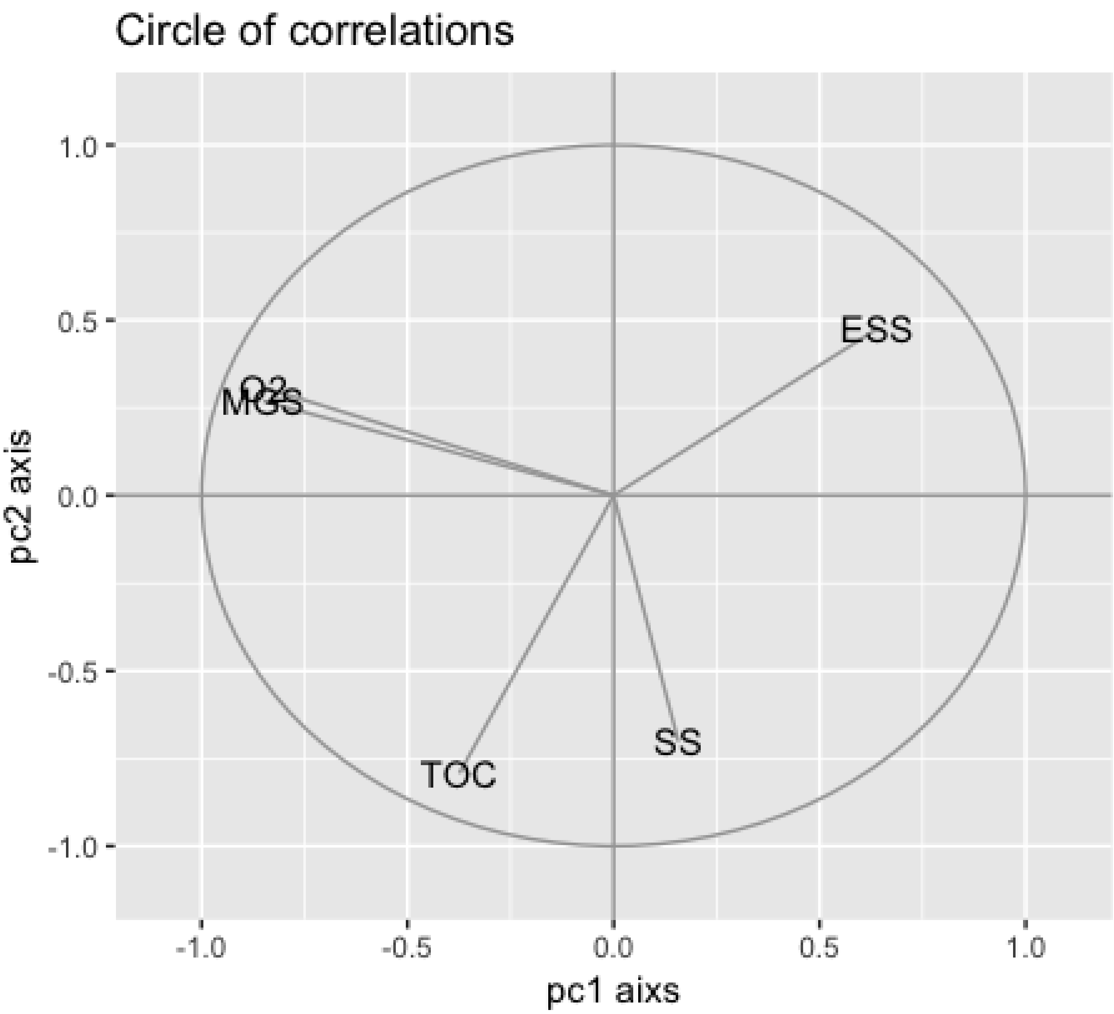

Statistical analyses were run on a subsets of the data presented in Table 1. Areas without Mean Grain Size (MGS) measurements were removed from the data set (e.g., Stations Z and BB). This resulted in data for 11 of the 13 sites examined in this study able to be examined. This data set was then subjected to principle component analysis in R generating the above figure. Illustrated by the PCA biplot, eigenvectors assigned to Epibenthic Standing Stock (ESS) and Total Organic Carbon (TOC) are somewhat diametric, meaning that they are inversely correlated. This same diametric trend is not seen between other eigenvectors. Mean Grain Size (MGS) and Oxygen eigenvectors group together and seem to be positively correlated.

Relationships observed in PCA analysis were further explored and confirmed using Pearson Correlation Coefficient to determine the linear relationship between the variables. When possible, all 13 sites were examined with Pearson's (n=13). Results can be found in the table below. The only significant relationship was a weak positive correlation between Mean Grain Size and Oxygen.

