cor

This code creates a correlation matrix to look at relationships between variables. This helps identify specific relationships of interest

Link:

Getting Started

Libraries

Data

Site data sets have lags incorporated (made in `MASTER_MAKER.qmd`)

Cleaning

Remove non-numeric variables

```
bo<-
  bo %>%
  select(!c(date, ...1))

c2<-
  c2 %>%
  select(!c(date, ...1))

rd<-
  rd %>%
  select(!c(date, ...1))
```

Make Datasets for normal and non-normal variables

Variables that are normally distributed across all three sites will be in one df. All others will be in another.

```
#BLIND OSO
b_norm<-
  bo %>%
  select(!c(sal, secchi, nn, tdn, don, doc, toc, tn))
b_para<-
  bo %>%
  select(sal, secchi, nn, tdn, don, doc, toc, tn)

#CANALS
c_norm<-
  c2 %>%
  select(!c(sal, secchi, nn, tdn, don, doc, toc, tn))
c_para<-
  c2 %>%
  select(sal, secchi, nn, tdn, don, doc, toc, tn)

#GULF
r_norm<-
  rd %>%
  select(!c(sal, secchi, nn, tdn, don, doc, toc, tn))
r_para<-
  rd %>%
  select(sal, secchi, nn, tdn, don, doc, toc, tn)
```

Log10 Transform non-normally distributed data for Norm df

Distributions can be found in `1_distribution.qmd`

```
#BLIND OSO
b_norm<-
  b_norm %>%
  mutate(amm = log10(amm), #Log-transforms data
         din_dip = log10(din_dip),
         dust = log10(dust),
         chl = log10(chl),
         dust_lag = log10(dust_lag))
```

```r
#CANALS
c_norm<-
  c_norm %>%
  mutate(orthop = log10(orthop),
         dust = log10(dust),
         dust_lag = log10(dust_lag))


#GULF
r_norm<-
  r_norm %>%
  mutate(dust = log10(dust),
         dust_lag = log10(dust_lag))
```

Correlation Matrix

There are different methods for **correlation analysis** : **Pearson parametric correlation test**, **Spearman** and **Kendall** rank-based **correlation analysis**. The default is pearson correlation coefficient which measures the linear **dependence** between two variables. kendall and spearman correlation methods are non-parametric **rank-based correlation test**.

1. Compute Correlations

If your data contain missing values, use the following R code to handle missing values by case-wise deletion.

```r
cor(x, method = "pearson", use = "complete.obs")
```

2. Make Function to Format

Simple function for formatting a **correlation matrix** into a table with 4 columns containing : Column 1 : row names (variable 1 for the correlation test), Column 2 : column names (variable 2 for the correlation test), Column 3 : the **correlation coefficients**, Column 4 : the **p-values** of the correlations

```r
flattenCorrMatrix <- function(cormat, pmat) {
  ut <- upper.tri(cormat)
  data.frame(
    row = rownames(cormat)[row(cormat)[ut]],
    column = rownames(cormat)[col(cormat)[ut]],
```

```
    cor  =(cormat)[ut],
    p = pmat[ut])}
```

3. Make Matrix

The function **rcorr()** [in **Hmisc** package] can be used to compute the **significance levels** for **pearson** and **spearman correlations**. It returns both the correlation coefficients and the p-value of the correlation for all possible pairs of columns in the data table.

NOTE THIS IS WITH DATA SETS PRIOR TO LOG TRANSFORMATION. SO EVERYTHING SPEARMANS.

```
bclean<- rcorr(as.matrix(bo))
flattenCorrMatrix(bclean$r, bclean$P)
```

```
         row   column          cor            p
1   copies_mL      chl  0.391956924 2.076230e-01
2   copies_mL      sal -0.413302183 1.817313e-01
3         chl      sal -0.633133322 2.710736e-02
4   copies_mL     temp -0.236364771 4.595296e-01
5         chl     temp -0.300703707 3.422521e-01
6         sal     temp  0.839120460 6.435872e-04
7   copies_mL   do_mgl  0.040715966 9.000217e-01
8         chl   do_mgl  0.426022274 1.673081e-01
9         sal   do_mgl -0.833672734 7.528661e-04
10       temp   do_mgl -0.798746187 1.834246e-03
11  copies_mL   do_per -0.101928025 7.526039e-01
12        chl   do_per  0.382872428 2.192883e-01
13        sal   do_per -0.744011588 5.527043e-03
14       temp   do_per -0.739913350 5.938779e-03
15     do_mgl   do_per  0.981998903 1.444345e-08
16  copies_mL       pH -0.090384104 7.799754e-01
17        chl       pH  0.210430820 5.115249e-01
18        sal       pH -0.242139909 4.483027e-01
19       temp       pH -0.206445779 5.197354e-01
20     do_mgl       pH  0.212156883 5.079865e-01
21     do_per       pH  0.233586970 4.649763e-01
22  copies_mL   secchi -0.267294326 4.009739e-01
23        chl   secchi -0.243389338 4.458911e-01
24        sal   secchi  0.312779433 3.222376e-01
25       temp   secchi  0.499655902 9.812279e-02
```

26	do_mgl	secchi	-0.386031042	2.151885e-01
27	do_per	secchi	-0.401507851	1.957752e-01
28	pH	secchi	0.393633755	2.055121e-01
29	copies_mL	amm	0.191703516	5.505952e-01
30	chl	amm	-0.085721196	7.910987e-01
31	sal	amm	-0.320622747	3.095906e-01
32	temp	amm	-0.409205544	1.865359e-01
33	do_mgl	amm	0.373429487	2.318236e-01
34	do_per	amm	0.327694095	2.984286e-01
35	pH	amm	-0.299836518	3.437145e-01
36	secchi	amm	-0.299372600	3.444982e-01
37	copies_mL	nn	0.545697855	6.646618e-02
38	chl	nn	0.296880635	3.487244e-01
39	sal	nn	-0.598744663	3.968362e-02
40	temp	nn	-0.536153216	7.234848e-02
41	do_mgl	nn	0.460563177	1.318708e-01
42	do_per	nn	0.323420502	3.051471e-01
43	pH	nn	-0.197758933	5.378283e-01
44	secchi	nn	-0.193293745	5.472304e-01
45	amm	nn	0.123519354	7.021259e-01
46	copies_mL	orthop	0.482379585	1.122269e-01
47	chl	orthop	0.450582938	1.415569e-01
48	sal	orthop	-0.456214620	1.360366e-01
49	temp	orthop	-0.321965443	3.074536e-01
50	do_mgl	orthop	0.323036048	3.057556e-01
51	do_per	orthop	0.258084418	4.180008e-01
52	pH	orthop	-0.024529552	9.396827e-01
53	secchi	orthop	-0.219991438	4.920626e-01
54	amm	orthop	-0.272874490	3.908309e-01
55	nn	orthop	0.782354948	2.633910e-03
56	copies_mL	sil	-0.152314048	6.365199e-01
57	chl	sil	-0.262357347	4.100572e-01
58	sal	sil	-0.105010322	7.453382e-01
59	temp	sil	-0.379349806	2.239156e-01
60	do_mgl	sil	0.373777105	2.313547e-01
61	do_per	sil	0.396807301	2.015529e-01
62	pH	sil	-0.218608814	4.948563e-01
63	secchi	sil	-0.231922407	4.682546e-01
64	amm	sil	0.664275925	1.846704e-02
65	nn	sil	0.194391140	5.449133e-01
66	orthop	sil	-0.007650716	9.811735e-01
67	copies_mL	din	0.548177280	6.499395e-02
68	chl	din	0.294113984	3.534486e-01

