Synchrony update: Part 2

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Recent Progress

- Generated quantities block
- Adding a covariance matrix
- Testing my second research question

Generated quantities block

Method suggested by Geoff:

```
generated quantities {

real ypred_new[N];
for (i in 1:N)
    ypred_new[i] = normal_rng(mu_y[species[i]], sigma_y);
 }
```

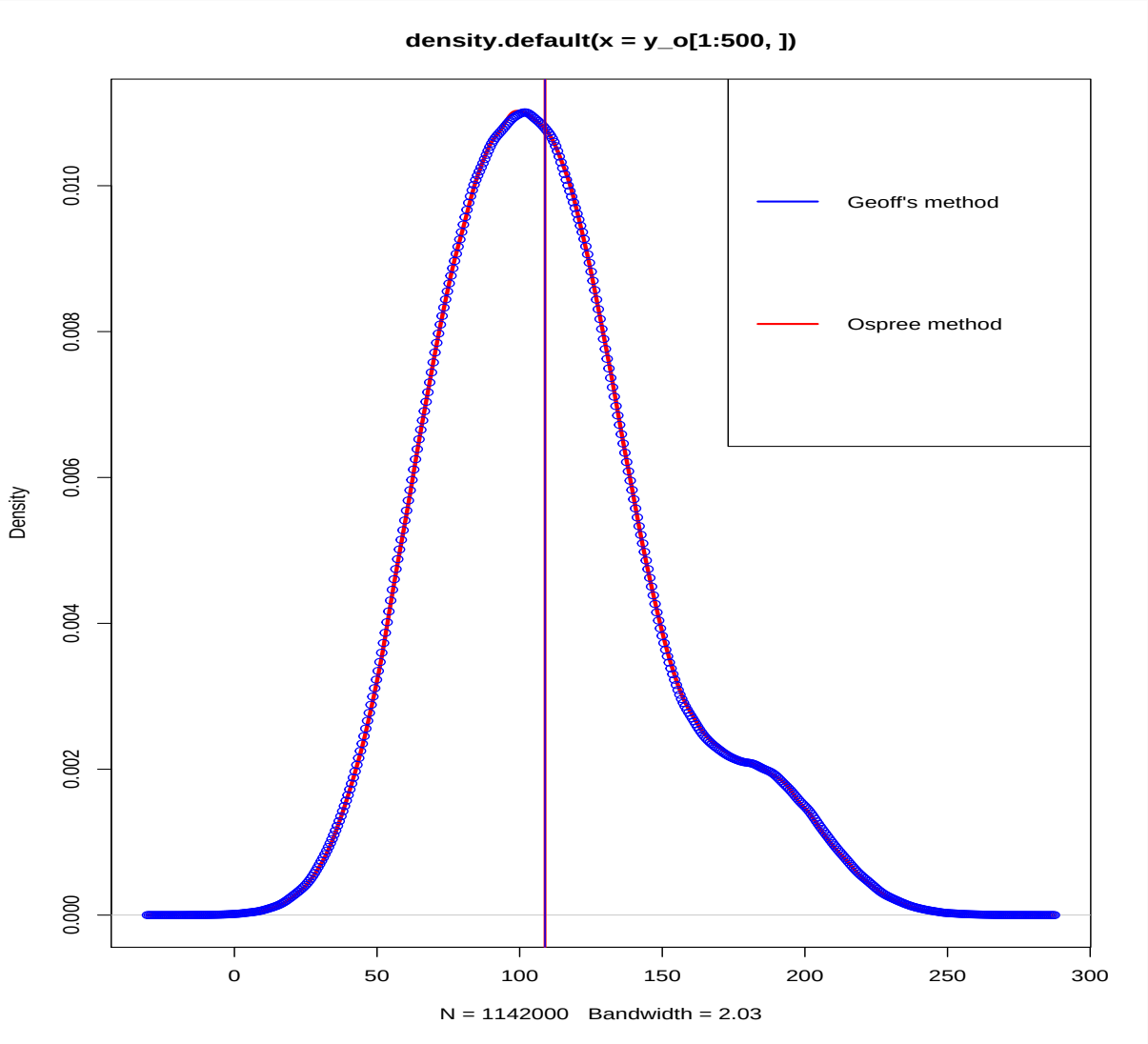
Method copied from Ospree model:

```
generated quantities {

real ypred_new[N];
for (i in 1:N)
ypred_new[i]=a+b[species[i]]*year[i];
for (i in 1:N)
ypred_new[i] = normal_rng(mu_y[species[i]], sigma_y);
}
```

Generated quantities block

They are equivalent!



