Algoritmo cuarta fase

Programación de algoritmo en programa R-Project para generar la asociación entre las anomalías y el dato normal de las variables de calidad del para obtener como resultado las correlaciones por cada Región.

PARTE A

- Se carga la base de datos de las anomalías semestrales de la variable precipitación.

```
dirBases_meteomarinos <- readline(prompt="indique la dirección de la carpeta que contiene las bases de datos: ")
## Rta: C:/Users/docentesambiental/Desktop/Meteomarinos_R/
# usar read.csv2 para windows!!
Base_Calidad <- read.csv(paste(dirBases_meteomarinos,readline(prompt="indique el nombre del archivo .csv a cargar:"),sep=""),header=TRUE)
## Rta: Matriz_RedCam.csv
str(Base_Calidad)

DF_Calidad <- Base_Calidad[,10:25];rownames(DF_Calidad) <- Base_Calidad[,1]
DF_Calidad_sinNAs <- na.omit(Base_Calidad)

length(DF_Calidad_sinNAs[,1])/length(Base_Calidad[,1])*100
```

- Se carga la base de datos según el índice macroclimatico en este caso es ONI.

```
 read.csv(paste(dirBases_meteomarinos,readline(prompt="indique el nombre del archivo .csv a cargar con los
  promedios semestrales de ONI:"),sep=""),header=TRUE)
# Estaciones2 <-
  (colnames(Base_Anomalia_Semestre_ONI[,4:length(colnames(Base_Anomalia_Semestre_ONI))]))
```

- Se eliminan las estaciones que no tienen datos

```
 Lista_Pruebas2 <- list()
for(i in 1:dim(TS2)[2]){
  Lista_Pruebas2[[i]] <- is.na(TS2[,i])
  }
No_NaS2 <- data.frame(1:length(Lista_Pruebas2))
for(j in 1:length(Lista_Pruebas2)){
  No_NaS2[j,] <- (9-sum(Lista_Pruebas2[[j]]))/9
  }
rownames(No_NaS2) <- Estaciones2
WhiCh_is_1 <- which(No_NaS2==1)
Base_Completa2 <- TS2[WhiCh_is_1]

  Temporada <- rep(c(1,2),5)
  Years <- rep(2010:2014,each=2)
```

- Se carga la base de la REDCAM y se escoge las filas de datos completas

```
#library(devtools)
#library(ggbiplot)

#ir.pca_Base_Calidad <-
prcomp(na.omit(DF_Calidad),scale=TRUE,center=TRUE);summary(ir.pca_Base_Calidad);ir.Region_Calidad <- Base_Calidad[,3];ggbiplot(ir.pca_Base_Calidad, obs.scale = 1, var.scale = 1,groups = ir.Region_Calidad, ellipse = TRUE,circle = TRUE,main="Calidad - Depto.");ir.Year_Calidad <-
```

```
as.factor(Base_Calidad[,5]);ggbiplot(ir.pca_Base_Calidad, obs.scale = 1, var.scale = 1,groups =
ir.Year_Calidad, ellipse = TRUE,circle = TRUE,main="Calidad - Year")

par(mfrow=c(3,1));for(i in 1:length(colnames(DF_Calidad))){
        plot(DF_Calidad[,i],type="l",main=colnames(DF_Calidad[i]))
```

- Indicar el parámetro de calidad del agua a seleccionar

```
 Seleccionar_Parametro <- function(){
 Parametro <- as.integer(readline(prompt="Indique el numero de la columna en que se encuentra el parametro
 a seleccionar: "));Position_Datos <-
 matrix(which(is.na(Base_Calidad[,Parametro])==FALSE));Base_Datos_Disponibles <-
 Base_Calidad[c(Position_Datos),c(1:9,Parametro)];Base_Datos_Disponibles
}
 Base_Datos_Disponibles <- Seleccionar
```

- Para la realización del algoritmo se carga la formula del Índice de calidad de aguas marinas y costeras según <Invemar. 2016. Diagnóstico y Evaluación de la calidad de las aguas marinas y costeras del Caribe y Pacífico colombianos. Santa Marta. Colombia. ISSN:2389-8615>

ECUACIÓN 1 EL ÍNDICE DE CALIDAD DE AGUAS MARINAS Y COSTERAS

$$\mathrm{ICAM} = [(\mathrm{XOD\text{^}0.16}) * (\mathrm{XpH\text{^}0.12}) * (\mathrm{XSST\text{^}0.13}) * (\mathrm{XDBO5\text{^}0.13}) * (\mathrm{XCTE\text{^}0.14}) * (\mathrm{XHAT\text{^}0.12}) * (\mathrm{XNO3\text{^}0.09}) * (\mathrm{XPO4\text{^}0.13})]/[0.16 + 0.12 + 0.13 + 0.13 + 0.14 + 0.12 + 0.09 + 0.13]]$$