69	sal	din	-0.604058399	3.751263e-02
70	temp	din	-0.543618288	6.771861e-02
71	do_mgl	din	0.467503637	1.253957e-01
72	do_per	din	0.329780358	2.951793e-01
73	pH	din	-0.203800072	5.252178e-01
74	secchi	din	-0.199353873	5.344866e-01
75	amm	din	0.145190159	6.525502e-01
76	nn	din	0.999760832	0.000000e+00
77	orthop	din	0.774072897	3.127218e-03
78	sil	din	0.208555520	5.153816e-01
79	copies_mL	din_dip	-0.047787641	8.827550e-01
80	chl	din_dip	0.017087717	9.579646e-01
81	sal	din_dip	-0.519065701	8.375388e-02
82	temp	din_dip	-0.721666972	8.058243e-03
83	do_mgl	din_dip	0.576410263	4.979063e-02
84	do_per	din_dip	0.540000010	6.993637e-02
85	pH	din_dip	0.037291197	9.083986e-01
86	secchi	din_dip	-0.230432034	4.711989e-01
87	amm	din_dip	0.765266932	3.725715e-03
88	nn	din_dip	0.181829199	5.716775e-01
89	orthop	din_dip	-0.257353284	4.193676e-01
90	sil	din_dip	0.641940860	2.441687e-02
91	din	din_dip	0.198156206	5.369951e-01
92	copies_mL	tdn	0.287534937	3.648182e-01
93	chl	tdn	0.410256773	1.852956e-01
94	sal	tdn	-0.709814335	9.709452e-03
95	temp	tdn	-0.543458455	6.781554e-02
96	do_mgl	tdn	0.810583897	1.383792e-03
97	do_per	tdn	0.730261812	6.999423e-03
98	pH	tdn	-0.049099545	8.795566e-01
99	secchi	tdn	-0.189431661	5.554171e-01
100	amm	tdn	0.576652928	4.967200e-02
101	nn	tdn	0.616619398	3.271932e-02
102	orthop	tdn	0.310974276	3.251878e-01
103	sil	tdn	0.420134427	1.738913e-01
104	din	tdn	0.627518091	2.893069e-02
105	din_dip	tdn	0.528084909	7.759187e-02
106	copies_mL	don	-0.204644518	5.234652e-01
107	chl	don	0.208773617	5.149324e-01
108	sal	don	-0.263734662	4.075128e-01
109	temp	don	-0.118391477	7.140228e-01
110	do_mgl	don	0.529151823	7.688406e-02
111	do_per	don	0.570496650	5.274354e-02

112	pH	don	0.148444809	6.452093e-01
113	secchi	don	-0.030354646	9.253908e-01
114	amm	don	0.569167919	5.342353e-02
115	nn	don	-0.258517405	4.171924e-01
116	orthop	don	-0.407167467	1.889553e-01
117	sil	don	0.309198013	3.281052e-01
118	din	don	-0.245188105	4.424303e-01
119	din_dip	don	0.454004333	1.381862e-01
120	tdn	don	0.600974583	3.876197e-02
121	copies_mL	doc	-0.181572893	5.722290e-01
122	chl	doc	0.191328379	5.513902e-01
123	sal	doc	0.135021021	6.756672e-01
124	temp	doc	0.261131216	4.123289e-01
125	do_mgl	doc	0.142263695	6.591751e-01
126	do_per	doc	0.224028909	4.839454e-01
127	pH	doc	0.271886786	3.926166e-01
128	secchi	doc	-0.072191720	8.235694e-01
129	amm	doc	-0.226208736	4.795886e-01
130	nn	doc	-0.374307321	2.306407e-01
131	orthop	doc	-0.159126562	6.213229e-01
132	sil	doc	-0.375088890	2.295905e-01
133	din	doc	-0.378232773	2.253951e-01
134	din_dip	doc	-0.334851456	2.873646e-01
135	tdn	doc	0.072542158	8.227250e-01
136	don	doc	0.478247952	1.157882e-01
137	copies_mL	toc	0.313986866	3.202725e-01
138	chl	toc	0.804331717	1.609566e-03
139	sal	toc	-0.671616612	1.676703e-02
140	temp	toc	-0.345778967	2.709287e-01
141	do_mgl	toc	0.623298290	3.035790e-02
142	do_per	toc	0.572124606	5.191871e-02
143	pH	toc	0.422571744	1.711468e-01
144	secchi	toc	-0.050560846	8.759961e-01
145	amm	toc	0.125967185	6.964683e-01
146	nn	toc	0.284200243	3.706534e-01
147	orthop	toc	0.281955043	3.746094e-01
148	sil	toc	-0.167371226	6.031116e-01
149	din	toc	0.286117641	3.672923e-01
150	din_dip	toc	0.156469990	6.272333e-01
151	tdn	toc	0.682035785	1.455521e-02
152	don	toc	0.555593409	6.072529e-02
153	doc	toc	0.458096886	1.342231e-01
154	copies_mL	tn	0.374522076	2.303518e-01

155	chl	tn	0.648959557	2.241587e-02
156	sal	tn	-0.870311068	2.314762e-04
157	temp	tn	-0.645013096	2.352568e-02
158	do_mgl	tn	0.865538178	2.750112e-04
159	do_per	tn	0.784748319	2.503086e-03
160	pH	tn	0.190768307	5.525781e-01
161	secchi	tn	-0.218889224	4.942891e-01
162	amm	tn	0.397369194	2.008568e-01
163	nn	tn	0.607200317	3.626954e-02
164	orthop	tn	0.437213580	1.552338e-01
165	sil	tn	0.203590740	5.256526e-01
166	din	tn	0.614173341	3.361621e-02
167	din_dip	tn	0.445712512	1.464458e-01
168	tdn	tn	0.928578820	1.297104e-05
169	don	tn	0.525782517	7.913446e-02
170	doc	tn	0.142682670	6.582252e-01
171	toc	tn	0.853568499	4.124565e-04
172	copies_mL	dust	0.267707429	4.002185e-01
173	chl	dust	0.349513910	2.654381e-01
174	sal	dust	-0.640954799	2.470802e-02
175	temp	dust	-0.480825547	1.135578e-01
176	do_mgl	dust	0.760468892	4.086347e-03
177	do_per	dust	0.697792825	1.162927e-02
178	pH	dust	0.113775781	7.247816e-01
179	secchi	dust	-0.138466446	6.678049e-01
180	amm	dust	0.657449041	2.015828e-02
181	nn	dust	0.366186212	2.417220e-01
182	orthop	dust	0.064499683	8.421475e-01
183	sil	dust	0.403957276	1.928053e-01
184	din	dust	0.379591019	2.235969e-01
185	din_dip	dust	0.562340555	5.701447e-02
186	tdn	dust	0.935076654	8.140900e-06
187	don	dust	0.774649094	3.090785e-03
188	doc	dust	0.190646148	5.528373e-01
189	toc	dust	0.710981876	9.536483e-03
190	tn	dust	0.873057169	2.089882e-04
191	copies_mL	dust_lag	0.653640119	2.114959e-02
192	chl	dust_lag	0.756849950	4.375390e-03
193	sal	dust_lag	-0.753961556	4.616976e-03
194	temp	dust_lag	-0.490121803	1.057503e-01
195	do_mgl	dust_lag	0.630337767	2.800441e-02
196	do_per	dust_lag	0.532372771	7.477402e-02
197	pH	dust_lag	0.033936010	9.166137e-01

```
198    secchi dust_lag -0.353117424 2.602023e-01
199       amm dust_lag  0.114720030 7.225769e-01
200        nn dust_lag  0.743259527 5.600937e-03
201    orthop dust_lag  0.738669643 6.068178e-03
202       sil dust_lag  0.027449265 9.325169e-01
203       din dust_lag  0.743587243 5.568646e-03
204   din_dip dust_lag  0.080386222 8.038691e-01
205       tdn dust_lag  0.731964778 6.802683e-03
206       don dust_lag  0.147938044 6.463504e-01
207       doc dust_lag  0.064610305 8.418798e-01
208       toc dust_lag  0.737438884 6.198308e-03
209        tn dust_lag  0.847880497 4.940454e-04
210      dust dust_lag  0.612448738 3.425906e-02
```

```r
cclean<- rcorr(as.matrix(c2))
flattenCorrMatrix(cclean$r, cclean$P)
```

```
          row   column           cor            p
1   copies_mL      chl  0.4223984948 1.713409e-01
2   copies_mL      sal  0.3768615241 2.272193e-01
3         chl      sal  0.6447365493 2.360492e-02
4   copies_mL     temp  0.0631733618 8.453586e-01
5         chl     temp  0.6529618027 2.132979e-02
6         sal     temp  0.6288234418 2.849917e-02
7   copies_mL   do_mgl -0.1495248585 6.427796e-01
8         chl   do_mgl -0.0685477001 8.323608e-01
9         sal   do_mgl -0.3917707574 2.078582e-01
10       temp   do_mgl -0.4536001184 1.385817e-01
11  copies_mL   do_per -0.1287401584 6.900762e-01
12        chl   do_per -0.0285108136 9.299127e-01
13        sal   do_per -0.3586787368 2.522406e-01
14       temp   do_per -0.4166251738 1.778912e-01
15     do_mgl   do_per  0.9982762781 1.194600e-13
16  copies_mL       pH -0.1828270966 5.695324e-01
17        chl       pH  0.0970873535 7.640515e-01
18        sal       pH  0.0114433172 9.718436e-01
19       temp       pH  0.0795011703 8.059920e-01
20     do_mgl       pH  0.1727595833 5.913201e-01
21     do_per       pH  0.1589840681 6.216394e-01
22  copies_mL   secchi -0.0218517590 9.462584e-01
23        chl   secchi -0.3361783539 2.853393e-01
```

