Sierra Nevada Time Series

J. Beem-Miller
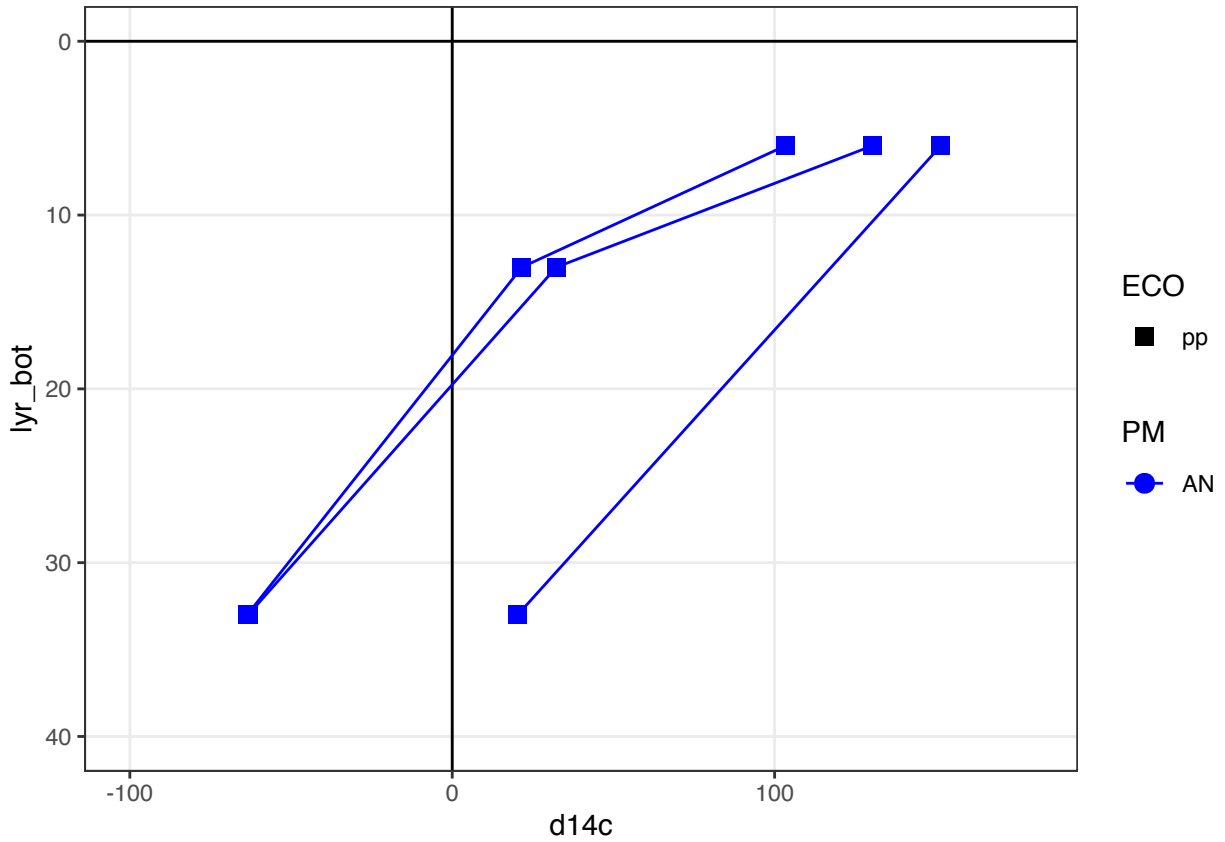
10 Aug 2020

Data preparation script for Sierra Nevada time series analysis
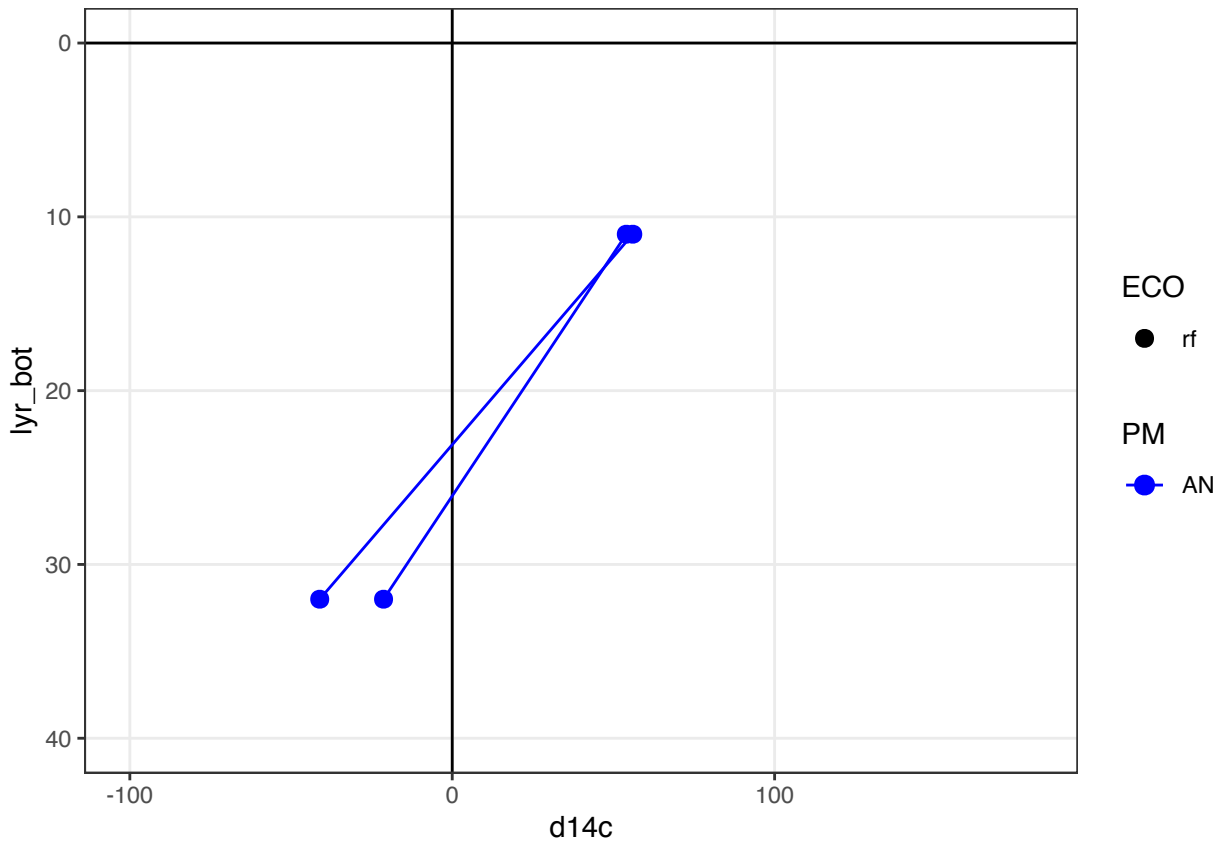
