**Epidemiology & Infection**

**Supplementary Material for the paper**

**“Spatio-temporal Modeling of Foot-and-Mouth Outbreaks”**

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**Table S1.** Summary of candidate variables for inclusion on the final model.

|  |  |  |  |
| --- | --- | --- | --- |
| **Covariates\*** | **min** | **median** | **max** |
| average temperature (°*C*) | 16.15 | 26.35 | 32.2 |
| average maximum temperature (°*C*) | 21.6 | 31.5 | 39.8 |
| average minimum temperature (°*C*) | 8.8 | 17.5 | 28.4 |
| average relative humidity (%) | 32.67 | 48.835 | 82 |
| average wind speed (knots) | 2.63 | 5.315 | 11.63 |
| average soil temperature (at a 10 cm depth) (°*C*) | 21.15 | 28.85 | 39.25 |
| number of cattle | 0 | 10 | 532 |
| number of sheep | 0 | 0 | 471 |

*(\*) Source: Greek National Meteorological Service*

*The WinBUGS program for the best selected model (ZIP model with g- prior, SM-OU specification, kernel (A))*

model{

O[1] ~ dpois(lambda[1])

u[1] ~ dbern(p[1])

lambda[1] <- (1 - u[1]) \* mu[1]

log(mu[1]) <- s + b[9]\*(pow((1+(x9[1]/b[10])),-b[11]))

logit(p[1]) <-s + c[7]\*x7[1]+c[8]\*x8[1]+c[9]\*(pow((1+(x9[1]/c[10])),-c[11]))

for(k in 2:3129) {

D1[k]<-pow((1+(x9[k]/b[10])),-b[11])

Incorporation of spatial kernel

D2[k]<-pow((1+(x9[k]/c[10])),-c[11])

}

for(i in 2:72){

V1[i]<-sum(D1[startinds[i]:endinds[i]])

V2[i]<-sum(D2[startinds[i]:endinds[i]])

N1[i]<-sum(x7[startindn[i]:endindn[i]])

N2[i]<-sum(x8[startindn[i]:endindn[i]])

O[i] ~ dpois(lambda[i])

u[i] ~ dbern(p[i])

lambda[i] <- (1 - u[i]) \* mu[i]

log(mu[i]) <-mu1[i]

Ornstein-Uhlenbeck process

mu1[i] ~ dnorm(M[i],U)

C[i]<- s + b[9]\*V1[i]+ gam1\*O[i-1]

M[i]<-C[i] + (log(mu[i-1])- C[i])\*exp(-phi)

logit(p[i]) <-s + c[7]\*N1[i]+c[8]\*N2[i]+c[9]\*V2[i]+gam2\*O[i-1]

}

U<-(2\*phi)/(1-exp(-2\*phi))

lamda<-exp(s)

for (k in 7:9) {b[k] ~ dnorm( 0, 0.0001)}

for (k in 7:9) {c[k] ~ dnorm( 0, 0.0001)}

for (k in 10:11) {b[k] ~ dnorm( 0, 0.0001)I(0,)}

for (k in 10:11) {c[k] ~ dnorm( 0, 0.0001)I(0,)}

gam1 ~ dnorm(0, 0.0001)

gam2 ~ dnorm(0, 0.0001)

for (i in 1:6)

{

for (j in 1:6)

{

Incorporation of g-prior distribution

inverse.V[i , j]<-inprod(x[ , i] , x[ , j])

}

}

for (i in 1:6)

{

for (j in 1:6)

{

prior.T[i , j]<-inverse.V[i , j]\*lamda/(K/(1-K))

Incorporation of g-prior distribution

}

}

s~ dnorm( 0, 0.1)

b[1:6] ~ dmnorm( mu.beta[ ], prior.T[ , ])

for (j in 1:6)

{mu.beta[j]<-0.0}

c[1:6] ~ dmnorm( mu.c[ ], prior.T[ , ])

for (j in 1:6)

{mu.c[j]<-0.0}

K~dbeta(1,1)

Ornstein-Uhlenbeck process

phi<-exp(theta)

theta ~ dnorm( 0, 0.1)

for (i in 1:72){

x0[i]<-x[i,1]

x1[i]<-x[i,2]

x2[i]<-x[i,3]

x3[i]<-x[i,4]

x4[i]<-x[i,5]

x5[i]<-x[i,6]

x6[i]<-x[i,7]}

}