24	sal	secchi	-0.4187712493	1.754383e-01
25	temp	secchi	-0.5000000000	9.785461e-02
26	do_mgl	secchi	0.0474336833	8.836181e-01
27	do_per	secchi	0.0207047298	9.490761e-01
28	pH	secchi	0.2915042910	3.579358e-01
29	copies_mL	amm	-0.1081447103	7.379693e-01
30	chl	amm	0.3266719167	3.000280e-01
31	sal	amm	0.4130378347	1.820390e-01
32	temp	amm	0.8723651596	2.144869e-04
33	do_mgl	amm	-0.6017549812	3.844305e-02
34	do_per	amm	-0.5780973225	4.896998e-02
35	pH	amm	-0.0335343767	9.175976e-01
36	secchi	amm	-0.4600172636	1.323892e-01
37	copies_mL	nn	0.2128313052	5.066068e-01
38	chl	nn	-0.4220256715	1.717593e-01
39	sal	nn	0.2170771571	4.979595e-01
40	temp	nn	-0.2660295747	4.032911e-01
41	do_mgl	nn	-0.5525460577	6.245501e-02
42	do_per	nn	-0.5684222913	5.380779e-02
43	pH	nn	-0.1313047177	6.841811e-01
44	secchi	nn	0.3655428732	2.426131e-01
45	amm	nn	-0.1340039773	6.779938e-01
46	copies_mL	orthop	0.1100074502	7.335995e-01
47	chl	orthop	-0.4848795765	1.101076e-01
48	sal	orthop	0.1441064819	6.550007e-01
49	temp	orthop	-0.2987338953	3.455788e-01
50	do_mgl	orthop	-0.5378102121	7.130258e-02
51	do_per	orthop	-0.5547070994	6.122489e-02
52	pH	orthop	-0.1692196876	5.990565e-01
53	secchi	orthop	0.4248117924	1.686485e-01
54	amm	orthop	-0.1218346916	7.060278e-01
55	nn	orthop	0.9816891288	1.572155e-08
56	copies_mL	sil	-0.1216870354	7.063701e-01
57	chl	sil	0.4599472175	1.324558e-01
58	sal	sil	-0.2163549552	4.994257e-01
59	temp	sil	0.2237800141	4.844441e-01
60	do_mgl	sil	0.5637459806	5.626190e-02
61	do_per	sil	0.5817887864	4.720759e-02
62	pH	sil	0.1326848373	6.810153e-01
63	secchi	sil	-0.3171099183	3.152203e-01
64	amm	sil	0.1164904405	7.184483e-01
65	nn	sil	-0.9791918144	2.966881e-08
66	orthop	sil	-0.9601807302	7.373511e-07

67	copies_mL	din	0.0468351434	8.850781e-01
68	chl	din	-0.0068943113	9.830346e-01
69	sal	din	0.4923666724	1.039199e-01
70	temp	din	0.5576001645	5.960457e-02
71	do_mgl	din	-0.8722871470	2.151139e-04
72	do_per	din	-0.8628594059	3.020937e-04
73	pH	din	-0.1162390900	7.190340e-01
74	secchi	din	-0.1463976806	6.498233e-01
75	amm	din	0.7529306987	4.705593e-03
76	nn	din	0.5512448570	6.320389e-02
77	orthop	din	0.5497623115	6.406469e-02
78	sil	din	-0.5526198420	6.241273e-02
79	copies_mL	din_dip	0.3497327720	2.651184e-01
80	chl	din_dip	0.6329098563	2.717830e-02
81	sal	din_dip	0.3128642581	3.220993e-01
82	temp	din_dip	0.4595497297	1.328341e-01
83	do_mgl	din_dip	-0.0705071019	8.276314e-01
84	do_per	din_dip	-0.0518426562	8.728746e-01
85	pH	din_dip	0.0181412733	9.553750e-01
86	secchi	din_dip	-0.5067689104	9.267866e-02
87	amm	din_dip	0.1566978513	6.267255e-01
88	nn	din_dip	-0.4062872138	1.900062e-01
89	orthop	din_dip	-0.4967561303	1.004024e-01
90	sil	din_dip	0.3438442691	2.737984e-01
91	din	din_dip	-0.1394285548	6.656148e-01
92	copies_mL	tdn	0.4255103934	1.678741e-01
93	chl	tdn	0.3917074131	2.079383e-01
94	sal	tdn	0.1759932661	5.842869e-01
95	temp	tdn	0.2967729895	3.489076e-01
96	do_mgl	tdn	-0.3952452465	2.034958e-01
97	do_per	tdn	-0.3826029199	2.196403e-01
98	pH	tdn	0.0216935351	9.466471e-01
99	secchi	tdn	-0.3920334553	2.075264e-01
100	amm	tdn	0.1788918944	5.780104e-01
101	nn	tdn	-0.0718108515	8.244875e-01
102	orthop	tdn	-0.1721247225	5.927047e-01
103	sil	tdn	0.0704926183	8.276663e-01
104	din	tdn	0.1008189908	7.552227e-01
105	din_dip	tdn	0.7416219138	5.764415e-03
106	copies_mL	don	0.4124120284	1.827687e-01
107	chl	don	0.3919895572	2.075818e-01
108	sal	don	0.0603145686	8.522872e-01
109	temp	don	0.1651846921	6.079216e-01