Merge templates with 14C, C, and N data

Radiocarbon analyses for the 2001 samples were not run originally, but were completed on archived samples in 2020. All profiles for each site are plotted below in order to give a sense of the within site variability.
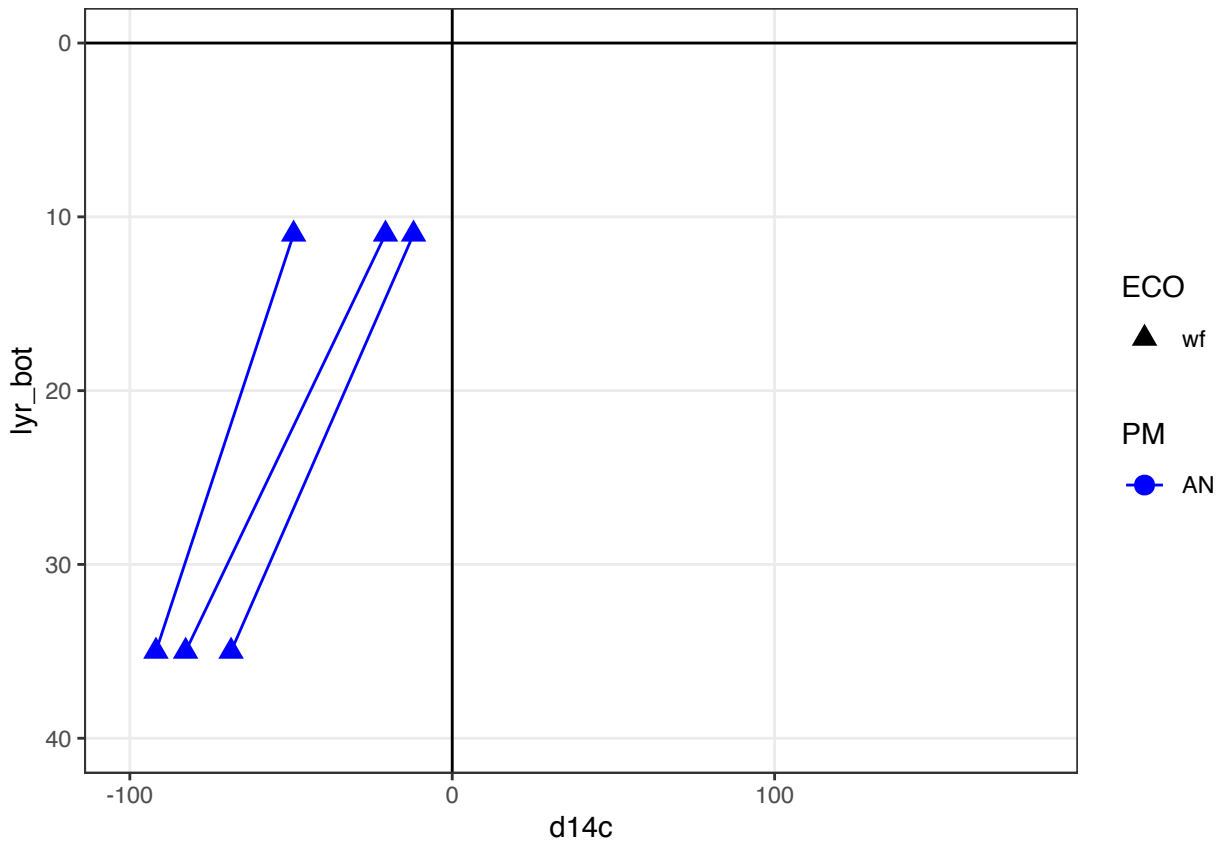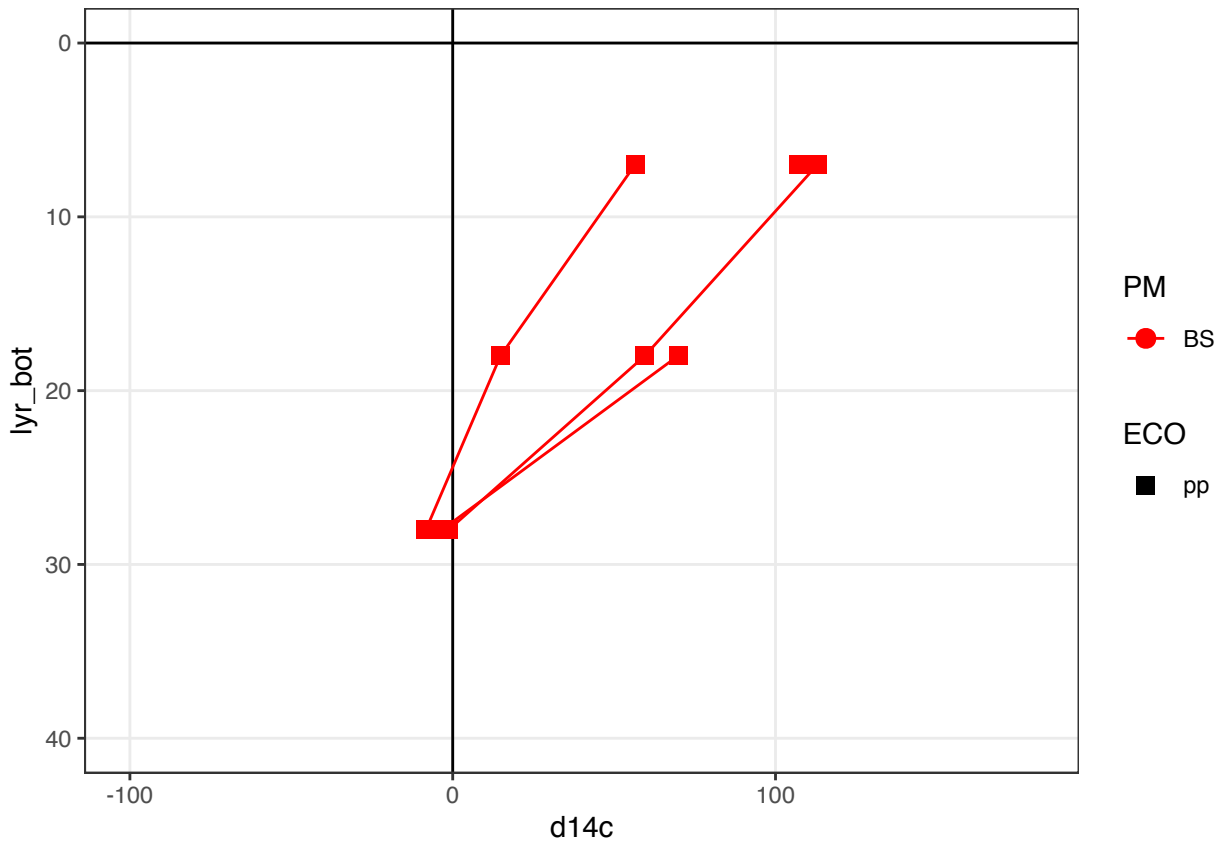
```
## $ANpp
```
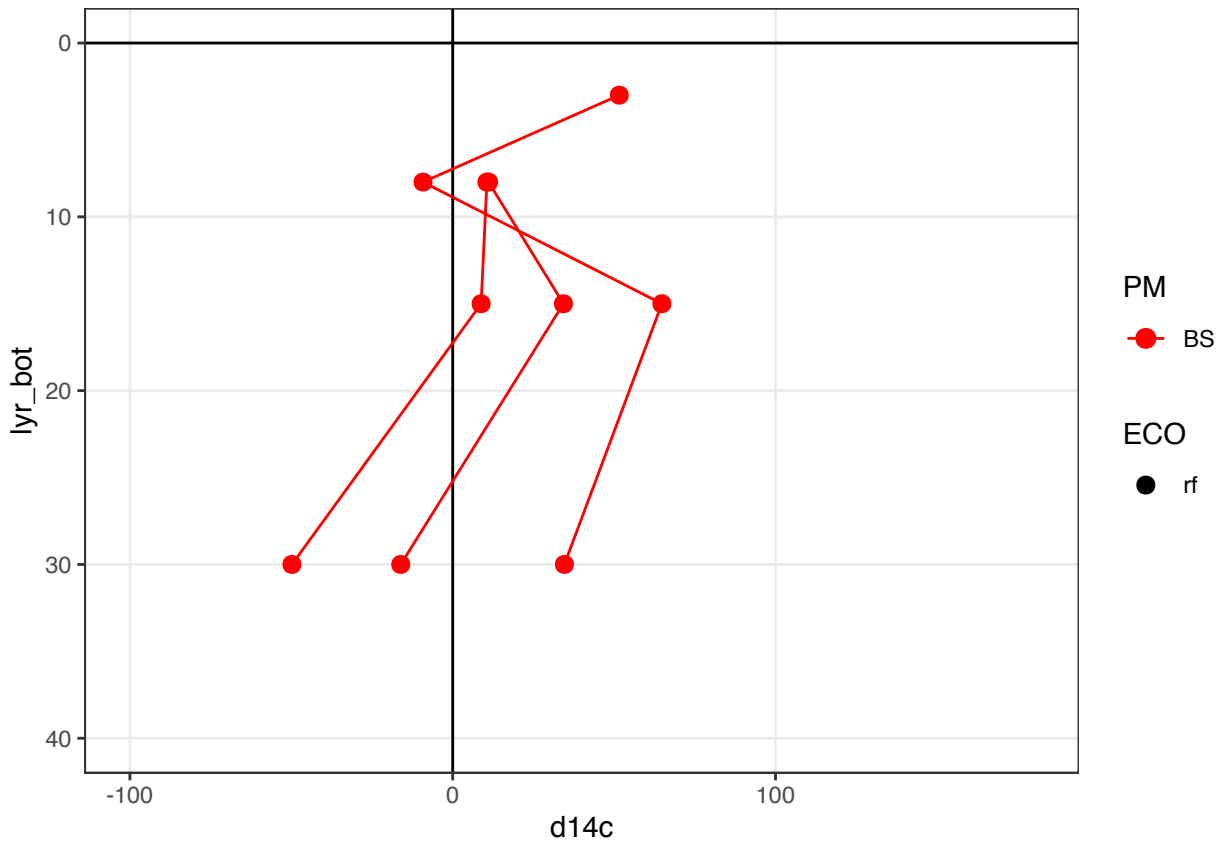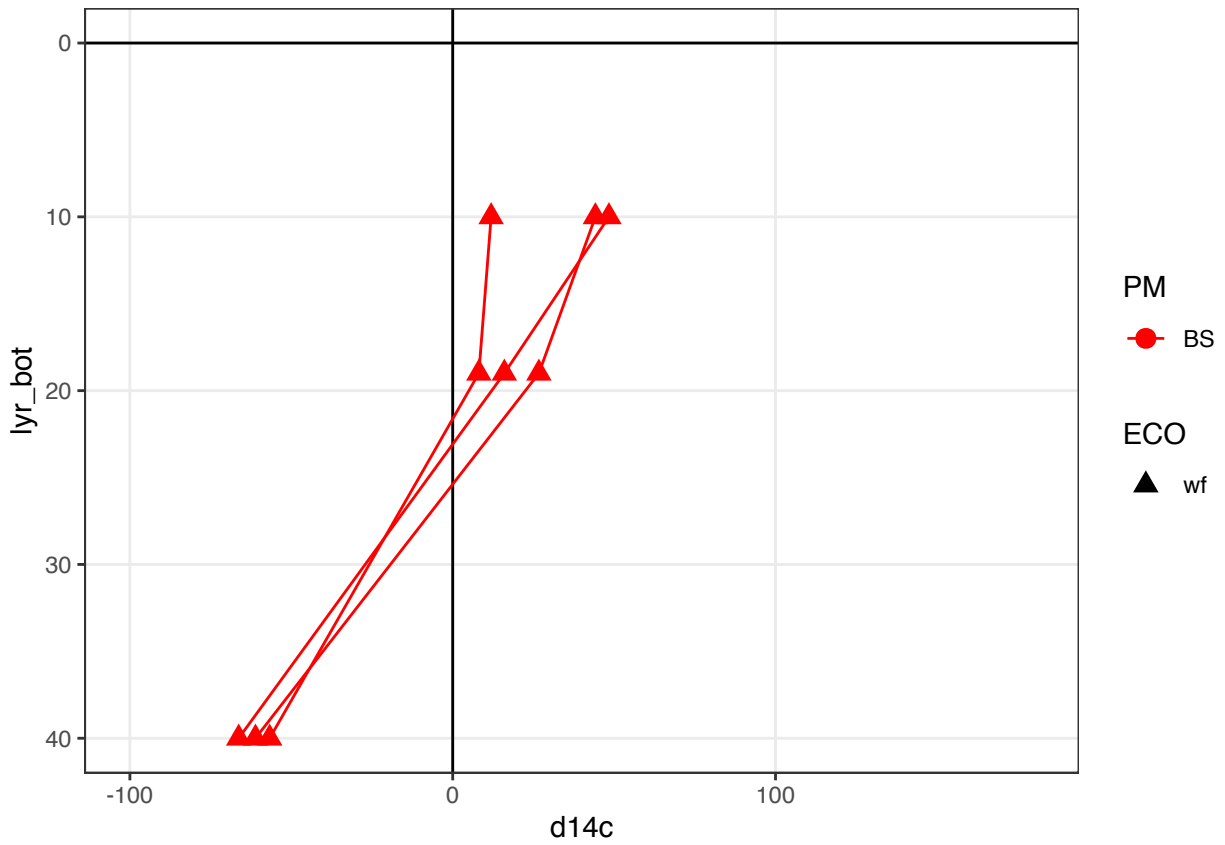


