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)	-3.171	3.544	-10.126	-3.173	3.795	-3.173	0	24.499
inc	-1.266	0.327	-1.910	-1.266	-0.624	-1.266	0	0.293
range/1000	1.691	0.274	1.234	1.663	2.309	1.599	NA	NA
sd	0.833	-0.017	0.692	0.800	0.932	0.807	NA	NA

LGCP with penalised complexity prior

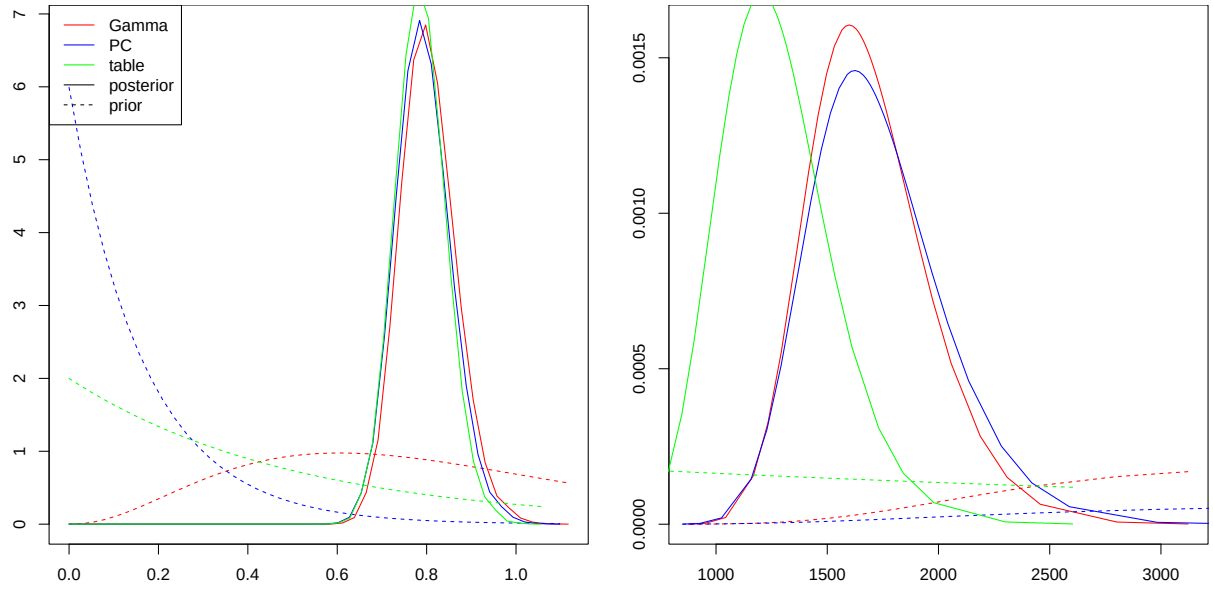
$pr(sd > 1) = 0.05$ and $pr(phi < 0.2) = 0.95$

```
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)	-3.288	3.533	-10.219	-3.290	3.659	-3.290	0	21.165
inc	-1.255	0.326	-1.897	-1.255	-0.615	-1.255	0	0.296
range/1000	1.730	0.304	1.228	1.697	2.419	1.624	NA	NA
sd	0.821	-0.016	0.681	0.790	0.919	0.798	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),
```



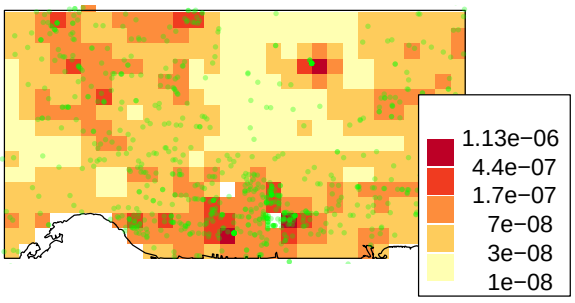
(a) sd (b) range

Figure 1: Priors and posteriors

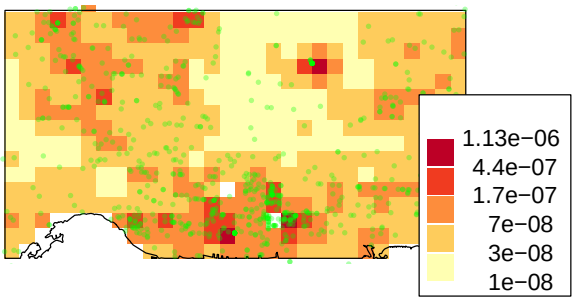
```
covariates=covList,
border=borderC, buffer=2000,
prior = list(
sd = cbind(sdSeq, dexp(sdSeq, 2)),
range = cbind(rangeSeq, dexp(rangeSeq, 1/5000))),
control.inla = list(strategy='gaussian')
)

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

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-2.450	3.330	-9.011	-2.443	4.072	-2.443	0	22.730
inc	-1.333	0.308	-1.936	-1.333	-0.726	-1.333	0	0.273
range/1000	1.274	0.254	0.846	1.250	1.841	1.204	NA	NA
sd	0.815	-0.016	0.681	0.785	0.900	0.795	NA	NA

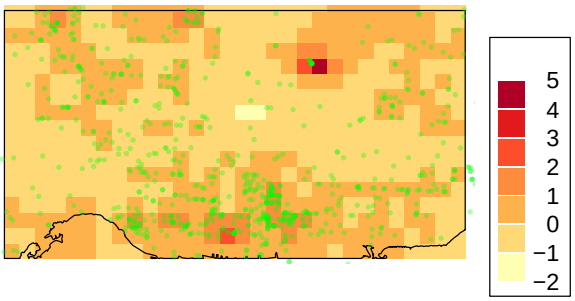
Maps



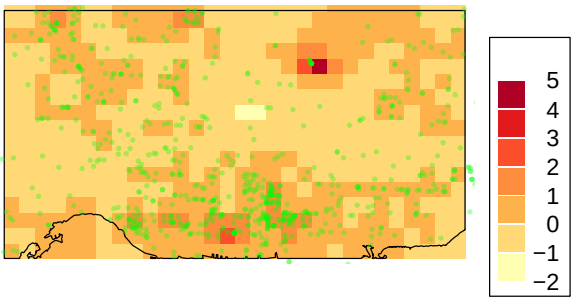
(a) gamma, fitted



(b) pc fitted



(c) gamma random



(d) pc random

Figure 2: Random effects and fitted values