LGCP with PC priors

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The data

```
library("geostatsp")
data('murder')
data('torontoPop')
murder = unwrap(murder)
torontoBorder = unwrap(torontoBorder)
torontoPdens = unwrap(torontoPdens)
torontoIncome = unwrap(torontoIncome)
```

covariates

```
theCrs = paste0("+proj=omerc +lat_0=43.7117469868935 +lonc=-79.3789787759006",
" +alpha=-20 +gamma=0 +k=1 +x_0=0 +y_0=0 +datum=WGS84 +units=m +no_defs")
murderT = project(murder, theCrs)
borderT = project(torontoBorder, crs(murderT))
borderC = crop(borderT, ext(-12700, 7000, -7500, 3100))

covList = list(
pop=torontoPdens,
inc = log(torontoIncome) )

formulaHere = ~ inc + offset(pop, log=TRUE)
```

LGCP with priors given by quantiles

gamma priors.

```
resG=lgcp(
formula = formulaHere, data=murderT,
grid=squareRaster(borderC, 30), covariates=covList,
border=borderC, buffer=2000,
prior = list(
```

```
sd = c(lower = 0.2, upper = 2),
range = c(lower = 2, upper=20)*1000),
control.inla=list(strategy='gaussian'))

if(!is.null(resG$parameters)) {
knitr::kable(resG$parameters$summary, digits=3)
}
```

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-3.178	3.549	-10.142	-3.181	3.801	-3.181	0	24.982
inc	-1.266	0.328	-1.911	-1.265	-0.623	-1.265	0	0.293
range/1000	1.691	0.269	1.237	1.665	2.292	1.608	NA	NA
sd	0.836	-0.020	0.695	0.800	0.926	0.807	NA	NA

LGCP with penalised complexity prior

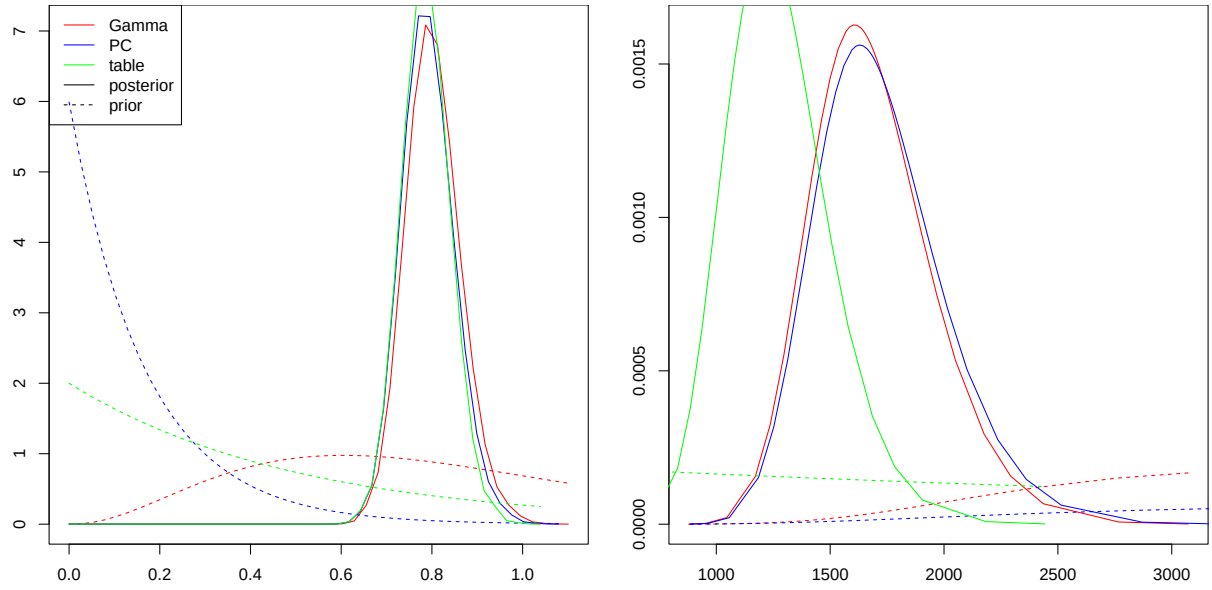
$pr(sd > 1) = 0.05$ and $pr(phi < 0.2) = 0.95$

```
resP=lgcp(formulaHere, data=murderT,
grid=squareRaster(borderC, 30),
covariates=covList,
border=borderC, buffer=2000,
prior = list(
sd = c(u=0.5, alpha=0.05),
range = c(u=10*1000, alpha = 0.4)),
control.inla = list(strategy='gaussian')
)

if(!is.null(resP$parameters)) {
knitr::kable(resP$parameters$summary, digits=3)
}
```