Covariance matrix

See stan code:

Projects – Deirdre – Stan – singlesp_randslopes_goo_wcov

Covariance matrix model output

Model fit using all data except the Thackeray dataset:

```
Warning messages:
1: The largest R-hat is NA, indicating chains have not mixed.
Running the chains for more iterations may help. See
http://mc-stan.org/misc/warnings.html#r-hat
2: Bulk Effective Samples Size (ESS) is too low, indicating posterior means and medians may be unreliable.
Running the chains for more iterations may help. See
http://mc-stan.org/misc/warnings.html#bulk-ess
3: Tail Effective Samples Size (ESS) is too low, indicating posterior variances and tail quantiles may be unreliabl
e.
Running the chains for more iterations may help. See
http://mc-stan.org/misc/warnings.html#tail-ess
```

Covariance matrix model output

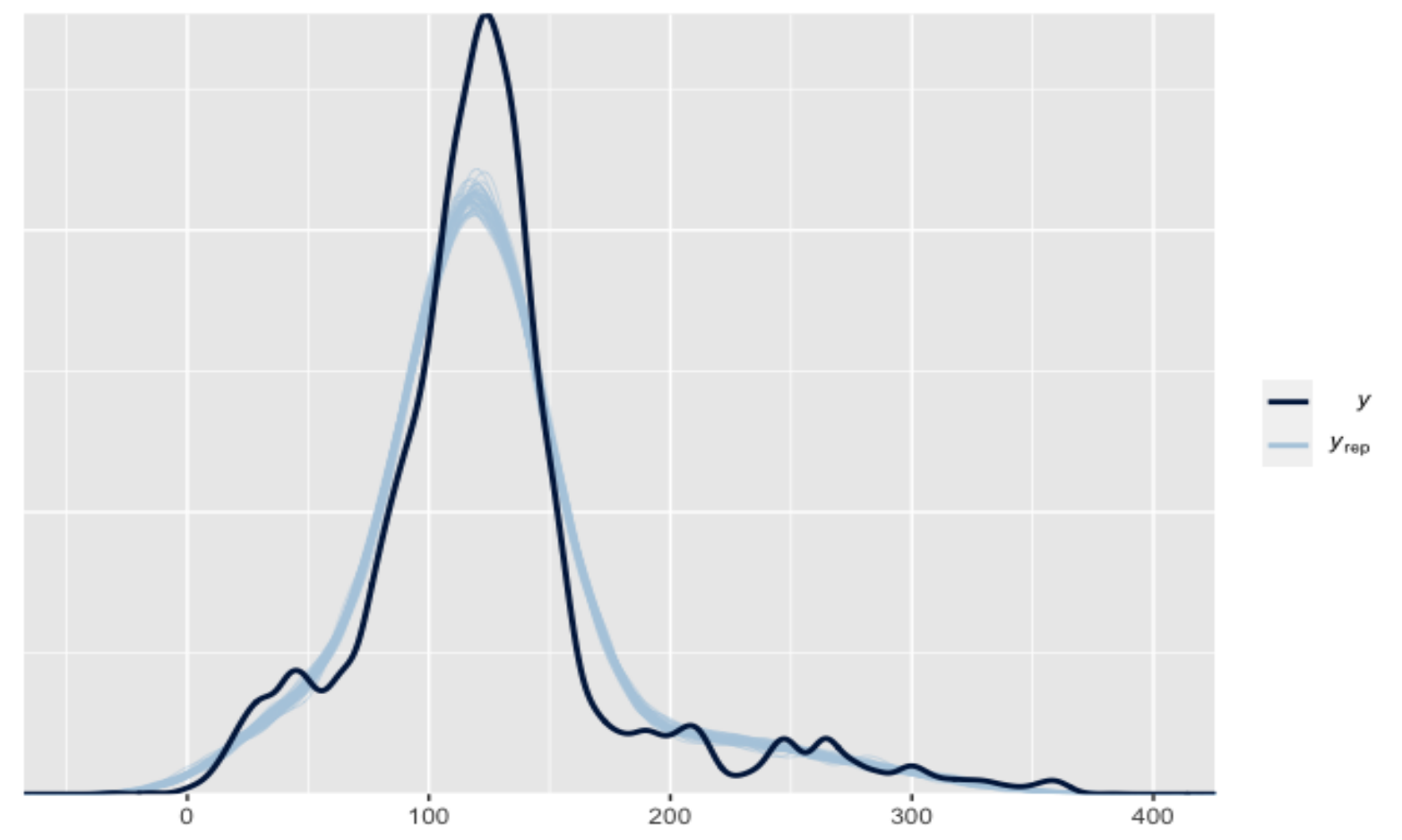
Model runs in a short amount of time and with no divergent transitions!

Printed model output:

	mean	se_mean	sd	2.5%	25%	50%	75%	97.5%	n_eff	Rhat
mu_a	139.21	0.04	3.62	132.02	136.78	139.22	141.64	146.39	8607	1
sigma_a	58.66	0.03	2.52	53.93	56.91	58.59	60.31	63.71	7438	1
mu_b	-0.34	0.00	0.07	-0.48	-0.39	-0.34	-0.29	-0.20	6116	1
sigma_b	1.03	0.00	0.06	0.92	0.99	1.02	1.06	1.14	3941	1
sigma_y	22.11	0.00	0.14	21.84	22.01	22.10	22.20	22.38	17670	1
a[1]	203.18	0.12	11.27	181.31	195.53	203.04	210.94	225.04	8168	1
a[2]	171.74	0.08	9.47	153.45	165.37	171.76	178.20	190.33	14008	1
a[3]	81.36	0.07	6.21	69.30	77.09	81.35	85.57	93.48	7036	1
a[4]	153.12	0.07	6.58	140.21	148.59	153.14	157.60	165.90	9110	1

Covariance matrix model output

Model fit using all data except the Thackeray dataset:



Testing my second research question

Are the observed trends in shifts in interactions similar using data from single-species studies, or should we be using biologically relevant paired species data?

Testing my second research question

Using only the Kharouba (2018) data and *very* rough randomization: