Description of the function rgevspatial

Description: This function generates spatial data from the max-stable model in Reich and Shaby (2012).

Inputs:

- nreps: Number of independent replications of the process
- S: nx2 matrix of spatial locations of the data points
- knots: Lx2 matrix of knot locations
- mu: A scalar or n-vector of GEV location parameters
- sig: A scalar or n-vector of GEV scale parameters
- xi: A scalar or n-vector of GEV shape parameters
- alpha: A scalar between 0 and 1 that controls the nugget effect
- bw: Bandwidth for the Gaussian kernel

Output:

A nreps x n matrix of simulated data.
Description of the function Bayes_GEV

Description: This function generates posterior samples from the max-stable model

Inputs (default):

- **y** nsites x nreps matrix of data.
- **S** nsites x 2 matrix of data locations.
- **knots (S)** nknots x 2 matrix of knots.
- **vary (c(T,F,F))** 3x1 vector taking values of TRUE or FALSE; if vary[1]=TRUE then the GEV location varies by site. Vary[2] and vary[3] control the GEV log scale and shape.
- **X (cbind(1,S))** nsites x p matrix of spatial covariates used in the prior mean of spatially-varying GEV parameters.
- **Sp (NULL)** npred x 2 matrix of prediction locations.
- **Xp (NULL)** npred x p matrix of spatial covariates at the prediction location.
- **init.beta (c(0,0,.001))** 3x1 vector of initial values for the GEV location, log scale, and shape.
- **init.alpha (0.25)** Initial value for nugget effect alpha.
- **init.range (1)** Initial value for the spatial range of the exponential correlation for the spatially-varying GEV parameters.
- **init.bw (1)** Initial value for the kernel bandwidth.
- **pri.mn.range (-2)** The prior for the spatial range of the exponential correlation for the spatially-varying GEV parameters is log-normal(pri.mn.range,pri.sd.range).
- **pri.sd.range (1)**
- **pri.mn.bw (0)** The prior for the kernel bandwidth is log-normal(pri.mn.bw,pri.sd.bw).
- **pri.sd.bw (1)**
- **pri.var.a (.1)** For spatially-varying GEV parameters, the prior for the variance is InvGamma(pri.var.a,pri.var.b).
- **pri.var.b (.1)**
- **pri.alpha.a (1)** The prior for alpha is beta(pri.alpha.a,pri.alpha.b).
- **pri.alpha.b (1)**
- **pri.sd.beta (10)** For spatially-varying GEV parameters, the prior mean is X%*%beta, where beta[j] has N(0,pri.sd.beta) prior.
- **pri.mn.gev (c(0,0,0))** For non-spatially varying GEV parameters, the prior is N(pri.mn.gev[j],pri.sd.gev[j]). The three elements correspond to the GEV location, log scale, and shape.
- **pri.sd.gev (c(10,1,.25))**
- **keep.samples (TRUE)** If true, all MCMC samples are returned for GEV parameters as well as spatial predictions. If FALSE, only posterior means and variances are returned.
- **iters (50000)** Number of MCMC iterations.
- **burn (10000)** Number to discard as burn-in.
- **update (50)** Number of iterations between graphical displays of the MCMC chain.
- **nthin (1)** Level of thinning. Iters*nthin samples will be generated; iters will be returned.
Outputs:

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>time</td>
<td>Run time.</td>
</tr>
<tr>
<td>beta.mn</td>
<td>Nsites x 3 matrix of posterior means of the GEV parameters at the data locations; the columns correspond to GEV location, log scale, and shape.</td>
</tr>
<tr>
<td>beta.var</td>
<td>Nsites x 3 matrix of posterior variances of the GEV parameters at the data locations.</td>
</tr>
<tr>
<td>beta.samples</td>
<td>Iters x nsites x 3 array of posterior samples for the GEV parameters.</td>
</tr>
<tr>
<td>beta.mn.pred</td>
<td>Npred x 3 matrix of posterior means of the GEV parameters at the prediction locations.</td>
</tr>
<tr>
<td>beta.var.pred</td>
<td>Npred x 3 matrix of posterior variances of the GEV parameters.</td>
</tr>
<tr>
<td>beta.samples.pred</td>
<td>Iters x npred x 3 array of posterior samples for the GEV parameters.</td>
</tr>
<tr>
<td>Y.mn.pred</td>
<td>Npred x nt matrix of posterior means for predicted values.</td>
</tr>
<tr>
<td>Y.var.pred</td>
<td>Npred x nt matrix of posterior variances for predicted values.</td>
</tr>
<tr>
<td>Y.samples.pred</td>
<td>Iters x npred x nt array of posterior samples for predicted values.</td>
</tr>
<tr>
<td>parameters</td>
<td>Iters x 7 matrix of posterior samples for: alpha, spatial range of spatially-varying GEV parameters, kernel bandwidth, GEV location, log scale, and shape at site 1, and the log-likelihood (conditioned on the random effects).</td>
</tr>
</tbody>
</table>