110	do_mgl	don	-0.1886699940	5.570376e-01
111	do_per	don	-0.1782138037	5.794763e-01
112	pH	don	0.0466903949	8.854312e-01
113	secchi	don	-0.3578860620	2.533666e-01
114	amm	don	0.0015667397	9.961444e-01
115	nn	don	-0.2006551041	5.317668e-01
116	orthop	don	-0.3003991693	3.427653e-01
117	sil	don	0.1995338436	5.341101e-01
118	din	don	-0.1340264435	6.779424e-01
119	din_dip	don	0.7722844583	3.242386e-03
120	tdn	don	0.9724045144	1.203264e-07
121	copies_mL	doc	-0.3277687108	2.983121e-01
122	chl	doc	-0.0536820263	8.683982e-01
123	sal	doc	-0.3101637516	3.265173e-01
124	temp	doc	-0.3289932074	2.964029e-01
125	do_mgl	doc	0.6040705399	3.750776e-02
126	do_per	doc	0.5788053859	4.862841e-02
127	pH	doc	0.3170027537	3.153930e-01
128	secchi	doc	0.3110952590	3.249896e-01
129	amm	doc	-0.3148274170	3.189084e-01
130	nn	doc	-0.4347910597	1.577989e-01
131	orthop	doc	-0.3694892006	2.371778e-01
132	sil	doc	0.4423866585	1.498458e-01
133	din	doc	-0.5540243988	6.161167e-02
134	din_dip	doc	-0.2380912749	4.561595e-01
135	tdn	doc	-0.6041871270	3.746111e-02
136	don	doc	-0.4735572967	1.199207e-01
137	copies_mL	toc	0.0346250900	9.149259e-01
138	chl	toc	0.1607182828	6.177914e-01
139	sal	toc	-0.1719145441	5.931634e-01
140	temp	toc	-0.1726630582	5.915305e-01
141	do_mgl	toc	0.4728364094	1.205643e-01
142	do_per	toc	0.4525024824	1.396593e-01
143	pH	toc	0.4236393552	1.699532e-01
144	secchi	toc	0.1438918092	6.554866e-01
145	amm	toc	-0.1698339415	5.977113e-01
146	nn	toc	-0.4739993404	1.195272e-01
147	orthop	toc	-0.4781965459	1.158329e-01
148	sil	toc	0.5255739353	7.927523e-02
149	din	toc	-0.4600017503	1.324039e-01
150	din_dip	toc	-0.0055183153	9.864203e-01
151	tdn	toc	-0.2507700039	4.317734e-01
152	don	toc	-0.1442036260	6.547809e-01

```
153       doc      toc  0.8546072429 3.987633e-04
154 copies_mL       tn  0.1635517808 6.115231e-01
155       chl       tn  0.3865308096 2.145441e-01
156       sal       tn  0.3051472022 3.348113e-01
157      temp       tn  0.4304917209 1.624172e-01
158    do_mgl       tn -0.2268147378 4.783805e-01
159    do_per       tn -0.2195331711 4.929878e-01
160        pH       tn  0.4612218627 1.312472e-01
161    secchi       tn -0.3654065795 2.428021e-01
162       amm       tn  0.2558949720 4.221004e-01
163        nn       tn -0.2309034819 4.702666e-01
164    orthop       tn -0.2997118314 3.439251e-01
165       sil       tn  0.1693340435 5.988060e-01
166       din       tn  0.0613645638 8.497413e-01
167   din_dip       tn  0.6840748136 1.414890e-02
168       tdn       tn  0.7217051986 8.053284e-03
169       don       tn  0.7025108793 1.084503e-02
170       doc       tn -0.2161791401 4.997829e-01
171       toc       tn  0.0539348906 8.677831e-01
172 copies_mL     dust  0.3117484177 3.239208e-01
173       chl     dust  0.3215195628 3.081623e-01
174       sal     dust  0.6606516503 1.935139e-02
175      temp     dust  0.1215632975 7.066570e-01
176    do_mgl     dust -0.4772051973 1.166986e-01
177    do_per     dust -0.4665521809 1.262708e-01
178        pH     dust -0.0234015098 9.424524e-01
179    secchi     dust -0.1463062696 6.500296e-01
180       amm     dust  0.0560478122 8.626459e-01
181        nn     dust  0.5313898077 7.541370e-02
182    orthop     dust  0.4884975400 1.070879e-01
183       sil     dust -0.4789553528 1.151732e-01
184       din     dust  0.4002618943 1.972966e-01
185   din_dip     dust  0.2114061016 5.095243e-01
186       tdn     dust  0.3702739707 2.361056e-01
187       don     dust  0.2757395151 3.856746e-01
188       doc     dust -0.4163910184 1.781601e-01
189       toc     dust -0.3173945074 3.147622e-01
190        tn     dust  0.2229253486 4.861580e-01
191 copies_mL dust_lag  0.7793753849 2.803989e-03
192       chl dust_lag  0.7618261206 3.981764e-03
193       sal dust_lag  0.5216430920 8.196020e-02
194      temp dust_lag  0.2907939149 3.591624e-01
195    do_mgl dust_lag  0.0005410147 9.986686e-01
```

```
196    do_per dust_lag  0.0399006184 9.020152e-01
197        pH dust_lag -0.1522571472 6.366474e-01
198    secchi dust_lag -0.0197148417 9.515081e-01
199       amm dust_lag -0.0179801519 9.557710e-01
200        nn dust_lag -0.0598610611 8.533872e-01
201    orthop dust_lag -0.1107873439 7.317721e-01
202       sil dust_lag  0.1466894043 6.491651e-01
203       din dust_lag -0.0571398807 8.599927e-01
204   din_dip dust_lag  0.4385582132 1.538216e-01
205       tdn dust_lag  0.2609399065 4.126839e-01
206       don dust_lag  0.2738554815 3.890614e-01
207       doc dust_lag -0.1802903421 5.749919e-01
208       toc dust_lag  0.0016865874 9.958494e-01
209        tn dust_lag  0.0719064317 8.242571e-01
210      dust dust_lag  0.3728093388 2.326614e-01
```

```
rclean<- rcorr(as.matrix(rd))
flattenCorrMatrix(rclean$r, rclean$P)
```

```
         row   column           cor            p
1   copies_mL      chl  0.7943133770 2.029048e-03
2   copies_mL      sal  0.2288055712 4.744218e-01
3         chl      sal  0.3151251842 3.184259e-01
4   copies_mL     temp -0.6940696334 1.227724e-02
5         chl     temp -0.4435635090 1.486370e-01
6         sal     temp -0.1613497404 6.163924e-01
7   copies_mL   do_mgl  0.0531339590 8.697316e-01
8         chl   do_mgl -0.0931355069 7.734296e-01
9         sal   do_mgl  0.0478535386 8.825943e-01
10       temp   do_mgl -0.2980630315 3.467157e-01
11  copies_mL   do_per -0.2772224773 3.830195e-01
12        chl   do_per -0.4205953071 1.733703e-01
13        sal   do_per  0.1070120861 7.406298e-01
14       temp   do_per -0.1040895373 7.475068e-01
15     do_mgl   do_per  0.8492857712 4.728164e-04
16  copies_mL       pH -0.6057520717 3.683882e-02
17        chl       pH -0.4468395062 1.453050e-01
18        sal       pH -0.3281495829 2.977175e-01
19       temp       pH  0.3443949446 2.729798e-01
20     do_mgl       pH  0.1817186347 5.719154e-01
21     do_per       pH  0.2362040959 4.598438e-01
```

```
22  copies_mL   secchi -0.5807065044 4.771959e-02
23        chl   secchi -0.3887362066 2.117145e-01
24        sal   secchi -0.2586883370 4.168735e-01
25       temp   secchi  0.6285694470 2.858277e-02
26     do_mgl   secchi  0.2545677686 4.245951e-01
27     do_per   secchi  0.3238640586 3.044459e-01
28         pH   secchi  0.6810540573 1.475388e-02
29  copies_mL      amm  0.8185943384 1.131031e-03
30        chl      amm  0.6528388845 2.136257e-02
31        sal      amm -0.1090982054 7.357316e-01
32       temp      amm -0.7545225128 4.569286e-03
33     do_mgl      amm  0.3658881412 2.421346e-01
34     do_per      amm  0.0183419583 9.548818e-01
35         pH      amm -0.2530188587 4.275157e-01
36     secchi      amm -0.2611063545 4.123750e-01
37  copies_mL       nn  0.2612438698 4.121199e-01
38        chl       nn  0.2910624264 3.586985e-01
39        sal       nn  0.2089561515 5.145566e-01
40       temp       nn -0.1789360476 5.779150e-01
41     do_mgl       nn -0.0522954441 8.717723e-01
42     do_per       nn -0.1616510265 6.157254e-01
43         pH       nn  0.2265423608 4.789233e-01
44     secchi       nn -0.0229244869 9.436238e-01
45        amm       nn  0.1634607242 6.117242e-01
46  copies_mL   orthop  0.3723562470 2.332747e-01
47        chl   orthop  0.2687562142 3.983039e-01
48        sal   orthop  0.2489108912 4.353088e-01
49       temp   orthop -0.2329580498 4.662137e-01
50     do_mgl   orthop -0.2591329517 4.160445e-01
51     do_per   orthop -0.4065593027 1.896810e-01
52         pH   orthop -0.0125127665 9.692133e-01
53     secchi   orthop -0.1284052495 6.908473e-01
54        amm   orthop  0.1453205119 6.522556e-01
55         nn   orthop  0.8034287301 1.644376e-03
56  copies_mL      sil -0.1482703013 6.456022e-01
57        chl      sil  0.0298089495 9.267289e-01
58        sal      sil  0.2014923057 5.300200e-01
59       temp      sil  0.4362410904 1.562603e-01
60     do_mgl      sil -0.6943819919 1.222187e-02
61     do_per      sil -0.5627977308 5.676890e-02
62         pH      sil -0.4238059355 1.697674e-01
63     secchi      sil -0.1896226713 5.550110e-01
64        amm      sil -0.4736609114 1.198284e-01
```

65	nn	sil	-0.1927242091	5.484345e-01
66	orthop	sil	-0.0018572142	9.954295e-01
67	copies_mL	din	0.8242241355	9.758559e-04
68	chl	din	0.6628980856	1.879968e-02
69	sal	din	-0.0942838011	7.707017e-01
70	temp	din	-0.7543243349	4.586092e-03
71	do_mgl	din	0.3590047810	2.517783e-01
72	do_per	din	0.0089171533	9.780578e-01
73	pH	din	-0.2306467967	4.707741e-01
74	secchi	din	-0.2546005522	4.245334e-01
75	amm	din	0.9974246310	8.884005e-13
76	nn	din	0.2335615481	4.650263e-01
77	orthop	din	0.2011014494	5.308352e-01
78	sil	din	-0.4832446571	1.114905e-01
79	copies_mL	din_dip	0.6897456778	1.306290e-02
80	chl	din_dip	0.5683650810	5.383735e-02
81	sal	din_dip	-0.1364429836	6.724187e-01
82	temp	din_dip	-0.6613996054	1.916640e-02
83	do_mgl	din_dip	0.5237779559	8.049442e-02
84	do_per	din_dip	0.2166849787	4.987554e-01
85	pH	din_dip	-0.2358182196	4.605989e-01
86	secchi	din_dip	-0.1762095180	5.838177e-01
87	amm	din_dip	0.9420262845	4.677072e-06
88	nn	din_dip	-0.0824724327	7.988699e-01
89	orthop	din_dip	-0.1731255303	5.905225e-01
90	sil	din_dip	-0.5170841224	8.515090e-02
91	din	din_dip	0.9229431156	1.878016e-05
92	copies_mL	tdn	0.0642679124	8.427085e-01
93	chl	tdn	-0.0728991035	8.218650e-01
94	sal	tdn	0.1470688466	6.483093e-01
95	temp	tdn	-0.0807998122	8.028775e-01
96	do_mgl	tdn	0.0960292753	7.665596e-01
97	do_per	tdn	-0.0087547162	9.784574e-01
98	pH	tdn	-0.1439031688	6.554609e-01
99	secchi	tdn	-0.3092654009	3.279942e-01
100	amm	tdn	-0.1574736934	6.249978e-01
101	nn	tdn	0.5188697633	8.389132e-02
102	orthop	tdn	0.4947790512	1.019767e-01
103	sil	tdn	0.1066331122	7.415205e-01
104	din	tdn	-0.1185853587	7.135719e-01
105	din_dip	tdn	-0.2902069705	3.601776e-01
106	copies_mL	don	-0.1222131146	7.051508e-01
107	chl	don	-0.2168882222	4.983429e-01