```
##
## $ANrf
```

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## 
## $ANwf
```

```
## 
## $BSpp
```

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##
## $BSrf
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##
## $BSwf
```

```
## 
## $GRpp
```
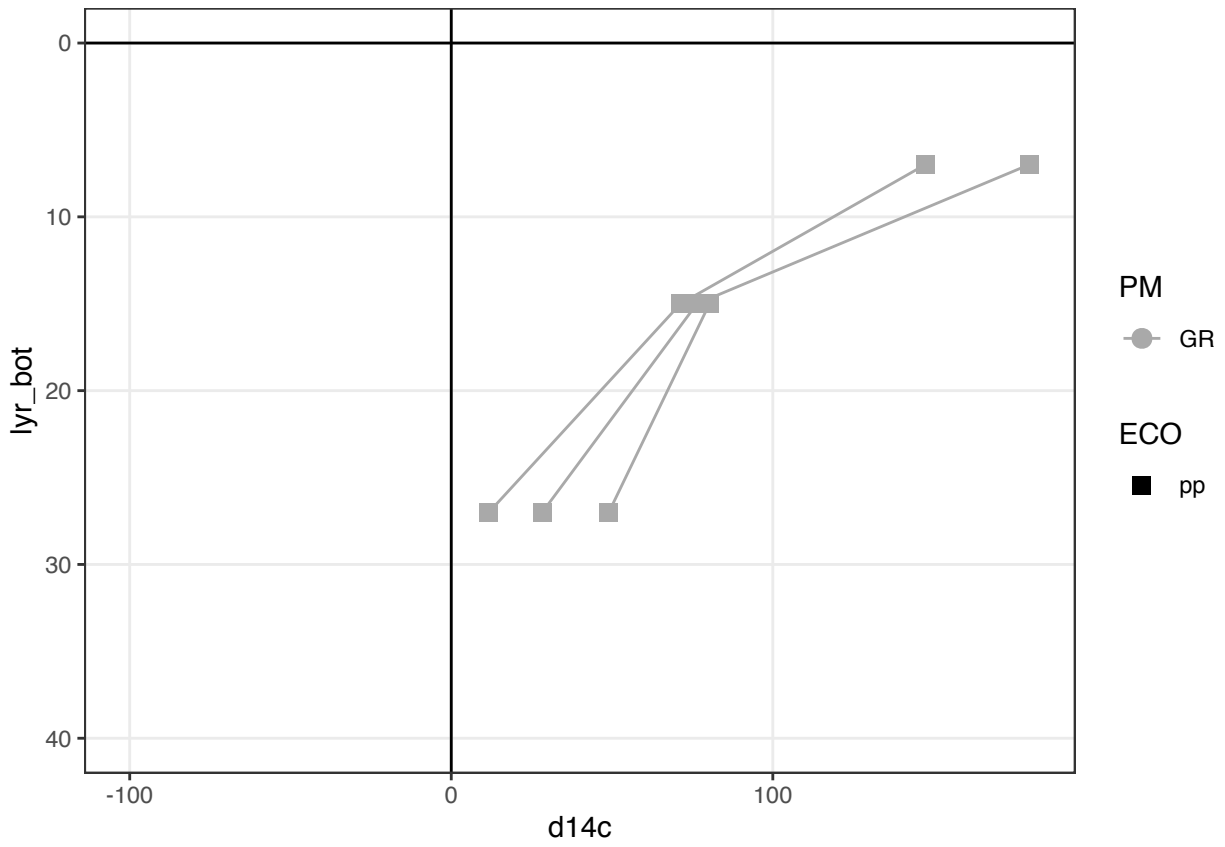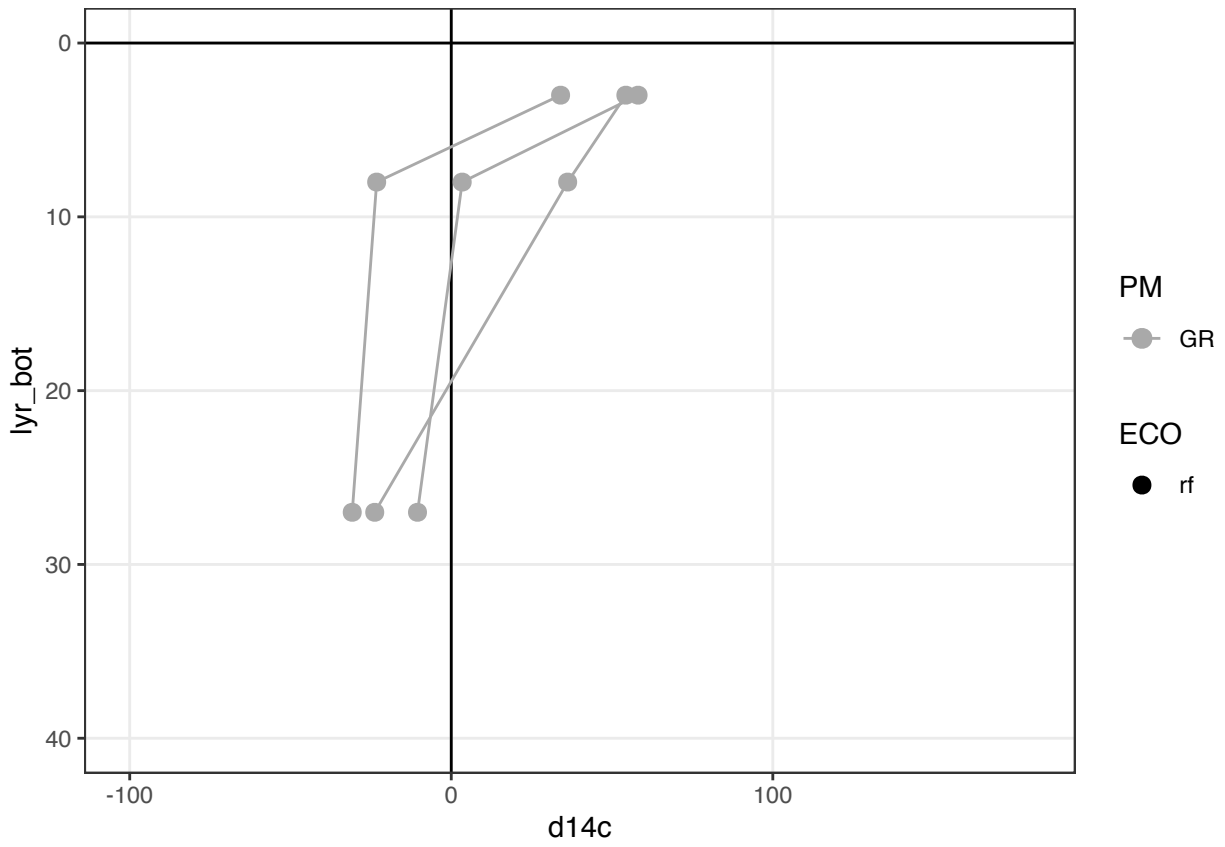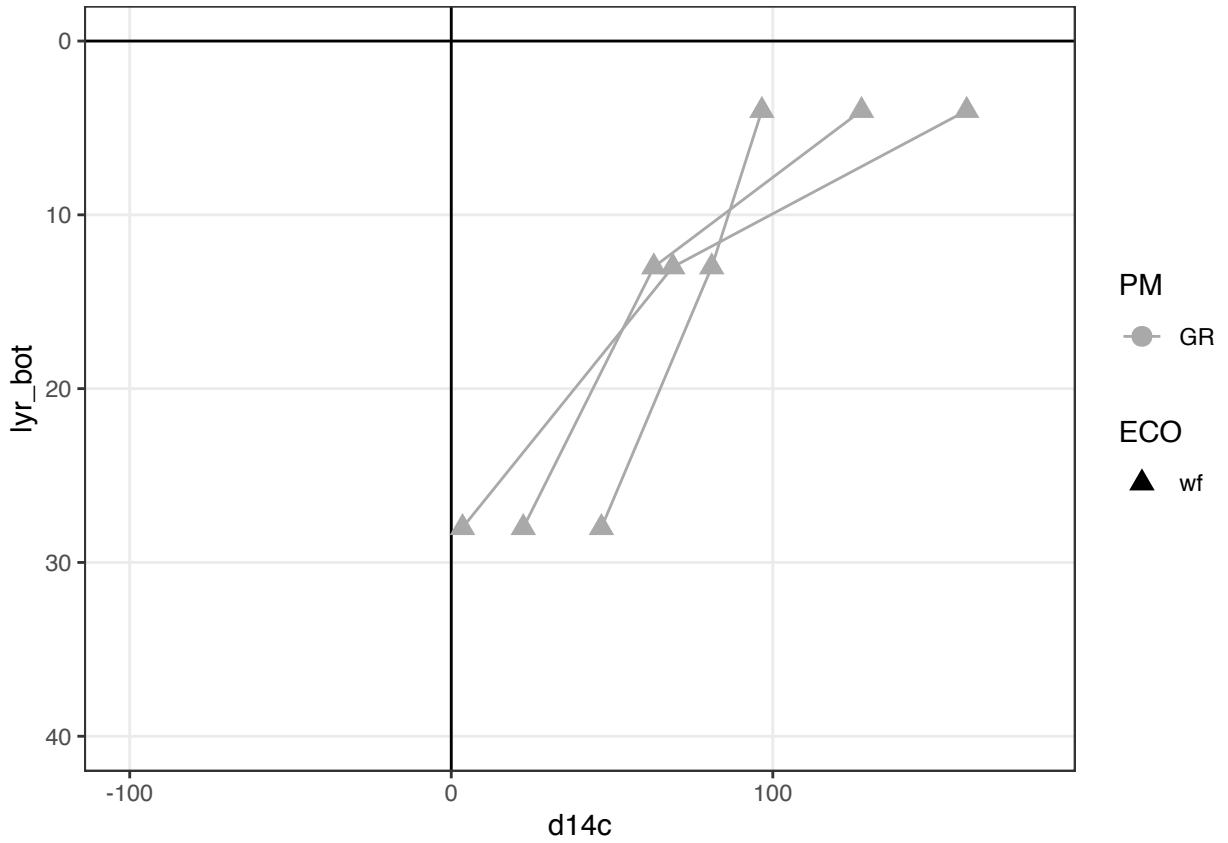
```
##
## $GRrf
```

```
##
## $GRwf
```

Fig. . Profiles of Δ^{14}C for 2001 samples

Caption: Within-site variability of Δ^{14}C for the 2001 samples.

2001 mean radiocarbon profiles

Mean profiles are shown below for the 2001 samples, error bars show ± 1 standard deviation.
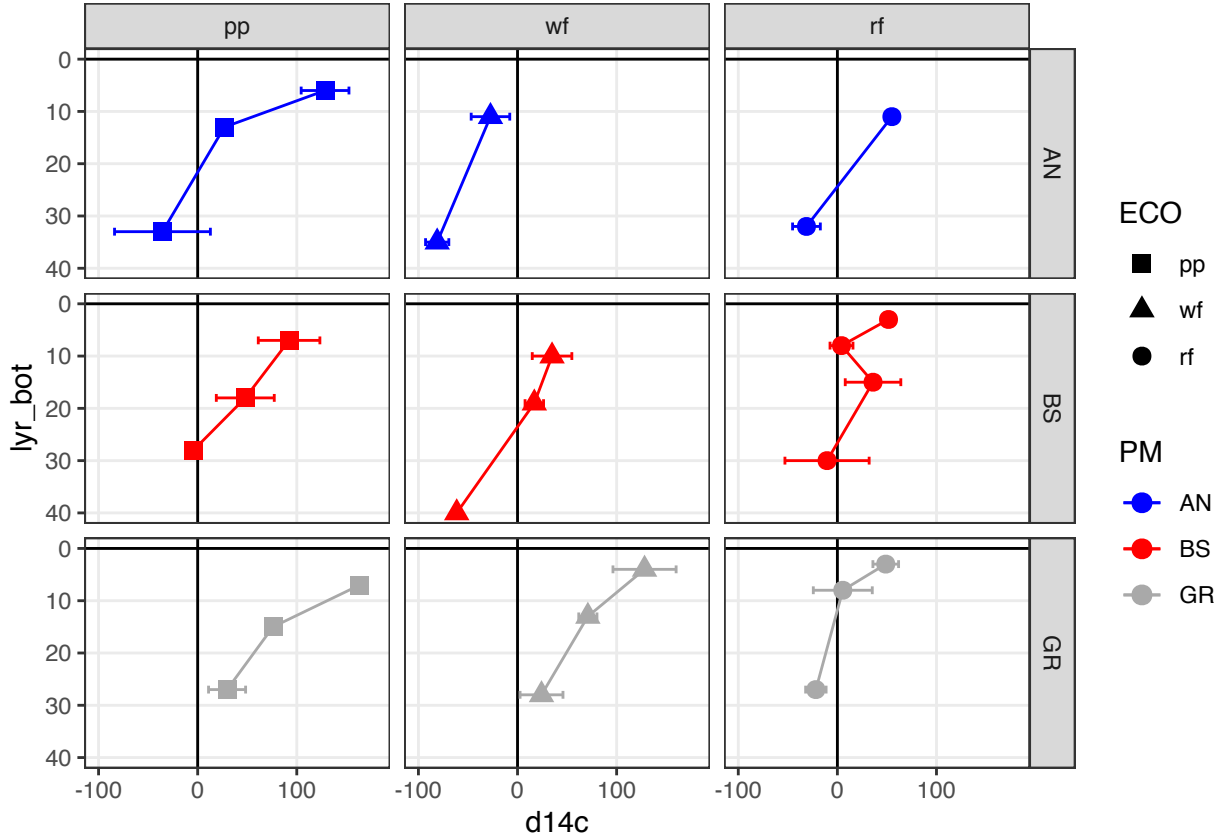
Fig. 2. Mean profile Δ^{14}C for 2001 samples

Caption: Mean Δ^{14}C by depth for each site in 2001. Error bars show ± 1 standard deviation.