Para nuestro trabajo la variable HAT no se tuvo en cuenta por que en la matriz de la REDCAM no contábamos con información, de igual forma se realizó con la misma ponderación de las variables.

```
Ponderación
 <as.data.frame(c(0.16,0.12,0.13,0.13,0.14,0.09,0.13),c("OD_promedio","pH_promedio","SST_promedio","DB
 O_promedio","CTE_promedio","NO3_promedio","PO4_promedio"));colnames(Ponderacion) <-
 c("Ponderación")
icam <- list()
for(i in 1:length(Ponderacion[,1])){icam[[i]] <- Base_Calidad[,rownames(Ponderacion)[i]]^Ponderacion[i,1]}
Icam <- (icam[[1]]*icam[[2]]*icam[[3]]*icam[[4]]*icam[[5]]*icam[[6]]*icam[[7]])/sum(Ponderacion)
ICAM <- cbind(Base_Calidad[,c(3,6,7,8)],Icam)
plot(ICAM[,"Icam"]);abline(h=c(25,50,70,90),col=c("red","orange","yellow","green"))
```

- Como resultado se genera las correlaciones según la región ya sea Caribe o Pacífico y el sustrato que se requiera (Agua estuarina, Agua Fluvial, Agua Marina)

```
REgion <- readline(prompt="Indique la región a trabajar (CARIBE o PACIFICO): ")
SUstrato <- readline(prompt="Indique el sustrato a trabajar (Agua Estuarina, Agua Fluvial, Agua Marina)")
```

	MES	METODO	R	MARE	ERROR MAXIMO
0	**1**	**Distancia Inversa**	**0.2**	**18.1**	**1415.9**
1	1	Kriging Lineal	0.3	24.8	1136.7
2	1	Curvatura Minima	0.5	26.8	873.0
3	1	Shepard Modificado	-0.2	106.2	2269.5
4	1	Vecino Natural	0.3	20.1	1165.2
5	1	Vecino mas Cercano	0.2	32.1	1399.4
6	1	Funcion de Base Radial	0.1	242.4	3596.4
7	1	Triangulacion Lineal	0.3	21.6	1148.6

ESTACION	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	0.209703082
11020010	5.908528	-76.142083	0.275985422
11020050	5.757667	-76.250861	0.377186868
11025010	5.878333	-76.084333	-0.021239739
11030040	5.481611	-76.740861	0.506207908
11035020	5.62625	-76.749722	-0.209054665
11040010	5.743611	-76.537806	0.817602273
11045010	5.690556	-76.643861	0.43508746
11050010	6.221778	-76.727028	0.13913615
11050020	5.994722	-76.780028	0.497032458
11050030	6.1025	-76.821361	0.616846789
11060010	6.42	-76.779278	0.347598899
11070020	6.332222	-76.228611	0.038672785
11070030	6.539444	-76.158611	0.266913753
11080010	6.559167	-76.885417	0.345101268
11090010	6.812528	-76.972722	0.442166915
11100020	7.1785	-77.034472	0.39942385
11110010	6.763333	-76.133611	0.259321932
11110020	6.6425	-76.075	0.07301107
11115040	6.786944	-76.190833	0.357887723
11150020	8.162917	-77.040417	0.587300232
12010010	7.766389	-76.855278	0.301651339
12010030	7.571111	-76.6975	0.274709789
12010050	7.808056	-76.703056	0.600901611
12010070	7.884444	-76.647778	-0.120578389
12010090	7.747667	-76.711889	0.246536546
12010110	7.987417	-76.638528	0.822878307
12015020	7.826111	-76.651389	0.565791251
12015070	7.816667	-76.717833	0.445613472
12025030	8.542944	-76.672556	0.613365393
23080390	6.468306	-75.163806	0.407925015
23080640	6.171083	-75.328	0.628270722
23080810	6.2495	-74.828111	0.192028542
23080820	6.146722	-75.11775	0.38170575
23085030	6.376278	-75.143389	0.14819585
23085140	5.963667	-75.100778	0.459408325
23085220	6.157667	-75.038917	0.417081338
23090020	6.393556	-74.681806	-0.272866202
23100030	6.840472	-74.785667	0.383018965
23100040	6.594278	-75.010917	0.417477986
23105030	6.774111	-74.796583	0.452866086
23055070	5.731139	-75.138639	0.321150135
11120040	7.439444	-77.115278	0.607519849
11130010	8.036778	-77.087861	0.600030642
11150030	8.530833	-77.276944	0.37094702
12010060	7.863056	-76.689167	0.399842362

12010100	7.945528	-76.617389	0.602624512
12010120	7.883611	-76.647222	0.413637008
12010170	7.460167	-76.689667	0.685810202
12015010	7.35	-76.483333	0.361020506
12020010	8.204167	-76.524722	0.781063947
23080650	6.073778	-75.335611	0.389252612
23080740	6.396944	-75.259167	0.435011462
23080760	6.4875	-75.017	0.266241586
23080920	6.133333	-75.273583	0.381196405
23085110	6.21425	-75.241333	0.597706634
23085160	6.311889	-75.253528	0.487533229
23085200	6.168639	-75.425889	0.621186812
23175020	7.011694	-74.716278	0.399749088
25020030	8.727222	-74.512222	0.203302202
25020330	8.366389	-74.569167	0.34965354
25020350	8.492778	-74.541667	-0.263375691
25020420	8.387694	-74.563	0.419091128
25020540	8.031111	-74.706111	0.343464051
25020810	8.291333	-74.605722	0.28998835
25021480	8.031944	-74.788528	0.489799951
25021490	8.339139	-74.559333	0.43179529
26170150	5.791056	-75.838806	0.168528268
26170180	5.547833	-75.641306	0.364332262
26175030	5.720167	-75.694278	0.439912312
26175040	5.800194	-75.650972	0.430340101
26180160	5.785972	-75.430417	0.514280881
26180180	5.71525	-75.2945	0.554059499
26180200	5.950833	-75.536833	0.50404056
26185020	5.886361	-75.318639	0.169521319
26190090	5.755	-75.975528	0.117871458
26190100	5.563972	-75.900083	0.370742595
26195030	5.587722	-75.800556	0.379009442
26200120	6.072944	-75.794583	-0.08918241
26200130	5.967778	-75.842222	0.288662758
26200140	6.157972	-75.771528	0.37835981
26200150	5.93675	-75.685111	0.432318928
26205080	6.341	-75.700861	0.372491748
26210080	6.099222	-75.873972	0.45968959
26210110	5.934833	-75.861139	0.028562463

	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	0.224240946
11020010	5.908528	-76.142083	0.307660897
11020050	5.757667	-76.250861	0.406765528
11025010	5.878333	-76.084333	0.019667088
11030040	5.481611	-76.740861	0.511171475
11035010	5.514722	-76.575833	0.447968054
11035020	5.62625	-76.749722	-0.117301039
11040010	5.743611	-76.537806	0.77827193
11045010	5.690556	-76.643861	0.599454475
11050010	6.221778	-76.727028	0.087032632
11050020	5.994722	-76.780028	0.395535305
11050030	6.1025	-76.821361	0.590632442
11060010	6.42	-76.779278	0.408930431
11070020	6.332222	-76.228611	0.093803183
11070030	6.539444	-76.158611	0.345710307
11080010	6.559167	-76.885417	0.285189447
11090010	6.812528	-76.972722	0.370917193
11100020	7.1785	-77.034472	0.327834786
11110010	6.763333	-76.133611	0.372818262
11110020	6.6425	-76.075	0.162002635
11115040	6.786944	-76.190833	0.559033285
11150020	8.162917	-77.040417	0.683745157
12010010	7.766389	-76.855278	0.228179335
12010030	7.571111	-76.6975	0.29624219
12010050	7.808056	-76.703056	0.648050373
12010070	7.884444	-76.647778	-0.218528743
12010090	7.747667	-76.711889	0.227913421
12010110	7.987417	-76.638528	0.700144363
12015020	7.826111	-76.651389	0.531674985
12015070	7.816667	-76.717833	0.416287606
12025030	8.542944	-76.672556	0.478411846
23080390	6.468306	-75.163806	0.547848623
23080640	6.171083	-75.328	0.707217309
23080810	6.2495	-74.828111	0.262129859
23080820	6.146722	-75.11775	0.496104275
23085030	6.376278	-75.143389	0.310036696
23085140	5.963667	-75.100778	0.578379294
23085220	6.157667	-75.038917	0.590068209
23090020	6.393556	-74.681806	-0.173109743
23100030	6.840472	-74.785667	0.581604366
23100040	6.594278	-75.010917	0.557818756
23105030	6.774111	-74.796583	0.640967695
23055070	5.731139	-75.138639	0.419952862
11110030	6.858056	-76.252222	0.131790958
11120040	7.439444	-77.115278	0.655569267
11130010	8.036778	-77.087861	0.553218337

11150030	8.530833	-77.276944	0.208485926
12010060	7.863056	-76.689167	0.386979301
12010100	7.945528	-76.617389	0.515105959
12010120	7.883611	-76.647222	0.265509535
12010170	7.460167	-76.689667	0.743502574
12015010	7.35	-76.483333	0.464444369
12020010	8.204167	-76.524722	0.693281202
23080650	6.073778	-75.335611	0.579291091
23080740	6.396944	-75.259167	0.609954717
23080760	6.4875	-75.017	0.410926679
23080920	6.133333	-75.273583	0.607572965
23085110	6.21425	-75.241333	0.781819787
23085160	6.311889	-75.253528	0.638435066
23085200	6.168639	-75.425889	0.771736643
23175020	7.011694	-74.716278	0.589084441
25020030	8.727222	-74.512222	0.305824845
25020330	8.366389	-74.569167	0.375825883
25020350	8.492778	-74.541667	-0.128658984
25020420	8.387694	-74.563	0.473817114
25020540	8.031111	-74.706111	0.399707502
25020810	8.291333	-74.605722	0.298085983
25021480	8.031944	-74.788528	0.569185876
25021490	8.339139	-74.559333	0.480580758
26170150	5.791056	-75.838806	0.250581926
26170180	5.547833	-75.641306	0.395921903
26175030	5.720167	-75.694278	0.523196764
26175040	5.800194	-75.650972	0.491912457
26180160	5.785972	-75.430417	0.616770138
26180180	5.71525	-75.2945	0.682713778
26180200	5.950833	-75.536833	0.585723905
26185020	5.886361	-75.318639	0.214319862
26190090	5.755	-75.975528	0.169902028
26190100	5.563972	-75.900083	0.462444855
26195020	5.691	-75.880222	0.398520647
26195030	5.587722	-75.800556	0.439431758
26200120	6.072944	-75.794583	0.201022385
26200130	5.967778	-75.842222	0.333666228
26200140	6.157972	-75.771528	0.489338051
26200150	5.93675	-75.685111	0.551630014
26205080	6.341	-75.700861	0.489665334
26210080	6.099222	-75.873972	0.638796813
26210110	5.934833	-75.861139	0.077219416