108	sal	don	0.1609437473	6.172917e-01
109	temp	don	0.0947348454	7.696308e-01
110	do_mgl	don	0.0109353966	9.730930e-01
111	do_per	don	-0.0106172073	9.738756e-01
112	pH	don	-0.0855893976	7.914136e-01
113	secchi	don	-0.2348750659	4.624469e-01
114	amm	don	-0.3724679854	2.331234e-01
115	nn	don	0.4410811299	1.511941e-01
116	orthop	don	0.4242608414	1.692608e-01
117	sil	don	0.2100777912	5.122500e-01
118	din	don	-0.3360671178	2.855088e-01
119	din_dip	don	-0.4816284229	1.128689e-01
120	tdn	don	0.9750194066	7.346767e-08
121	copies_mL	doc	-0.4598055084	1.325906e-01
122	chl	doc	-0.4268036873	1.664464e-01
123	sal	doc	0.0041415091	9.898082e-01
124	temp	doc	0.5272653616	7.813859e-02
125	do_mgl	doc	-0.1715016800	5.940648e-01
126	do_per	doc	-0.0306502150	9.246661e-01
127	pH	doc	0.3051513629	3.348044e-01
128	secchi	doc	0.5570005768	5.993790e-02
129	amm	doc	-0.4070134454	1.891389e-01
130	nn	doc	-0.0226492678	9.442997e-01
131	orthop	doc	0.1919951365	5.499775e-01
132	sil	doc	0.4208439546	1.730895e-01
133	din	doc	-0.4008517121	1.965755e-01
134	din_dip	doc	-0.4653508720	1.273814e-01
135	tdn	doc	0.0271568329	9.332344e-01
136	don	doc	0.1153450669	7.211185e-01
137	copies_mL	toc	0.1753641660	5.856526e-01
138	chl	toc	-0.0412764140	8.986517e-01
139	sal	toc	0.3383215662	2.820853e-01
140	temp	toc	0.0564020060	8.617852e-01
141	do_mgl	toc	-0.2093676352	5.137099e-01
142	do_per	toc	-0.1795901592	5.765024e-01
143	pH	toc	-0.1563068043	6.275970e-01
144	secchi	toc	0.0252823930	9.378346e-01
145	amm	toc	-0.0273996476	9.326386e-01
146	nn	toc	0.2566532811	4.206783e-01
147	orthop	toc	0.5501768551	6.382319e-02
148	sil	toc	0.4029928459	1.939713e-01
149	din	toc	-0.0082080687	9.798023e-01
150	din_dip	toc	-0.2093860602	5.136720e-01

151	tdn	toc	0.2419528095	4.486643e-01
152	don	toc	0.2324342301	4.672454e-01
153	doc	toc	0.7243752765	7.712495e-03
154	copies_mL	tn	0.3266748680	3.000233e-01
155	chl	tn	0.0571558439	8.599539e-01
156	sal	tn	0.2815581647	3.753110e-01
157	temp	tn	-0.5402181875	6.980125e-02
158	do_mgl	tn	0.4841395199	1.107322e-01
159	do_per	tn	0.3690406237	2.377919e-01
160	pH	tn	-0.2550425133	4.237019e-01
161	secchi	tn	-0.4058907258	1.904807e-01
162	amm	tn	0.2109747410	5.104087e-01
163	nn	tn	0.4327900234	1.599379e-01
164	orthop	tn	0.3578746709	2.533828e-01
165	sil	tn	-0.4081400876	1.877983e-01
166	din	tn	0.2384909157	4.553811e-01
167	din_dip	tn	0.1413064265	6.613471e-01
168	tdn	tn	0.7071253137	1.011671e-02
169	don	tn	0.6170617394	3.255898e-02
170	doc	tn	-0.4474718790	1.446674e-01
171	toc	tn	-0.0786728521	8.079799e-01
172	copies_mL	dust	0.5401906402	6.981830e-02
173	chl	dust	0.2642030690	4.066494e-01
174	sal	dust	0.4080599837	1.878934e-01
175	temp	dust	-0.7473270902	5.210001e-03
176	do_mgl	dust	-0.0317508005	9.219682e-01
177	do_per	dust	-0.0701849227	8.284087e-01
178	pH	dust	-0.5063452125	9.299712e-02
179	secchi	dust	-0.6066722300	3.647639e-02
180	amm	dust	0.3583603993	2.526925e-01
181	nn	dust	0.3664059652	2.414181e-01
182	orthop	dust	0.5516582218	6.296531e-02
183	sil	dust	-0.0003788654	9.990676e-01
184	din	dust	0.3768021509	2.272985e-01
185	din_dip	dust	0.1562390812	6.277480e-01
186	tdn	dust	0.3356644053	2.861228e-01
187	don	dust	0.2327640352	4.665957e-01
188	doc	dust	-0.2071420893	5.182967e-01
189	toc	dust	0.3221007175	3.072388e-01
190	tn	dust	0.6060438703	3.672361e-02
191	copies_mL	dust_lag	0.6489370114	2.242210e-02
192	chl	dust_lag	0.6834889301	1.426478e-02
193	sal	dust_lag	0.5403113070	6.974363e-02

```
194      temp dust_lag -0.4352639369 1.572961e-01
195    do_mgl dust_lag -0.3016671284 3.406313e-01
196    do_per dust_lag -0.4866733107 1.086035e-01
197        pH dust_lag -0.7949295361 2.001064e-03
198    secchi dust_lag -0.6699971963 1.713175e-02
199       amm dust_lag  0.2870233551 3.657102e-01
200        nn dust_lag  0.0165133351 9.593765e-01
201    orthop dust_lag  0.2639129783 4.071840e-01
202       sil dust_lag  0.4599211915 1.324805e-01
203       din dust_lag  0.2800375218 3.780053e-01
204   din_dip dust_lag  0.1812069103 5.730169e-01
205       tdn dust_lag  0.1061946224 7.425516e-01
206       don dust_lag  0.0380490404 9.065442e-01
207       doc dust_lag -0.2657565698 4.037921e-01
208       toc dust_lag  0.1949447907 5.437459e-01
209        tn dust_lag  0.1758000886 5.847061e-01
210      dust dust_lag  0.6124487377 3.425906e-02
```