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-3.296	3.530	-10.220	-3.298	3.646	-3.298	0	20.927
inc	-1.255	0.326	-1.896	-1.254	-0.615	-1.254	0	0.296
range/1000	1.724	0.282	1.252	1.696	2.361	1.630	NA	NA
sd	0.825	-0.021	0.687	0.789	0.910	0.795	NA	NA

LGCP with table priors

```
sdSeq = seq(0,4,len=501)
rangeSeq = seq(0,15*1000, len=501)
resT=lgcp(formulaHere,
data=murderT,
grid=squareRaster(borderC, 30),
```



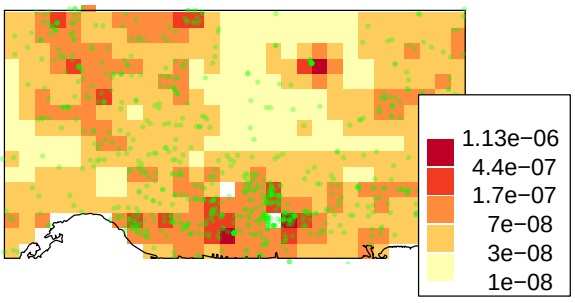
(a) sd (b) range

Figure 1: Priors and posteriors

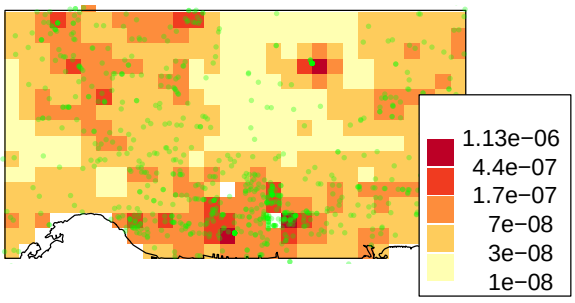
```
covariates=covList,
border=borderC, buffer=2000,
prior = list(
sd = cbind(sdSeq, dexp(sdSeq, 2)),
range = cbind(rangeSeq, dexp(rangeSeq, 1/5000))),
control.inla = list(strategy='gaussian')
)

if(!is.null(resT$parameters)) {
knitr::kable(resT$parameters$summary, digits=3)
}
```

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-2.449	3.331	-9.012	-2.441	4.073	-2.441	0	22.744
inc	-1.333	0.308	-1.936	-1.333	-0.726	-1.333	0	0.273
range/1000	1.276	0.228	0.886	1.256	1.783	1.216	NA	NA
sd	0.820	-0.021	0.686	0.786	0.894	0.795	NA	NA

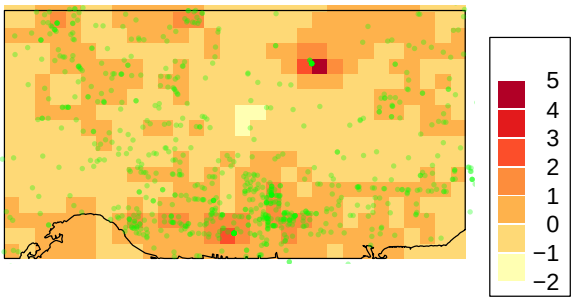
Maps



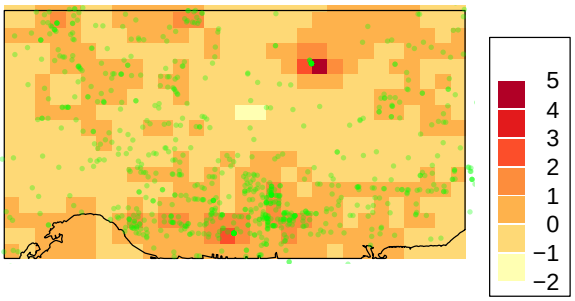
(a) gamma, fitted



(b) pc fitted



(c) gamma random



(d) pc random

Figure 2: Random effects and fitted values