summary(h)

Family: binomial

Link function: logit

Formula:

outcome ~ s(Long, Lat) + s(Density) + s(Diameter) + s(Depth) +

s(dir, z)

Parametric coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -44.43 11.19 -3.972 7.13e-05 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Approximate significance of smooth terms:

edf Ref.df Chi.sq p-value

s(Long,Lat) 14.37533 29 46.718 1.14e-06 \*\*\*

s(Density) 7.17395 8 891.270 < 2e-16 \*\*\*

s(Diameter) 0.02128 9 0.002 0.90

s(Depth) 0.02973 9 0.013 0.57

s(dir,z) 22.42768 29 1059.511 < 2e-16 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

R-sq.(adj) = 0.0191 Deviance explained = 13%

-REML = 1.0186e+05 Scale est. = 1 n = 1168900

gam.check(h,type='response')

Method: REML Optimizer: outer newton

full convergence after 8 iterations.

Gradient range [-0.009937577,0.07059506]

(score 101857.7 & scale 1).

eigenvalue range [-6.648231e-11,4.958126].

Model rank = 86 / 86

Basis dimension (k) checking results. Low p-value (k-index<1) may

indicate that k is too low, especially if edf is close to k'.

k' edf k-index p-value

s(Long,Lat) 29.0000 14.3753 0.94 0.305

s(Density) 9.0000 7.1740 0.91 0.015 \*

s(Diameter) 9.0000 0.0213 0.93 0.155

s(Depth) 9.0000 0.0297 0.94 0.460

s(dir,z) 29.0000 22.4277 0.90 0.070 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

concurvity(h,full=T)

para s(Long,Lat) s(Density) s(Diameter) s(Depth) s(dir,z)

worst 3.475204e-22 1.343401e-04 1.027513e-04 9.330298e-05 1.198553e-04 1.370444e-04

observed 3.475204e-22 5.862104e-05 6.725296e-05 7.134279e-05 5.864392e-05 3.738670e-05

estimate 3.475204e-22 5.448168e-05 6.785727e-05 7.017309e-05 6.444312e-05 4.545893e-05