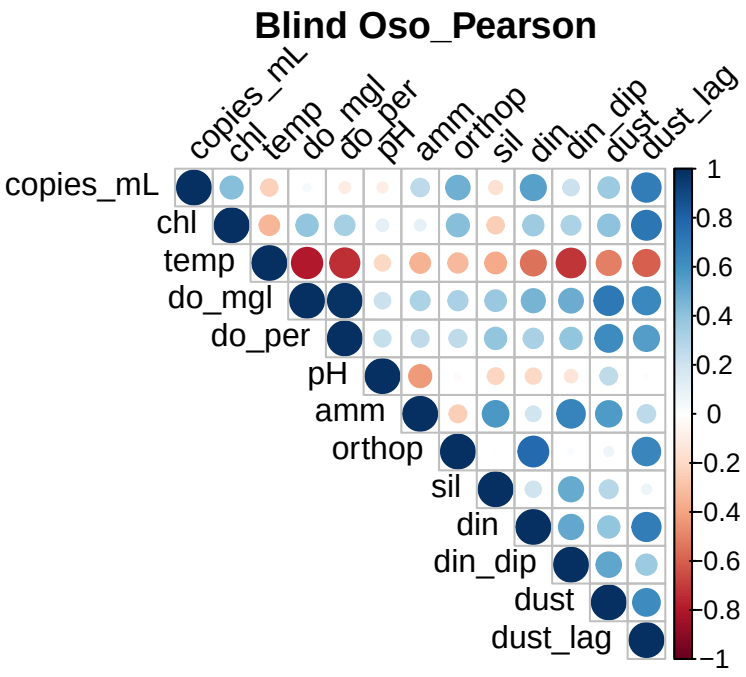
Extract cor and p value

Visualize with `corrplot()` function

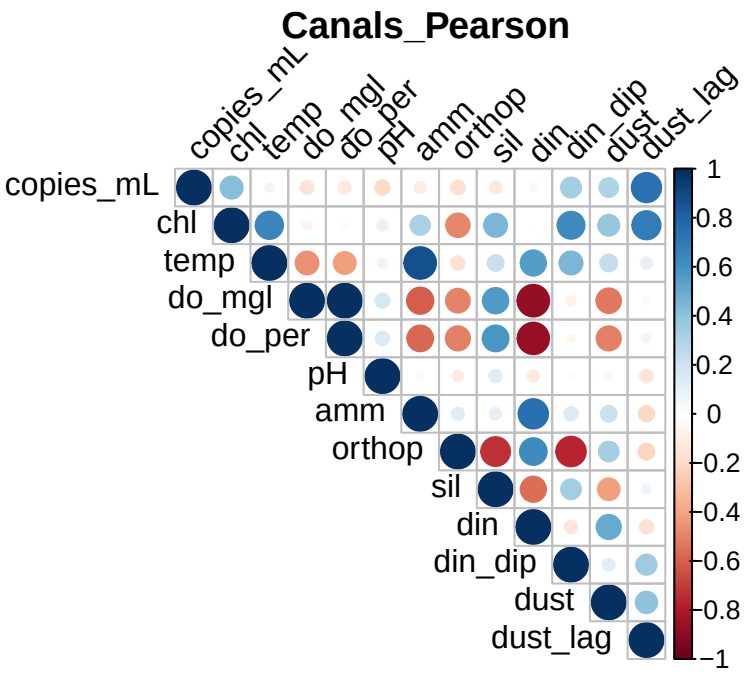
The function **corrplot()** takes the **correlation matrix** as the first argument. The second argument (type="upper") is used to display only the upper triangular of the **correlation matrix**.

Just Normal Data

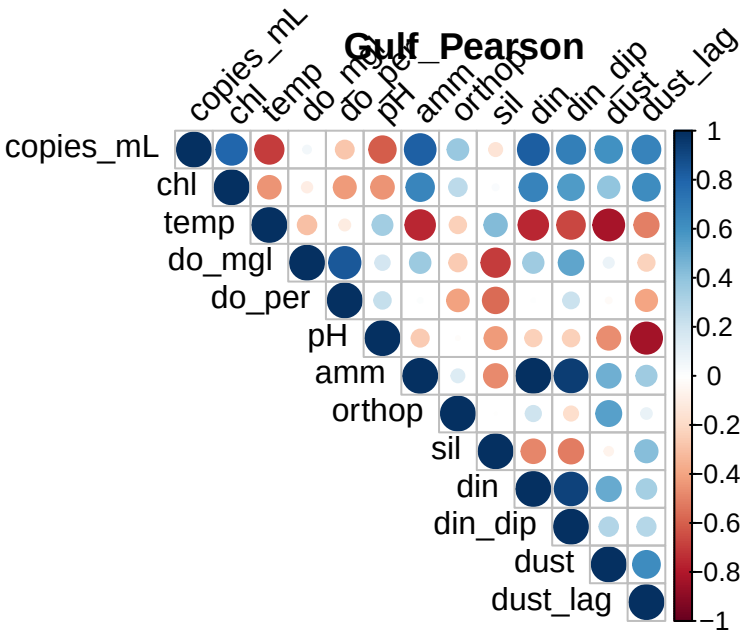
```
#Normal Data
 corrplot(b, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Blind Oso_Pearson",  mar=c(0,0,1,0)) #Adds and lowers title
```




```
corrplot(c, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Canals_Pearson", mar=c(0,0,1,0))
```

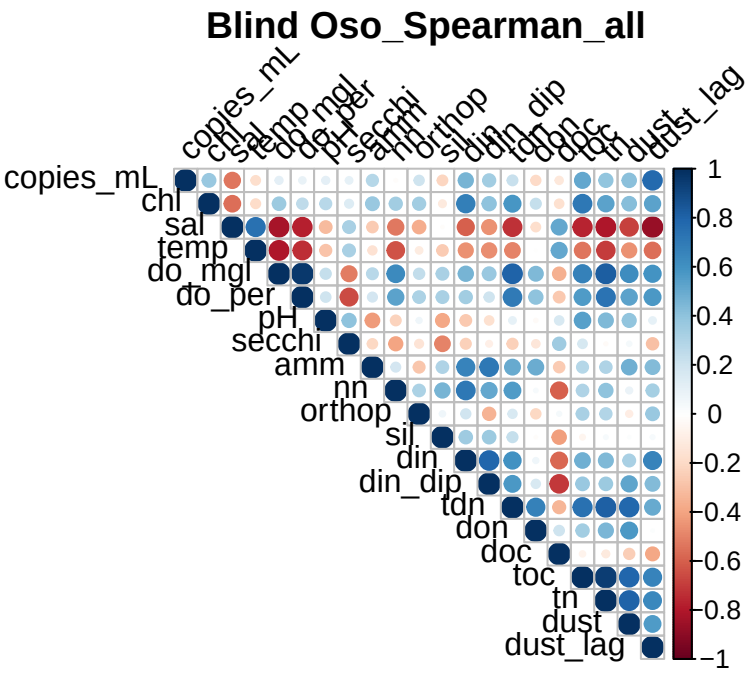



```
corrplot(r, type = "upper",
        tl.col = "black", tl.srt = 45, mar=c(0,0,1,0))
        title(main = "Gulf_Pearson")
```

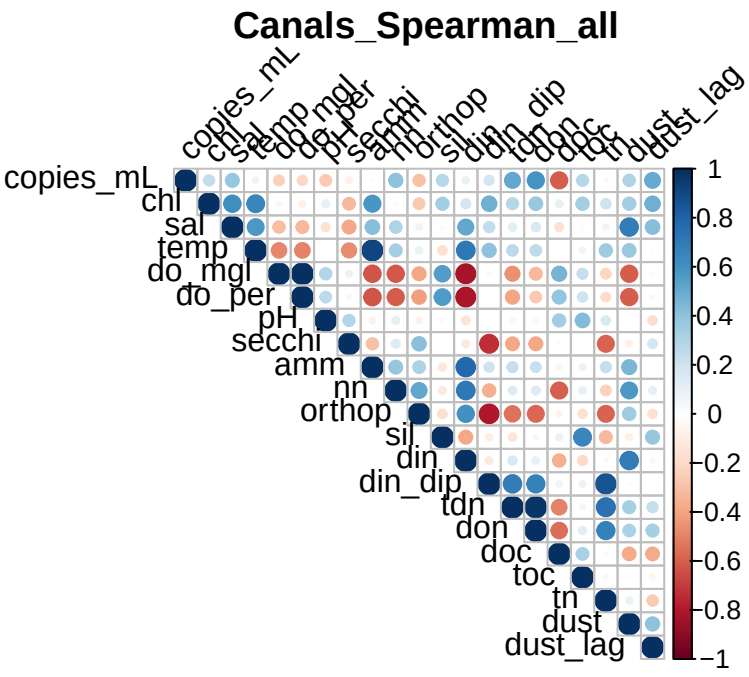


All Spearman

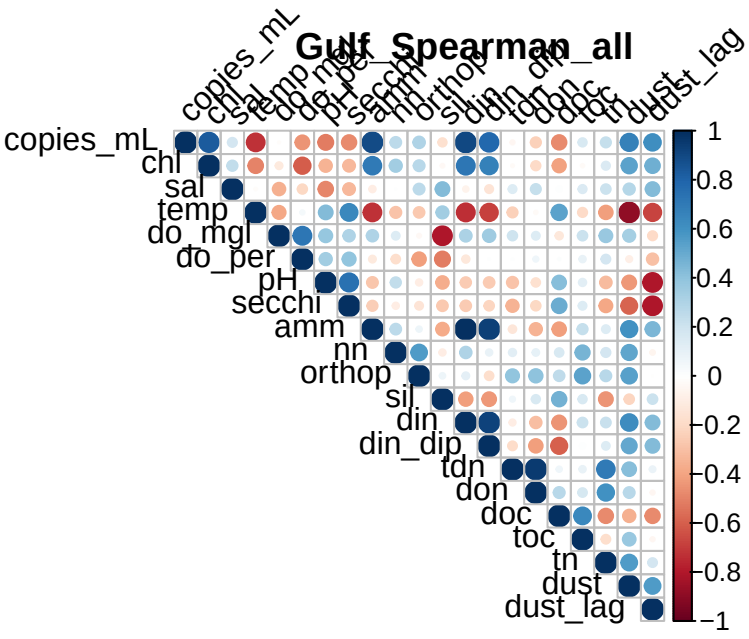
```
#Non-Parametric Data
 corrplot(b2, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Blind Oso_Spearman_all",  mar=c(0,0,1,0)) #Adds and lowers title
```




```
corrplot(c22, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Canals_Spearman_all", mar=c(0,0,1,0))
```




```
corrplot(r2, type = "upper",
         tl.col = "black", tl.srt = 45, mar=c(0,0,1,0))
         title(main = "Gulf_Spearman_all" )
```



