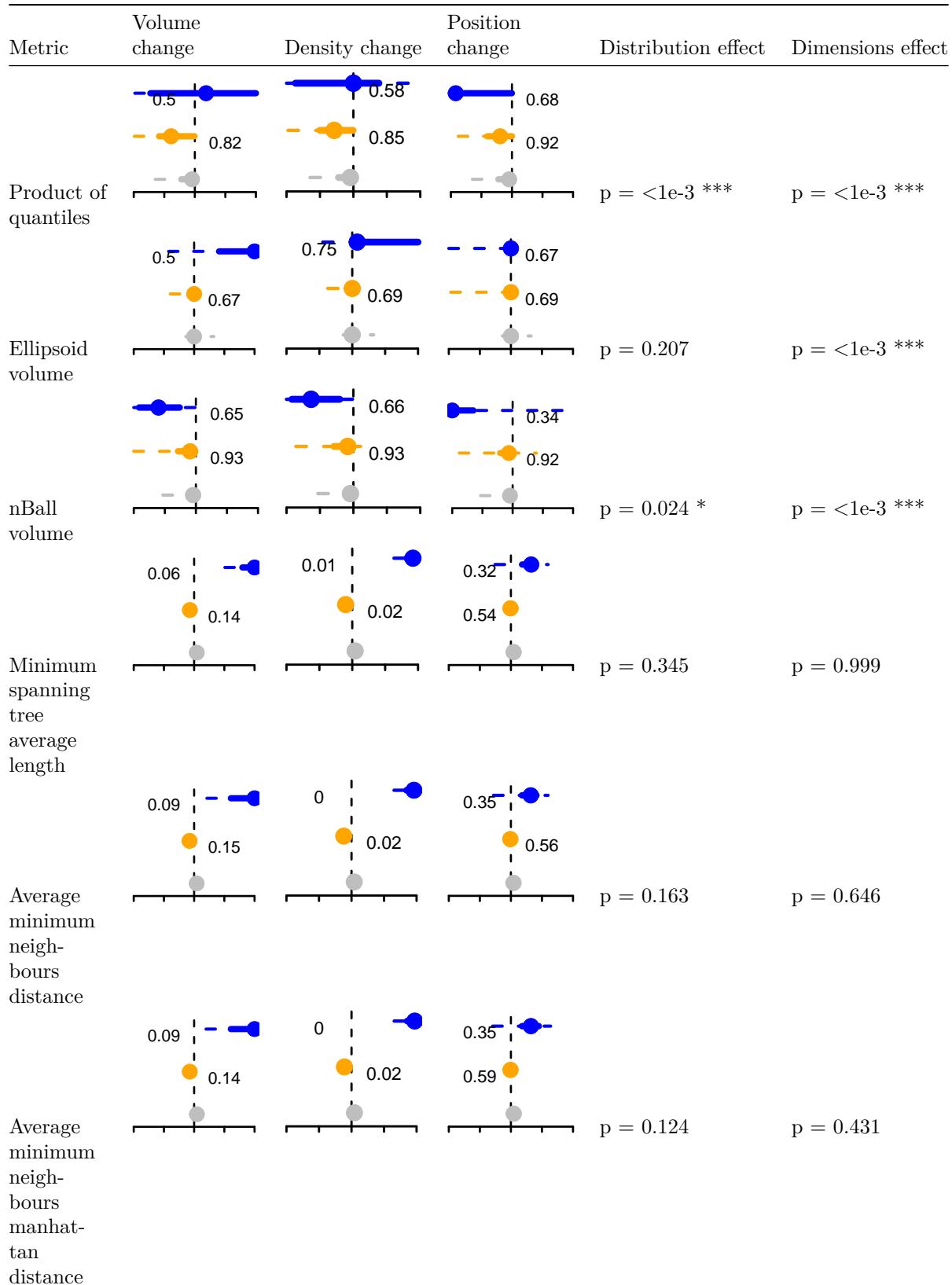


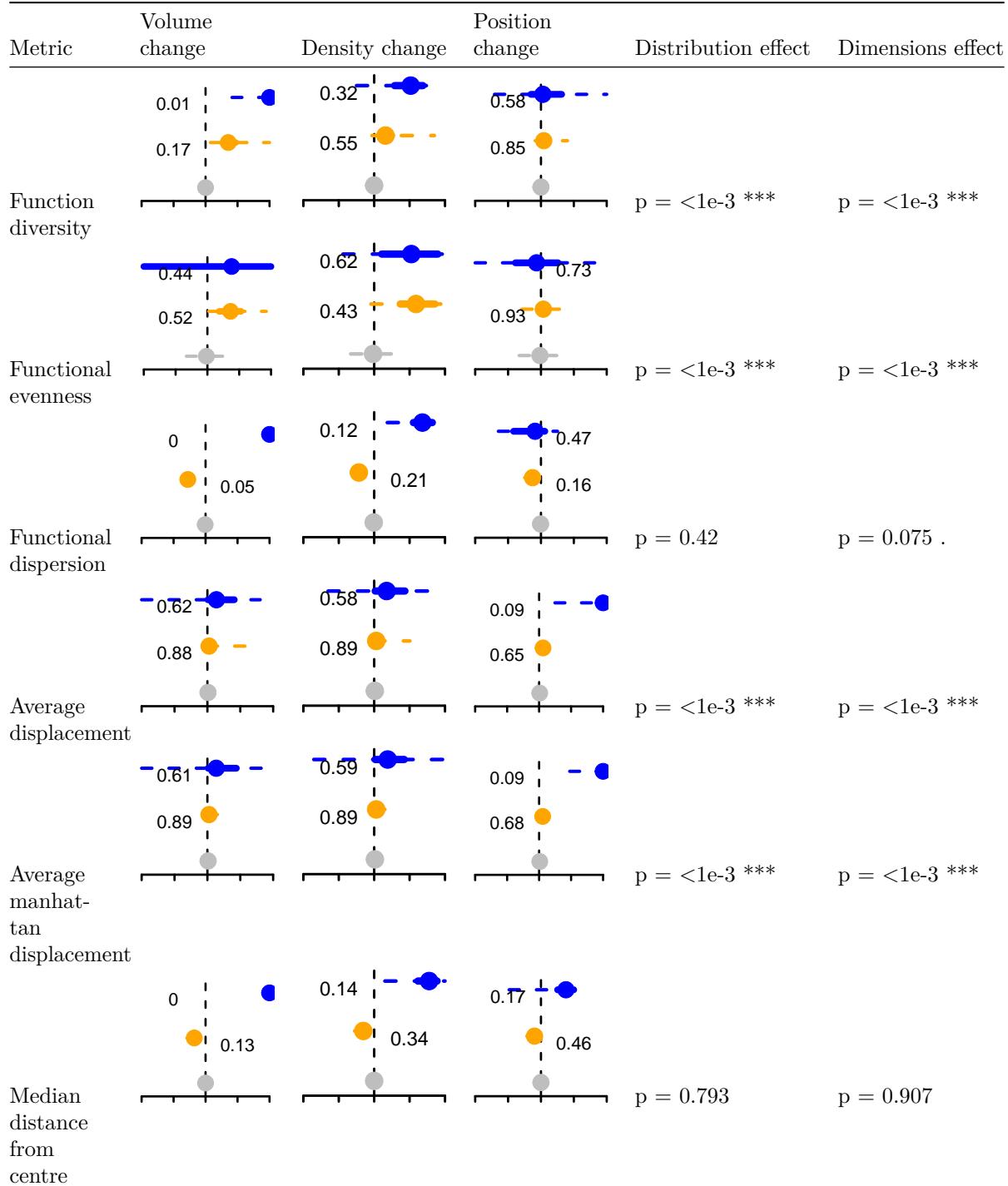


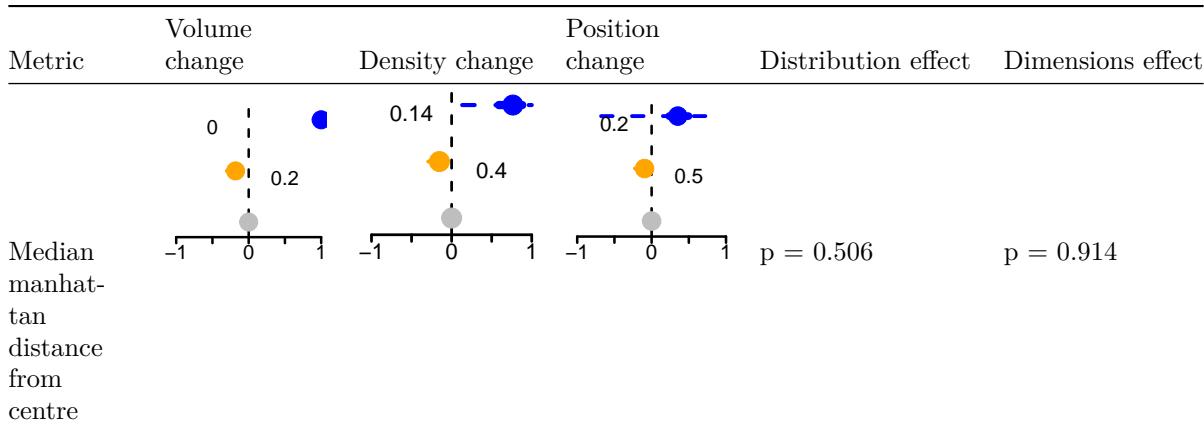