	MES	METODO	R	MARE	ERROR MAXIMO
0	1	Distancia Inversa	0.3	48.5	1605.6
1	1	Kriging Lineal	0.3	49.4	1216.0
2	**1**	**Curvatura Minima**	**0.5**	**41.4**	**608.8**
3	1	Shepard Modificado	0.0	138.4	3534.6
4	1	Vecino Natural	0.3	49.9	1245.2
5	1	Vecino mas Cercano	0.2	63.6	1464.3
6	1	Funcion de Base Radial	0.1	248.0	3522.3
7	1	Triangulacion Lineal	0.3	51.8	1222.3

ESTACION	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	0.28457398
11020010	5.908528	-76.142083	0.211568093
11025010	5.878333	-76.084333	-0.018465987
11030040	5.481611	-76.740861	0.482936051
11035020	5.62625	-76.749722	-0.313674803
11040010	5.743611	-76.537806	0.646380317
11045010	5.690556	-76.643861	0.339614249
11050010	6.221778	-76.727028	0.150317625
11050030	6.1025	-76.821361	0.66046919
11060010	6.42	-76.779278	0.355493758
11070020	6.332222	-76.228611	0.06350018
11070030	6.539444	-76.158611	0.323070479
11080010	6.559167	-76.885417	0.198050222
11100020	7.1785	-77.034472	0.283885254
11110010	6.763333	-76.133611	0.432154287
11115040	6.786944	-76.190833	0.509740044
11150020	8.162917	-77.040417	0.536163548
12010030	7.571111	-76.6975	0.309706617
12010050	7.808056	-76.703056	0.588281386
12010070	7.884444	-76.647778	-0.271432342
12010090	7.747667	-76.711889	0.141795875
12010110	7.987417	-76.638528	0.605862876
12015020	7.826111	-76.651389	0.318573066
12015070	7.816667	-76.717833	0.248235135
12025030	8.542944	-76.672556	-0.028066319
23080640	6.171083	-75.328	0.656344071
23080820	6.146722	-75.11775	0.456268054
23085030	6.376278	-75.143389	0.285059086
23085140	5.963667	-75.100778	0.49096465
23085220	6.157667	-75.038917	0.506639142
23100030	6.840472	-74.785667	0.401401849
23100040	6.594278	-75.010917	0.424214708
23105030	6.774111	-74.796583	0.402276549
23055070	5.731139	-75.138639	0.279229109
11120040	7.439444	-77.115278	0.613181665
11130010	8.036778	-77.087861	0.375772224
11150030	8.530833	-77.276944	0.068089843
12010060	7.863056	-76.689167	0.14595058
12010100	7.945528	-76.617389	0.356713971
12010120	7.883611	-76.647222	-0.005564371
12010170	7.460167	-76.689667	0.648022483
12015010	7.35	-76.483333	0.41112196
12020010	8.204167	-76.524722	0.550381973
23080650	6.073778	-75.335611	0.457442482
23080740	6.396944	-75.259167	0.558523338
23080920	6.133333	-75.273583	0.508757849

23085110	6.21425	-75.241333	0.61887276
23085160	6.311889	-75.253528	0.502044125
23085200	6.168639	-75.425889	0.680406822
25020030	8.727222	-74.512222	0.539187253
25020330	8.366389	-74.569167	0.299248133
25020350	8.492778	-74.541667	-0.120843197
25020420	8.387694	-74.563	0.35679323
25020540	8.031111	-74.706111	0.510677631
25020810	8.291333	-74.605722	0.286025773
25021480	8.031944	-74.788528	0.359681684
25021490	8.339139	-74.559333	0.322383388
26170180	5.547833	-75.641306	0.243407323
26175030	5.720167	-75.694278	0.469575922
26175040	5.800194	-75.650972	0.380960974
26180160	5.785972	-75.430417	0.505966191
26180180	5.71525	-75.2945	0.600836508
26180200	5.950833	-75.536833	0.454191322
26185020	5.886361	-75.318639	0.193744668
26190090	5.755	-75.975528	0.077952471
26195030	5.587722	-75.800556	0.347482832
26200120	6.072944	-75.794583	0.088052564
26200130	5.967778	-75.842222	0.396028969
26200140	6.157972	-75.771528	0.442099921
26200150	5.93675	-75.685111	0.477853847
26205080	6.341	-75.700861	0.443839819
26210080	6.099222	-75.873972	0.506392047