Everything

```
par(mfrow=c(3,3))
#Normal Data
 corrplot(b, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Blind Oso_Pearson",  mar=c(0,0,1,0)) #Adds and lowers title

 corrplot(c, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Canals_Pearson", mar=c(0,0,1,0))

 corrplot(r, type = "upper",
         tl.col = "black", tl.srt = 45, mar=c(0,0,1,0))
         title(main = "Gulf_Pearson")

#Non-Parametric Data
 corrplot(b1, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Blind Oso_Spearman",  mar=c(0,0,1,0)) #Adds and lowers title
```

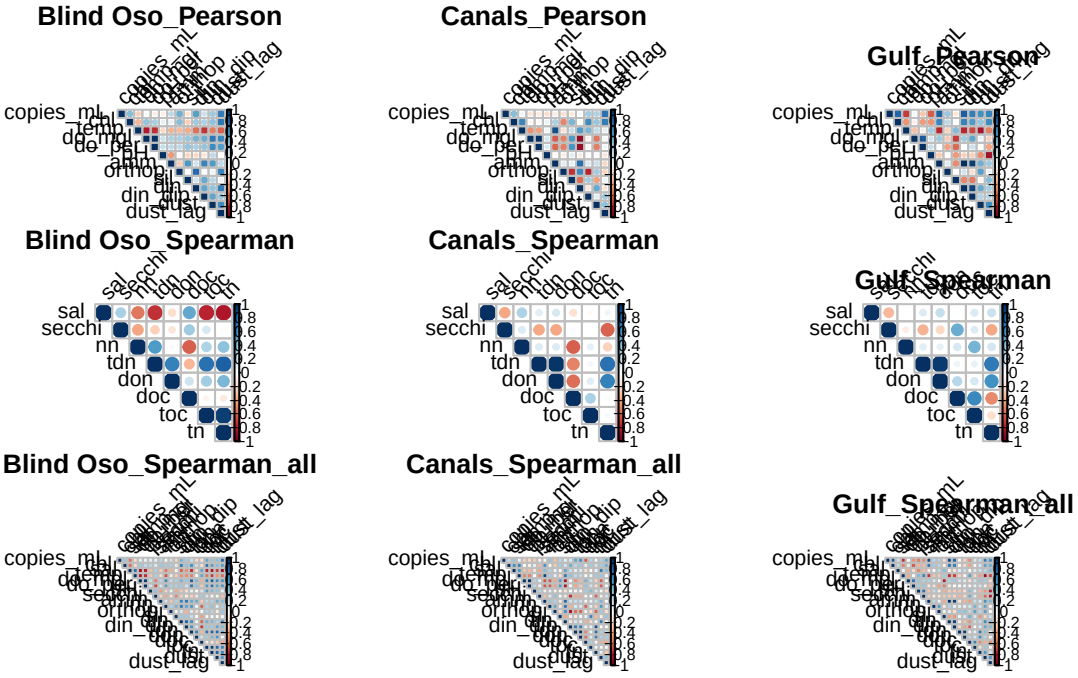
```
corrplot(c1, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Canals_Spearman", mar=c(0,0,1,0))

corrplot(r1, type = "upper",
         tl.col = "black", tl.srt = 45, mar=c(0,0,1,0))
         title(main = "Gulf_Spearman" )

#Non-Parametric Data
 corrplot(b2, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Blind Oso_Spearman_all",  mar=c(0,0,1,0)) #Adds and lowers title

corrplot(c22, type = "upper",
         tl.col = "black", tl.srt = 45,
         title = "Canals_Spearman_all", mar=c(0,0,1,0))

corrplot(r2, type = "upper",
         tl.col = "black", tl.srt = 45, mar=c(0,0,1,0))
         title(main = "Gulf_Spearman_all" )
```



Correlation Tables

Load in data again to bypass earlier code

Rename Copies –> Vibrio

```
bo<-
  bo %>%
  rename("Total Vibrio" = "copies_mL",
         "Chlorophyl a" = "chl",
         "Salinity" = "sal",
         "Temperature" = "temp",
         "Dissolved Oxygen (mg/L)" = "do_mgl",
         "Dissolved Oxygen (%)" = "do_per",
         "Secchi" = "secchi",
         "Ammonium" = "amm",
         "Nitrate+Nitrite" = "nn",
         "Orthophosphate" = "orthop",
         "Silicate" = "sil",
         "DIN" = "din",
         "DIN:DIP" = "din_dip",
         "TDN" = "tdn",
         "DON" = "don",
         "DOC" = "doc",
         "TOC" = "toc",
         "TN" = "tn",
         "Dust" = "dust",
         "Dust_Lag" = "dust_lag")

c2<-
  c2 %>%
  rename("Total Vibrio" = "copies_mL",
         "Chlorophyl a" = "chl",
         "Salinity" = "sal",
         "Temperature" = "temp",
         "Dissolved Oxygen (mg/L)" = "do_mgl",
         "Dissolved Oxygen (%)" = "do_per",
         "Secchi" = "secchi",
         "Ammonium" = "amm",
         "Nitrate+Nitrite" = "nn",
         "Orthophosphate" = "orthop",
```

```
          "Silicate" = "sil",
          "DIN" = "din",
          "DIN:DIP" = "din_dip",
          "TDN" = "tdn",
          "DON" = "don",
          "DOC" = "doc",
          "TOC" = "toc",
          "TN" = "tn",
          "Dust" = "dust",
          "Dust_Lag" = "dust_lag")

rd<-
  rd %>%
  rename("Total Vibrio" = "copies_mL",
          "Chlorophyl a" = "chl",
          "Salinity" = "sal",
          "Temperature" = "temp",
          "Dissolved Oxygen (mg/L)" = "do_mgl",
          "Dissolved Oxygen (%)" = "do_per",
          "Secchi" = "secchi",
          "Ammonium" = "amm",
          "Nitrate+Nitrite" = "nn",
          "Orthophosphate" = "orthop",
          "Silicate" = "sil",
          "DIN" = "din",
          "DIN:DIP" = "din_dip",
          "TDN" = "tdn",
          "DON" = "don",
          "DOC" = "doc",
          "TOC" = "toc",
          "TN" = "tn",
          "Dust" = "dust",
          "Dust_Lag" = "dust_lag")
```

Create Species Dataframes and Site-Species Dataframes

```
#SPECIES DF
vc<-
  sp %>%
  filter(type %in% "V. cholerae") %>%
```

```
  rename("Vc" = "copies_mL")
vp<-
  sp %>%
  filter(type %in% "V. parahaemolyticus") %>%
  rename("Vp" = "copies_mL")
vv<-
  sp %>%
  filter(type %in% "V. vulnificus") %>%
  rename("Vv" = "copies_mL")

#SITE_SPECIES DF
b_vc <-
  vc %>%
  filter(site %in% "Blind Oso") %>%
  select(Vc, date)
b_vv <-
  vv %>%
  filter(site %in% "Blind Oso") %>%
  select(Vv, date)
b_vp <-
  vp %>%
  filter(site %in% "Blind Oso") %>%
  select(Vp, date)

c_vc <-
  vc %>%
  filter(site %in% "Canals") %>%
  select(Vc, date)
c_vv <-
  vv %>%
  filter(site %in% "Canals") %>%
  select(Vv, date)
c_vp <-
  vp %>%
  filter(site %in% "Canals") %>%
  select(Vp, date)

r_vc <-
  vc %>%
  filter(site %in% "Gulf") %>%
  select(Vc, date)
```

```
r_vv <-
  vv %>%
  filter(site %in% "Gulf") %>%
  select(Vv, date)
r_vp <-
  vp %>%
  filter(site %in% "Gulf") %>%
  select(Vp, date)
```

Combine Species with Site Masters

```
b_list<- list(b_vc, b_vv, b_vp, bo)
c_list<- list(c_vc, c_vv, c_vp, c2)
r_list<- list(r_vc, r_vv, r_vp, rd)

bo<-
  b_list %>% reduce(full_join, by = 'date') %>%
  select(!c(date, ...1, Vp)) %>%
  rename("V. cholerae" = "Vc",
         "V. vulnificus" = "Vv")

c2<-
  c_list %>% reduce(full_join, by = 'date') %>%
  select(!c(date, ...1)) %>%
  rename("V. cholerae" = "Vc",
         "V. parahaemolyticus" = "Vp",
         "V. vulnificus" = "Vv")

rd<-
  r_list %>% reduce(full_join, by = 'date') %>%
  select(!c(date, ...1)) %>%
  rename("V. cholerae" = "Vc",
         "V. parahaemolyticus" = "Vp",
         "V. vulnificus" = "Vv")
```

Table: Env, Spp, Total

This is using Spearman's for all. This Correlation Function uses a df as opposed to a matrix, so it is more user friendly for making tables.

p* = < 0.05 // ** = < 0.01 // *** = <0.001

```
bo_table<-
  kable(as.data.frame(correlation_matrix(bo, type = "spearman", digits = 2)) %>%
  select(1:4) %>%
    filter(!row_number() %in% c(1:4)),
  caption = "Blind Oso: Correlations between Environmental and Biological Variables using

c2_table<-
  kable(as.data.frame(correlation_matrix(c2, type = "spearman", digits = 2)) %>%
  select(1:5) %>%
    filter(!row_number() %in% c(1:5)),
  caption = "Canals: Correlations between Environmental and Biological Variables using Spe

rd_table<-
  kable(as.data.frame(correlation_matrix(rd, type = "spearman", digits = 2)) %>%
  select(1:5) %>%
    filter(!row_number() %in% c(1:5)),
  caption = "Gulf: Correlations between Environmental and Biological Variables using Spear

bo_table
```

```
c2_table
```

```
rd_table
```

Matrix: Env, Sp, Total

Create Matrix for all environmental parameters, species, and total vibrio

Table: Species, Total, Chl

```
bo_table2<-
  kable(as.data.frame(correlation_matrix(bo, type = "spearman", digits = 2)) %>%
  select(1:4) %>%
    filter(row_number() %in% c(22,23)),
  caption = "Blind Oso: Correlations between Dust Depsoition and Biological Variables usin

c2_table2<-
  kable(as.data.frame(correlation_matrix(c2, type = "spearman", digits = 2)) %>%
  select(1:5) %>%
```

Blind Oso: Correlations between Environmental and Biological Variables using Spearman's Rank correlations

	V. cholerae	V. vulnificus	Total Vibrio	Chlorophyl a
Salinity	-0.52	-0.78**	-0.41	-0.63*
Temperature	-0.61*	-0.67*	-0.24	-0.30
Dissolved Oxygen (mg/L)	0.64*	0.83***	0.04	0.43
Dissolved Oxygen (%)	0.55	0.78**	-0.10	0.38
pH	-0.16	0.04	-0.09	0.21
Secchi	-0.24	-0.37	-0.27	-0.24
Ammonium	0.69*	0.71**	0.19	-0.09
Nitrate+Nitrite	0.61*	0.45	0.55	0.30
Orthophosphate	0.12	0.24	0.48	0.45
Silicate	0.51	0.53	-0.15	-0.26
DIN	0.62*	0.47	0.55	0.29
DIN:DIP	0.63*	0.66*	-0.05	0.02
TDN	0.81**	0.90***	0.29	0.41
DON	0.37	0.64*	-0.20	0.21
DOC	-0.10	0.01	-0.18	0.19
TOC	0.29	0.64*	0.31	0.80**
TN	0.65*	0.89***	0.37	0.65*
Dust	0.77**	0.91***	0.27	0.35
Dust_Lag	0.42	0.69*	0.65*	0.76**

Canals: Correlations between Environmental and Biological Variables using Spearman's Rank correlations

	V. cholerae	V. vulnificus	V. parahaemolyticus	Total Vibrio	Chlorophyl a
Salinity	-0.30	0.27	0.33	0.38	0.64*
Temperature	0.18	-0.27	0.04	0.06	0.65*
Dissolved Oxygen (mg/L)	-0.26	0.21	0.17	-0.15	-0.07
Dissolved Oxygen (%)	-0.27	0.18	0.18	-0.13	-0.03
pH	-0.01	0.38	-0.02	-0.18	0.10
Secchi	0.28	0.06	-0.52	-0.02	-0.34
Ammonium	0.14	-0.34	-0.09	-0.11	0.33
Nitrate+Nitrite	-0.12	0.20	-0.11	0.21	-0.42
Orthophosphate	-0.13	0.18	-0.14	0.11	-0.48
Silicate	0.08	-0.24	0.06	-0.12	0.46
DIN	0.04	-0.15	-0.15	0.05	-0.01
DIN:DIP	0.13	-0.15	0.14	0.35	0.63*
TDN	0.18	-0.35	0.06	0.43	0.39
DON	0.17	-0.32	0.10	0.41	0.39
DOC	-0.14	0.48	-0.08	-0.33	-0.05
TOC	-0.21	0.33	-0.23	0.03	0.16
TN	-0.13	0.01	0.10	0.16	0.39
Dust	-0.25	0.35	0.38	0.31	0.32
Dust_Lag	-0.08	-0.25	-0.16	0.78**	0.76**

Gulf: Correlations between Environmental and Biological Variables using Spearman's Rank correlations

	V. cholerae	V. vulnificus	V. parahaemolyticus	Total Vibrio	Chlorophyl a
Salinity	0.43	0.20	-0.34	0.23	0.32
Temperature	-0.30	-0.07	0.28	-0.69*	-0.44
Dissolved Oxygen (mg/L)	-0.25	0.10	-0.16	0.05	-0.09
Dissolved Oxygen (%)	-0.37	0.11	0.01	-0.28	-0.42
pH	-0.48	0.40	0.43	-0.61*	-0.45
Secchi	-0.45	0.26	0.58*	-0.58*	-0.39
Ammonium	0.08	0.11	-0.08	0.82**	0.65*
Nitrate+Nitrite	-0.20	-0.09	0.26	0.26	0.29
Orthophosphate	-0.01	-0.04	0.32	0.37	0.27
Silicate	0.30	-0.19	0.04	-0.15	0.03
DIN	0.06	0.10	-0.05	0.82***	0.66*
DIN:DIP	0.08	0.15	-0.20	0.69*	0.57
TDN	-0.13	-0.43	-0.11	0.06	-0.07
DON	-0.14	-0.44	-0.09	-0.12	-0.22
DOC	-0.36	0.30	0.73**	-0.46	-0.43
TOC	-0.26	0.11	0.54	0.18	-0.04
TN	0.01	-0.42	-0.34	0.33	0.06
Dust	0.29	-0.25	-0.05	0.54	0.26
Dust_Lag	0.77**	-0.16	-0.47	0.65*	0.68*

Blind Oso: Correlations between Dust Depsoition and Biological Variables using Spearman's Rank correlations

	V. cholerae	V. vulnificus	Total Vibrio	Chlorophyl a
Dust	0.77**	0.91***	0.27	0.35
Dust_Lag	0.42	0.69*	0.65*	0.76**

Canals: Correlations between Dust Depsoition and Biological Variables using Spearman's Rank correlations

	V. cholerae	V. vulnificus	V. parahaemolyticus	Total Vibrio	Chlorophyl a
Dust	-0.25	0.35	0.38	0.31	0.32
Dust_Lag	-0.08	-0.25	-0.16	0.78**	0.76**

```
    filter(row_number() %in% c(23,24)),
  caption = "Canals: Correlations between Dust Depsoition and Biological Variables using S

rd_table2<-
  kable(as.data.frame(correlation_matrix(rd, type = "spearman", digits = 2)) %>%
  select(1:5) %>%
    filter(row_number() %in% c(23,24)),
  caption = "Gulf: Correlations between Dust Depsoition and Biological Variables using Spe

bo_table2
```

```
c2_table2
```

```
rd_table2
```

It's also possible to **combine correlogram with the significance test**. We'll use the result *res.cor2* generated in the previous section with **rcorr**() function [in **Hmisc** package]:

We get errors but still get the corrplot

Stack overflow: In the vignette for package 'corrplot' it says "We can get p-value matrix…by

Gulf: Correlations between Dust Depsoition and Biological Variables using Spearman's Rank correlations

	V. cholerae	V. vulnificus	V. parahaemolyticus	Total Vibrio	Chlorophyl a
Dust	0.29	-0.25	-0.05	0.54	0.26
Dust_Lag	0.77**	-0.16	-0.47	0.65*	0.68*

cor.mtest()…". The output of that function produces a p-values matrix with zeroes on the diagonal. The output of rcorr produces a matrix of p-values with NA on the diagonal. Maybe you can just replace your NA diagonal values with zeroes. If you switch to cor.mtest() you'll need to be sure and understand all of its parameters.

```
#BLIND OSO
#corrplot(bo_2$r, type="upper",
         #tl.col = "black", tl.srt = 45,
        # p.mat = bo_2$P, sig.level = 0.05, insig = "blank")

#CANALS

#corrplot(c2_2$r, type="upper",
         #tl.col = "black", tl.srt = 45,
         #p.mat = c2_2$P, sig.level = 0.05, insig = "blank")

#GULF

#corrplot(rd_2$r, type="upper",
        # tl.col = "black", tl.srt = 45,
        # p.mat = rd_2$P, sig.level = 0.05, insig = "blank")
```