Variable 1	Variable 2	Pearson's Correlation Coefficient	R2	n=	*Correlation:* the nearer the value is to zero, the weaker the relationship
ESS	TOC	-0.4823	0.2326	11	weak negative
ESS	TOC	-0.3123	0.0975	13	weak negative
TOC	O2	-0.0335	0.0011	11	weak negative
TOC	O2	0.0294	0.0009	13	super weak positive
MGS	O2	0.7434	0.5526	11	positive
ESS	MGS	-0.2108	0.0444	11	super weak negative
SS	TOC	0.3067	0.0941	11	weak positive
SS	TOC	0.3585	0.1285	13	weak positive
SS	O2	-0.1068	0.0114	13	super weak negative

Code:

```
##FRONTIERS DATA!!!##
# PCA with function prcomp
pca1 = prcomp(Fdata, scale. = TRUE)



# sqrt of eigenvalues
pca1$sdev

# loadings
head(pca1$rotation)
# PCs (aka scores)
head(pca1$x)


##Plot of observations
# load ggplot2
library(ggplot2)

# create data frame with scores
scores = as.data.frame(pca1$x)

# plot of observations
ggplot(data = scores, aes(x = PC1, y = PC2, label = rownames(scores))) +
  geom_hline(yintercept = 0, colour = "gray65") +
  geom_vline(xintercept = 0, colour = "gray65") +
  geom_text(colour = "tomato", alpha = 0.8, size = 4) +
  ggtitle("PCA plot of Foraminifera Data")
```

```
##Circle of correlations
# function to create a circle
circle <- function(center = c(0, 0), npoints = 100) {
  r = 1
  tt = seq(0, 2 * pi, length = npoints)
  xx = center[1] + r * cos(tt)
  yy = center[1] + r * sin(tt)
  return(data.frame(x = xx, y = yy))
}
corcir = circle(c(0, 0), npoints = 100)

# create data frame with correlations between variables and PCs
correlations = as.data.frame(cor(Fdata, pca1$x))

# data frame with arrows coordinates
arrows = data.frame(x1 = c(0, 0, 0, 0, 0), y1 = c(0, 0, 0, 0, 0), x2 = correlations$PC1,
                    y2 = correlations$PC2)

# geom_path will do open circles
ggplot() + geom_path(data = corcir, aes(x = x, y = y), colour = "gray65") +
  geom_segment(data = arrows, aes(x = x1, y = y1, xend = x2, yend = y2), colour = "gray65") +
  geom_text(data = correlations, aes(x = PC1, y = PC2, label = rownames(correlations))) +
  geom_hline(yintercept = 0, colour = "gray65") + geom_vline(xintercept = 0,
                                                              colour = "gray65") + xlim(-1.1, 1.1) + ylim(-1.1, 1.1) + labs(x =
"pc1 aixs",
                                                                                                                            y = "pc2 axis") +
ggtitle("Circle of correlations")
```

Results of R:

```
> View(Fdata)
> ##FRONTIERS DATA!!!##
> # PCA with function prcomp
> pca1 = prcomp(Fdata, scale. = TRUE)
> # sqrt of eigenvalues
> pca1$sdev
[1] 1.4207037 1.2303458 0.8797703 0.7422846 0.3779786
> # loadings
> head(pca1$rotation)
           PC1        PC2        PC3        PC4        PC5
MGS -0.5983826  0.2185458 -0.2614201  0.4342729 -0.5807260
TOC -0.2636214 -0.6442930  0.1789607  0.5804510  0.3826748
O2  -0.5979505  0.2501085 -0.3141561 -0.3071505  0.6219851
```

```
ESS  0.4501300  0.3859190 -0.4729947  0.5681725  0.3192266
SS   0.1108160 -0.5706458 -0.7597464 -0.2394207 -0.1659708
> # PCs (aka scores)
> head(pca1$x)
          PC1        PC2         PC3        PC4         PC5
[1,]  0.2629010  0.7646930 -1.00624866  0.9625796 -0.70015975
[2,]  1.6217888  0.8850462  0.09888609  0.4184100  0.74718617
[3,]  0.5768880 -2.4623715 -1.17478559 -0.8452668  0.06776053
[4,]  0.4876588  0.7060636  0.82312260 -0.5838049 -0.41951306
[5,]  0.4589969  0.4697771  0.84285924 -0.3797488 -0.20666666
[6,] -0.9937053 -1.4311148  0.83183633  1.1377766 -0.06038815
> ##Plot of observations
> # load ggplot2
> library(ggplot2)
> # create data frame with scores
> scores = as.data.frame(pca1$x)
> ggplot(data = scores, aes(x = PC1, y = PC2, label = rownames(scores))) +
+   geom_hline(yintercept = 0, colour = "gray65") +
+   geom_vline(xintercept = 0, colour = "gray65") +
+   geom_text(colour = "tomato", alpha = 0.8, size = 4) +
+   ggtitle("PCA plot of Foraminifera Data")
> circle <- function(center = c(0, 0), npoints = 100) {
+   r = 1
+   tt = seq(0, 2 * pi, length = npoints)
+   xx = center[1] + r * cos(tt)
+   yy = center[1] + r * sin(tt)
+   return(data.frame(x = xx, y = yy))
+ }
> corcir = circle(c(0, 0), npoints = 100)
> # create data frame with correlations between variables and PCs
> correlations = as.data.frame(cor(Fdata, pca1$x))
> arrows = data.frame(x1 = c(0, 0, 0, 0, 0), y1 = c(0, 0, 0, 0, 0), x2 = correlations$PC1,
+                    y2 = correlations$PC2)
> ggplot() + geom_path(data = corcir, aes(x = x, y = y), colour = "gray65") +
+   geom_segment(data = arrows, aes(x = x1, y = y1, xend = x2, yend = y2), colour = "gray65") +
+   geom_text(data = correlations, aes(x = PC1, y = PC2, label = rownames(correlations))) +
+   geom_hline(yintercept = 0, colour = "gray65") + geom_vline(xintercept = 0,
+                                                  colour = "gray65") + xlim(-1.1, 1.1) + ylim(-1.1, 1.1) + labs(x
= "pc1 aixs",
+                                                                                                              y = "pc2 axis") +
ggtitle("Circle of correlations")
```