	MES	METODO	R	MARE	ERROR MAXIMO
0	**1**	**Distancia Inversa**	**0.3**	**-63.8**	**4763.8**
1	1	Kriging Lineal	0.2	-54.9	4588.1
2	1	Curvatura Minima	0.5	-5.0	2765.0
3	1	Shepard Modificado	0.2	-75.6	11040.3
4	1	Vecino Natural	0.3	-61.1	4093.3
5	1	Vecino mas Cercano	0.2	-45.5	4778.0
6	1	Funcion de Base Radial	0.1	35.0	11246.1
7	1	Triangulacion Lineal	0.3	-59.4	4115.3

ESTACION	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	-0.139164461
11020010	5.908528	-76.142083	-0.279272421
11020050	5.757667	-76.250861	-0.484707617
11025010	5.878333	-76.084333	-0.082739947
11030040	5.481611	-76.740861	-0.31128442
11035020	5.62625	-76.749722	0.033327679
11040010	5.743611	-76.537806	-0.083692731
11045010	5.690556	-76.643861	0.047882868
11050010	6.221778	-76.727028	-0.465393683
11050020	5.994722	-76.780028	0.178130009
11050030	6.1025	-76.821361	-0.302056081
11060010	6.42	-76.779278	-0.228794057
11070020	6.332222	-76.228611	-0.32045153
11070030	6.539444	-76.158611	-0.224747447
11080010	6.559167	-76.885417	-0.533187941
11090010	6.812528	-76.972722	-0.660496189
11100020	7.1785	-77.034472	-0.456925032
11110010	6.763333	-76.133611	-0.150687564
11110020	6.6425	-76.075	-0.409347737
11115040	6.786944	-76.190833	-0.156708505
11150020	8.162917	-77.040417	-0.223813727
12010010	7.766389	-76.855278	-0.455636187
12010030	7.571111	-76.6975	-0.160419165
12010050	7.808056	-76.703056	-0.454258261
12010070	7.884444	-76.647778	0.019173881
12010090	7.747667	-76.711889	-0.51920291
12010110	7.987417	-76.638528	-0.47231539
12015020	7.826111	-76.651389	-0.501448257
12015070	7.816667	-76.717833	-0.537325538
12025030	8.542944	-76.672556	-0.493993525
23080390	6.468306	-75.163806	-0.017586022
23080640	6.171083	-75.328	0.010214952
23080810	6.2495	-74.828111	-0.172730035
23080820	6.146722	-75.11775	-0.155388486
23085030	6.376278	-75.143389	0.063343701
23085140	5.963667	-75.100778	-0.407767952
23085220	6.157667	-75.038917	-0.282452588
23090020	6.393556	-74.681806	-0.297613564
23100030	6.840472	-74.785667	-0.098969283
23100040	6.594278	-75.010917	0.210798718
23105030	6.774111	-74.796583	-0.281444369
23055070	5.731139	-75.138639	-0.396400272
11120040	7.439444	-77.115278	-0.502001191
11130010	8.036778	-77.087861	-0.728403994
11150030	8.530833	-77.276944	-0.436684907
12010060	7.863056	-76.689167	-0.204494851

12010100	7.945528	-76.617389	-0.379302595
12010120	7.883611	-76.647222	-0.466791515
12010170	7.460167	-76.689667	-0.060189542
12015010	7.35	-76.483333	-0.0358921
12020010	8.204167	-76.524722	-0.142958003
23080650	6.073778	-75.335611	-0.135404126
23080740	6.396944	-75.259167	-0.16177083
23080760	6.4875	-75.017	-0.12158485
23080920	6.133333	-75.273583	-0.046472994
23085110	6.21425	-75.241333	-0.236283999
23085160	6.311889	-75.253528	-0.032670146
23085200	6.168639	-75.425889	-0.321391092
23175020	7.011694	-74.716278	-0.108534774
25020030	8.727222	-74.512222	-0.420444052
25020330	8.366389	-74.569167	-0.260844224
25020350	8.492778	-74.541667	0.114301601
25020420	8.387694	-74.563	-0.447656669
25020540	8.031111	-74.706111	0.171482632
25020810	8.291333	-74.605722	-0.454165978
25021480	8.031944	-74.788528	-0.437831431
25021490	8.339139	-74.559333	-0.406735187
26170150	5.791056	-75.838806	-0.412592291
26170180	5.547833	-75.641306	-0.308267914
26175030	5.720167	-75.694278	-0.294878788
26175040	5.800194	-75.650972	-0.291324552
26180160	5.785972	-75.430417	-0.41863599
26180180	5.71525	-75.2945	-0.199777934
26180200	5.950833	-75.536833	-0.415909528
26185020	5.886361	-75.318639	0.026636143
26190090	5.755	-75.975528	-0.154350622
26190100	5.563972	-75.900083	-0.129197332
26195030	5.587722	-75.800556	-0.299118135
26200120	6.072944	-75.794583	0.2243463
26200130	5.967778	-75.842222	0.292929215
26200140	6.157972	-75.771528	-0.296546398
26200150	5.93675	-75.685111	-0.189194806
26205080	6.341	-75.700861	-0.083011891
26210080	6.099222	-75.873972	-0.087678802
26210110	5.934833	-75.861139	-0.208269085