All metrics results 80% removal



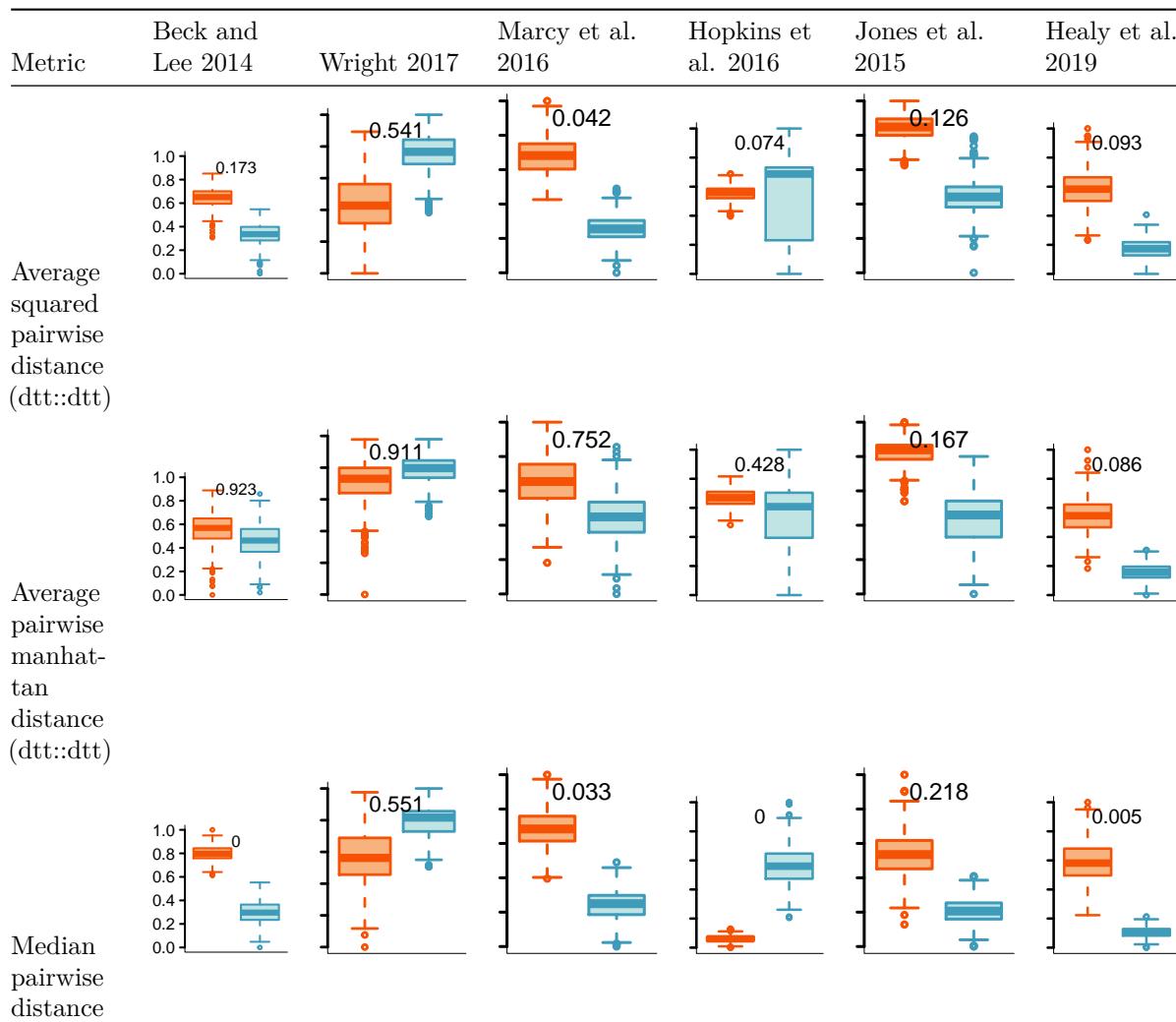


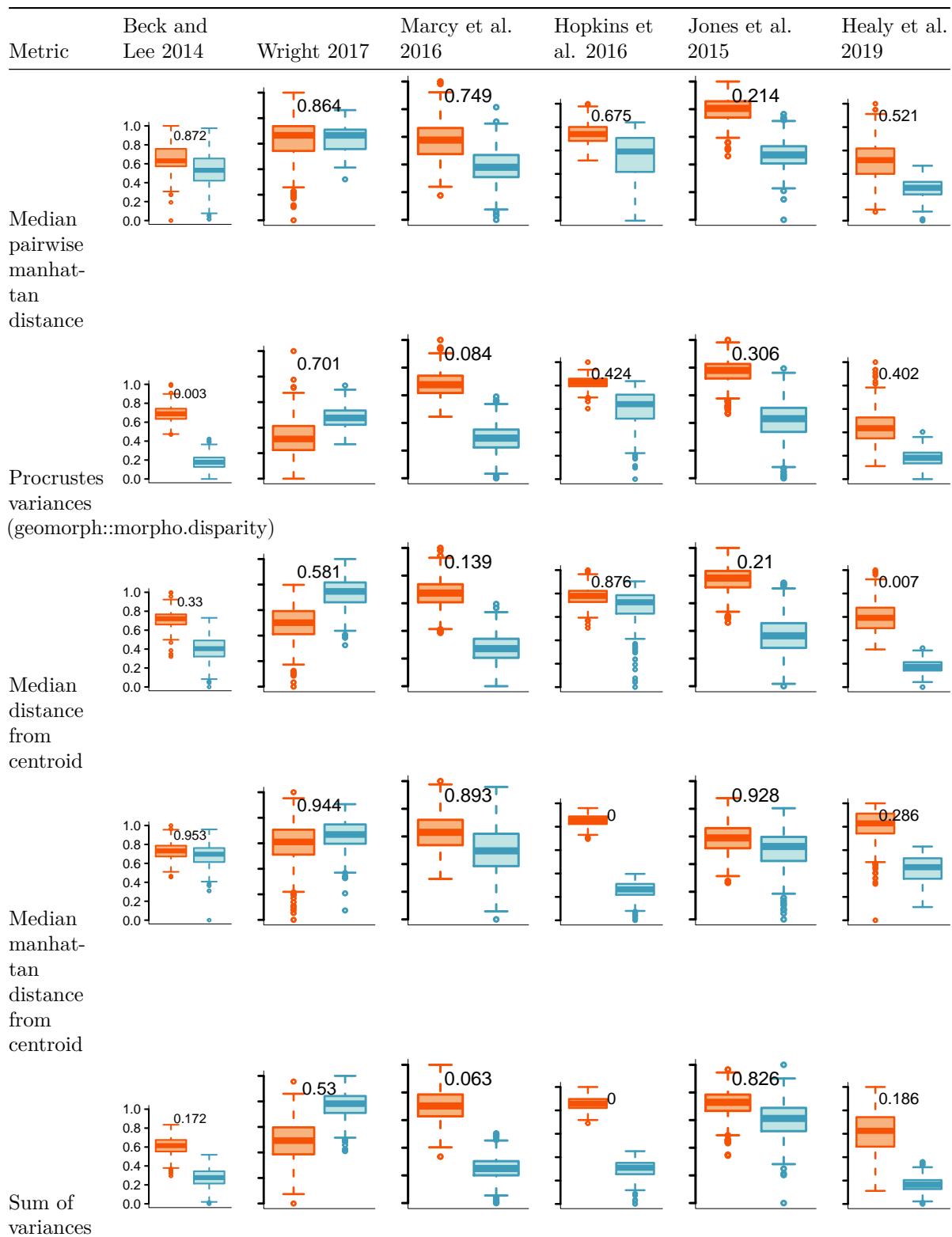