	MES	METODO	R	MARE	ERROR MAXIMO
0	1	Distancia Inversa	0.2	27.4	2533.8
1	1	Kriging Lineal	0.2	27.2	2513.2
2	**1**	**Curvatura Minima**	**0.5**	**23.5**	**2346.4**
3	1	Shepard Modificado	-0.2	-143.3	5684.5
4	1	Vecino Natural	0.3	43.1	2496.7
5	1	Vecino mas Cercano	0.2	-2.9	2534.5
6	1	Funcion de Base Radial	-0.1	-358.3	17868.1
7	1	Triangulacion Lineal	0.3	27.4	2513.6

ESTACION	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	0.291424281
11020010	5.908528	-76.142083	0.300173387
11020050	5.757667	-76.250861	0.541699122
11025010	5.878333	-76.084333	0.022429948
11030040	5.481611	-76.740861	0.540995423
11035020	5.62625	-76.749722	-0.126379567
11040010	5.743611	-76.537806	0.765084766
11045010	5.690556	-76.643861	0.402561516
11050010	6.221778	-76.727028	0.295636658
11050020	5.994722	-76.780028	0.349954417
11050030	6.1025	-76.821361	0.702358989
11060010	6.42	-76.779278	0.480692163
11070020	6.332222	-76.228611	0.011008628
11070030	6.539444	-76.158611	0.240735513
11080010	6.559167	-76.885417	0.486706153
11090010	6.812528	-76.972722	0.562489732
11100020	7.1785	-77.034472	0.61050961
11110010	6.763333	-76.133611	0.339183504
11110020	6.6425	-76.075	0.220080371
11115040	6.786944	-76.190833	0.398356506
11150020	8.162917	-77.040417	0.598735928
12010010	7.766389	-76.855278	0.478946489
12010030	7.571111	-76.6975	0.384404334
12010050	7.808056	-76.703056	0.724070082
12010070	7.884444	-76.647778	-0.115248132
12010090	7.747667	-76.711889	0.493529074
12010110	7.987417	-76.638528	0.868350189
12015020	7.826111	-76.651389	0.676443382
12015070	7.816667	-76.717833	0.673234391
12025030	8.542944	-76.672556	0.644710871
23080390	6.468306	-75.163806	0.404216372
23080640	6.171083	-75.328	0.459898396
23080810	6.2495	-74.828111	0.20899615
23080820	6.146722	-75.11775	0.487705564
23085030	6.376278	-75.143389	0.166302557
23085140	5.963667	-75.100778	0.580506376
23085220	6.157667	-75.038917	0.547470841
23090020	6.393556	-74.681806	-0.088797303
23100030	6.840472	-74.785667	0.33038676
23100040	6.594278	-75.010917	0.309661694
23105030	6.774111	-74.796583	0.444954056
23055070	5.731139	-75.138639	0.42738105
11120040	7.439444	-77.115278	0.796479819
11130010	8.036778	-77.087861	0.715104063
11150030	8.530833	-77.276944	0.570421454
12010060	7.863056	-76.689167	0.424092606

12010100	7.945528	-76.617389	0.614482515
12010120	7.883611	-76.647222	0.455064408
12010170	7.460167	-76.689667	0.677586367
12015010	7.35	-76.483333	0.305085483
12020010	8.204167	-76.524722	0.766028557
23080650	6.073778	-75.335611	0.423157189
23080740	6.396944	-75.259167	0.501360827
23080760	6.4875	-75.017	0.342362589
23080920	6.133333	-75.273583	0.405341626
23085110	6.21425	-75.241333	0.641657099
23085160	6.311889	-75.253528	0.462249562
23085200	6.168639	-75.425889	0.674210042
23175020	7.011694	-74.716278	0.430738784
25020030	8.727222	-74.512222	0.410995552
25020330	8.366389	-74.569167	0.342856003
25020350	8.492778	-74.541667	-0.397817877
25020420	8.387694	-74.563	0.475655392
25020540	8.031111	-74.706111	0.241440048
25020810	8.291333	-74.605722	0.374741123
25021480	8.031944	-74.788528	0.461537212
25021490	8.339139	-74.559333	0.466041096
26170150	5.791056	-75.838806	0.206527459
26170180	5.547833	-75.641306	0.423658871
26175030	5.720167	-75.694278	0.459089485
26175040	5.800194	-75.650972	0.446577536
26180160	5.785972	-75.430417	0.611246195
26180180	5.71525	-75.2945	0.539014922
26180200	5.950833	-75.536833	0.574937531
26185020	5.886361	-75.318639	0.119853628
26190090	5.755	-75.975528	0.174418847
26190100	5.563972	-75.900083	0.365261076
26195030	5.587722	-75.800556	0.400495581
26200120	6.072944	-75.794583	-0.081723716
26200130	5.967778	-75.842222	0.146284822
26200140	6.157972	-75.771528	0.388304906
26200150	5.93675	-75.685111	0.455144922
26205080	6.341	-75.700861	0.382546344
26210080	6.099222	-75.873972	0.419351692
26210110	5.934833	-75.861139	0.052071902

	MES	METODO	R	MARE	ERROR MAXIMO
0	1	Distancia Inversa	0.3	57.4	2997.0
1	1	Kriging Lineal	0.3	56.7	2774.2
2	**1**	**Curvatura Minima**	**0.4**	**31.3**	**692.3**
3	1	Shepard Modificado	-0.2	129.9	2694.3
4	1	Vecino Natural	0.3	58.2	2445.8
5	1	Vecino mas Cercano	0.3	59.2	2086.8
6	1	Funcion de Base Radial	0.1	252.3	3906.9
7	1	Triangulacion Lineal	0.4	58.2	2293.8

ESTACION	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	0.244899344
11020010	5.908528	-76.142083	0.308886235
11020050	5.757667	-76.250861	0.510529355
11025010	5.878333	-76.084333	0.0440138
11030040	5.481611	-76.740861	0.529279239
11035010	5.514722	-76.575833	0.520701571
11035020	5.62625	-76.749722	-0.010491873
11040010	5.743611	-76.537806	0.750615281
11045010	5.690556	-76.643861	0.579951686
11050010	6.221778	-76.727028	0.219773638
11050020	5.994722	-76.780028	0.259238478
11050030	6.1025	-76.821361	0.668851205
11060010	6.42	-76.779278	0.529452517
11070020	6.332222	-76.228611	0.006113553
11070030	6.539444	-76.158611	0.268675581
11080010	6.559167	-76.885417	0.401810132
11090010	6.812528	-76.972722	0.465431143
11100020	7.1785	-77.034472	0.559107724
11110010	6.763333	-76.133611	0.433133869
11110020	6.6425	-76.075	0.283586166
11115040	6.786944	-76.190833	0.582974884
11150020	8.162917	-77.040417	0.697723903
12010010	7.766389	-76.855278	0.413546953
12010030	7.571111	-76.6975	0.401191956
12010050	7.808056	-76.703056	0.771558562
12010070	7.884444	-76.647778	-0.222110397
12010090	7.747667	-76.711889	0.481382851
12010110	7.987417	-76.638528	0.729483432
12015020	7.826111	-76.651389	0.62404538
12015070	7.816667	-76.717833	0.633706611
12025030	8.542944	-76.672556	0.515702281
23080390	6.468306	-75.163806	0.570738063
23080640	6.171083	-75.328	0.539731494
23080810	6.2495	-74.828111	0.287476783
23080820	6.146722	-75.11775	0.59203272
23085030	6.376278	-75.143389	0.324355086
23085140	5.963667	-75.100778	0.617443646
23085220	6.157667	-75.038917	0.700540117
23090020	6.393556	-74.681806	0.01782521
23100030	6.840472	-74.785667	0.546373041
23100040	6.594278	-75.010917	0.471460117
23105030	6.774111	-74.796583	0.62557707
23055070	5.731139	-75.138639	0.435421321
11110030	6.858056	-76.252222	0.215379148
11120040	7.439444	-77.115278	0.823468198
11130010	8.036778	-77.087861	0.661782204

11150030	8.530833	-77.276944	0.50918766
12010060	7.863056	-76.689167	0.410539576
12010100	7.945528	-76.617389	0.500079537
12010120	7.883611	-76.647222	0.28448951
12010170	7.460167	-76.689667	0.703809892
12015010	7.35	-76.483333	0.386564289
12020010	8.204167	-76.524722	0.645967145
23080650	6.073778	-75.335611	0.620247014
23080740	6.396944	-75.259167	0.689107214
23080760	6.4875	-75.017	0.509943355
23080920	6.133333	-75.273583	0.627115043
23085110	6.21425	-75.241333	0.80304214
23085160	6.311889	-75.253528	0.624636666
23085200	6.168639	-75.425889	0.815816044
23175020	7.011694	-74.716278	0.635019048
25020030	8.727222	-74.512222	0.499643639
25020330	8.366389	-74.569167	0.371368606
25020350	8.492778	-74.541667	-0.296260612
25020420	8.387694	-74.563	0.50131736
25020540	8.031111	-74.706111	0.30117917
25020810	8.291333	-74.605722	0.370801175
25021480	8.031944	-74.788528	0.535948549
25021490	8.339139	-74.559333	0.514799565
26170150	5.791056	-75.838806	0.265911873
26170180	5.547833	-75.641306	0.402134678
26175030	5.720167	-75.694278	0.507548449
26175040	5.800194	-75.650972	0.490027276
26180160	5.785972	-75.430417	0.679855659
26180180	5.71525	-75.2945	0.627951561
26180200	5.950833	-75.536833	0.627770085
26185020	5.886361	-75.318639	0.154279195
26190090	5.755	-75.975528	0.195482961
26190100	5.563972	-75.900083	0.424102096
26195020	5.691	-75.880222	0.433404083
26195030	5.587722	-75.800556	0.440226749
26200120	6.072944	-75.794583	0.191937249
26200130	5.967778	-75.842222	0.164591648
26200140	6.157972	-75.771528	0.462484727
26200150	5.93675	-75.685111	0.551217315
26205080	6.341	-75.700861	0.469477723
26210080	6.099222	-75.873972	0.578956135
26210110	5.934833	-75.861139	0.105942367