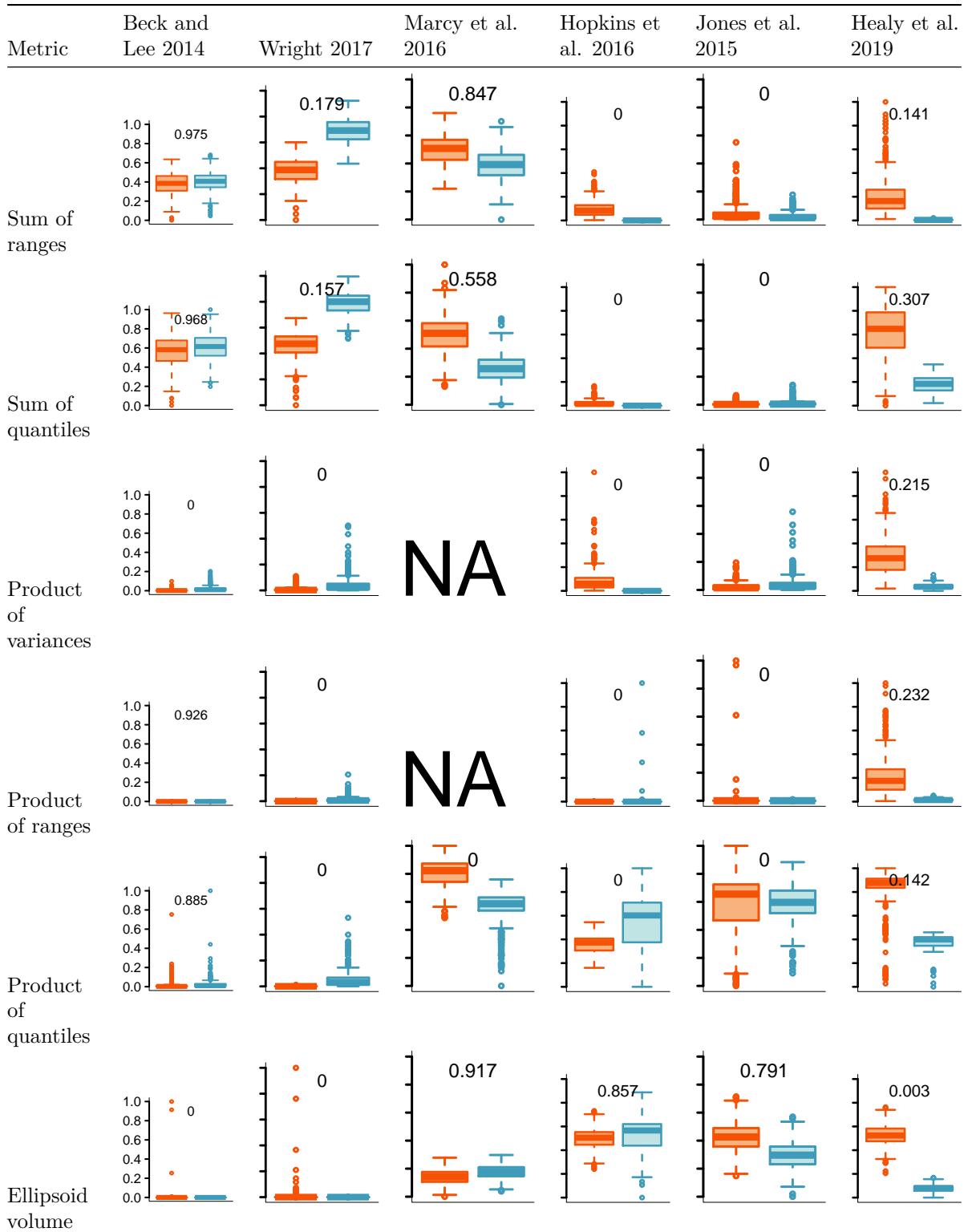


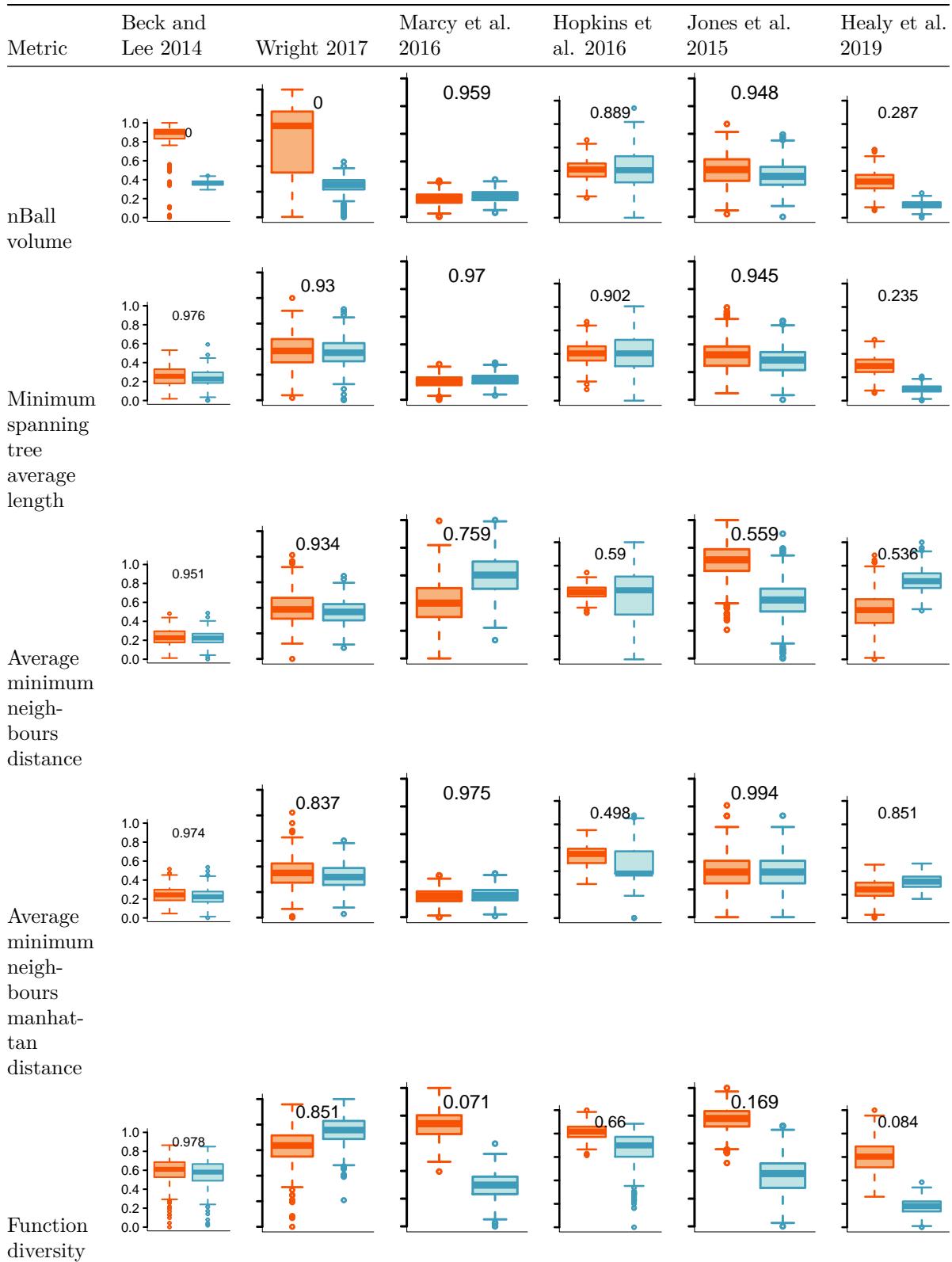


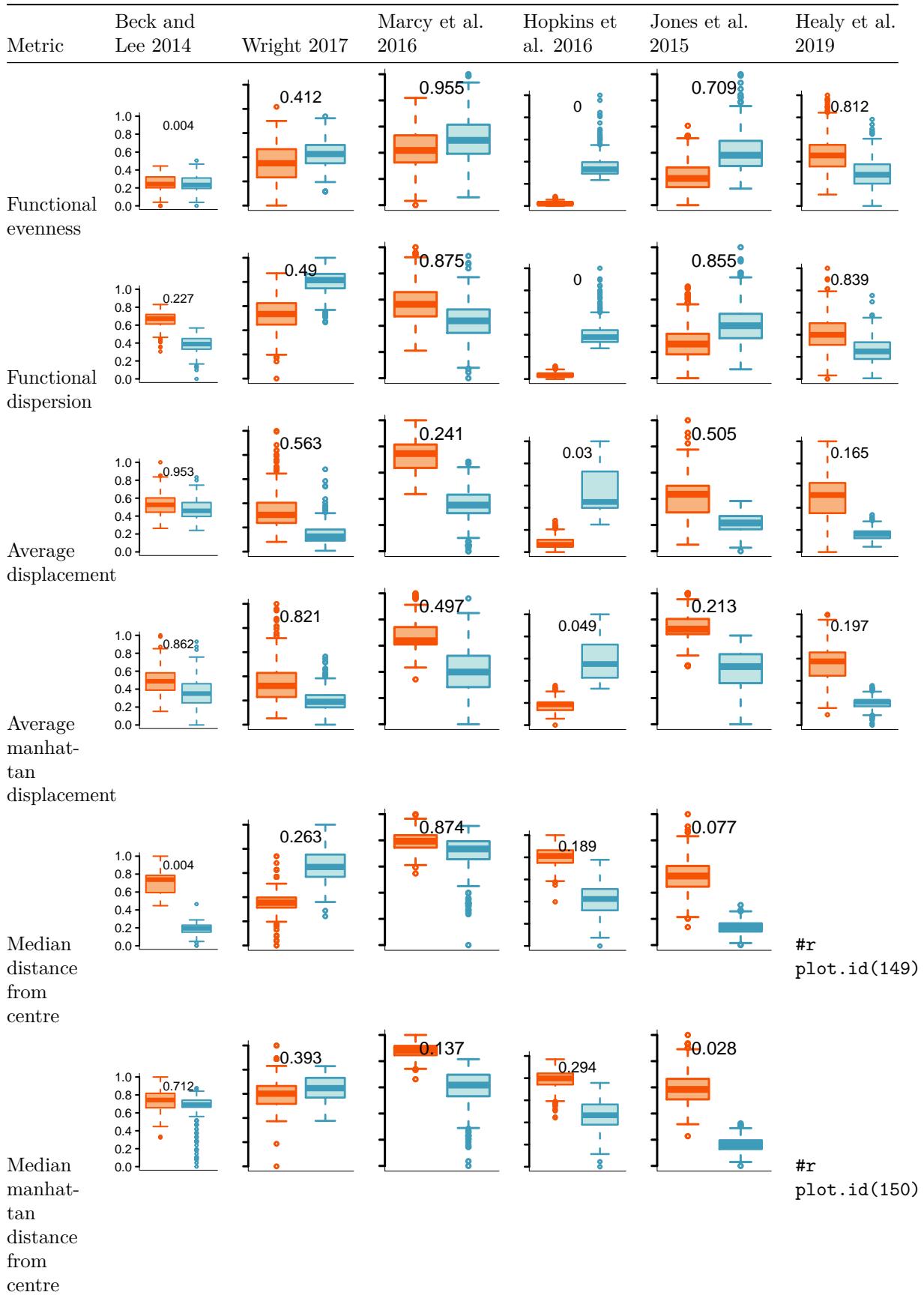
Empirical results (all metrics)











| Metric | Beck and Lee 2014 | Wright 2017 | Marcy et al. 2016 | Hopkins et al. 2016 | Jones et al. 2015 | Healy et al. 2019 |
|--------|----------------------|-------------|----------------------|------------------------|----------------------|----------------------|
|--------|----------------------|-------------|----------------------|------------------------|----------------------|----------------------|