	MES	METODO	R	MARE	ERROR MAXIMO
0	1	Distancia Inversa	0.3	81.7	6353.1
1	1	Kriging Lineal	0.3	61.7	5359.8
2	**1**	**Curvatura Minima**	**0.4**	**11.8**	**3179.4**
3	1	Shepard Modificado	-0.1	131.7	5702.9
4	1	Vecino Natural	0.3	32.8	5069.5
5	1	Vecino mas Cercano	0.3	49.7	5627.6
6	1	Funcion de Base Radial	0.1	237.0	6032.6
7	1	Triangulacion Lineal	0.3	36.0	4448.7

ESTACION	LATITUD	LONGITUD	x
11010010	5.458861	-76.545	0.33
11020010	5.908528	-76.142083	0.20
11025010	5.878333	-76.084333	0.01
11030040	5.481611	-76.740861	0.49
11035020	5.62625	-76.749722	-0.24
11040010	5.743611	-76.537806	0.55
11045010	5.690556	-76.643861	0.27
11050010	6.221778	-76.727028	0.27
11050030	6.1025	-76.821361	0.76
11060010	6.42	-76.779278	0.47
11070020	6.332222	-76.228611	-0.07
11070030	6.539444	-76.158611	0.23
11080010	6.559167	-76.885417	0.32
11100020	7.1785	-77.034472	0.50
11110010	6.763333	-76.133611	0.46
11115040	6.786944	-76.190833	0.51
11150020	8.162917	-77.040417	0.53
12010030	7.571111	-76.6975	0.38
12010050	7.808056	-76.703056	0.69
12010070	7.884444	-76.647778	-0.37
12010090	7.747667	-76.711889	0.33
12010110	7.987417	-76.638528	0.56
12015020	7.826111	-76.651389	0.30
12015070	7.816667	-76.717833	0.46
12025030	8.542944	-76.672556	-0.07
23080640	6.171083	-75.328	0.47
23080820	6.146722	-75.11775	0.56
23085030	6.376278	-75.143389	0.30
23085140	5.963667	-75.100778	0.53
23085220	6.157667	-75.038917	0.60
23100030	6.840472	-74.785667	0.39
23100040	6.594278	-75.010917	0.31
23105030	6.774111	-74.796583	0.40
23055070	5.731139	-75.138639	0.30
11120040	7.439444	-77.115278	0.78
11130010	8.036778	-77.087861	0.47
11150030	8.530833	-77.276944	0.24
12010060	7.863056	-76.689167	0.06
12010100	7.945528	-76.617389	0.27
12010120	7.883611	-76.647222	-0.05
12010170	7.460167	-76.689667	0.55
12015010	7.35	-76.483333	0.34
12020010	8.204167	-76.524722	0.43
23080650	6.073778	-75.335611	0.48
23080740	6.396944	-75.259167	0.62
23080920	6.133333	-75.273583	0.50

23085110	6.21425	-75.241333	0.64
23085160	6.311889	-75.253528	0.46
23085200	6.168639	-75.425889	0.69
25020030	8.727222	-74.512222	0.69
25020330	8.366389	-74.569167	0.21
25020350	8.492778	-74.541667	-0.32
25020420	8.387694	-74.563	0.28
25020540	8.031111	-74.706111	0.31
25020810	8.291333	-74.605722	0.31
25021480	8.031944	-74.788528	0.28
25021490	8.339139	-74.559333	0.32
26170180	5.547833	-75.641306	0.22
26175030	5.720167	-75.694278	0.44
26175040	5.800194	-75.650972	0.34
26180160	5.785972	-75.430417	0.55
26180180	5.71525	-75.2945	0.51
26180200	5.950833	-75.536833	0.46
26185020	5.886361	-75.318639	0.10
26190090	5.755	-75.975528	0.10
26195030	5.587722	-75.800556	0.32
26200120	6.072944	-75.794583	0.02
26200130	5.967778	-75.842222	0.28
26200140	6.157972	-75.771528	0.41
26200150	5.93675	-75.685111	0.46
26205080	6.341	-75.700861	0.42
26210080	6.099222	-75.873972	0.46

	MES	METODO	R	MARE	ERROR MAXIMO
0	1	Distancia Inversa	0.4	51.5	2041.8
1	**1**	**Kriging Lineal**	**0.2**	**51.8**	**1722.7**
2	1	Curvatura Minima	0.6	55.5	1799.1
3	1	Shepard Modificado	0.1	58.1	5686.2
4	1	Vecino Natural	0.4	54.0	1617.4
5	1	Vecino mas Cercano	0.3	74.9	1873.4
6	1	Funcion de Base Radial	0.1	306.4	10598.4
7	1	Triangulacion Lineal	0.3	57.3	1528.5