2009 radiocarbon profiles

Mean profiles are shown below for the 2009 samples (error bars not shown as only a single replicate profile was analyzed).

Fig. 3. Mean profile Δ^{14}C for 2009 samples

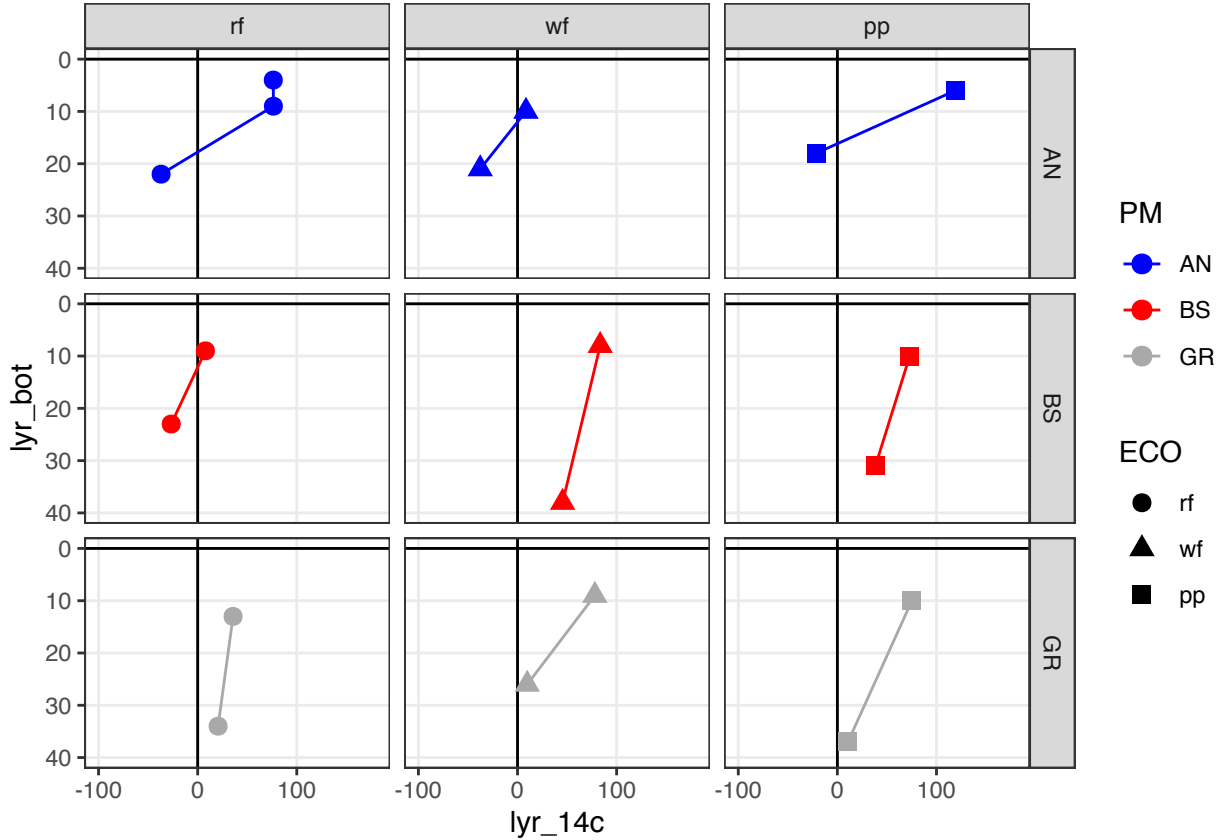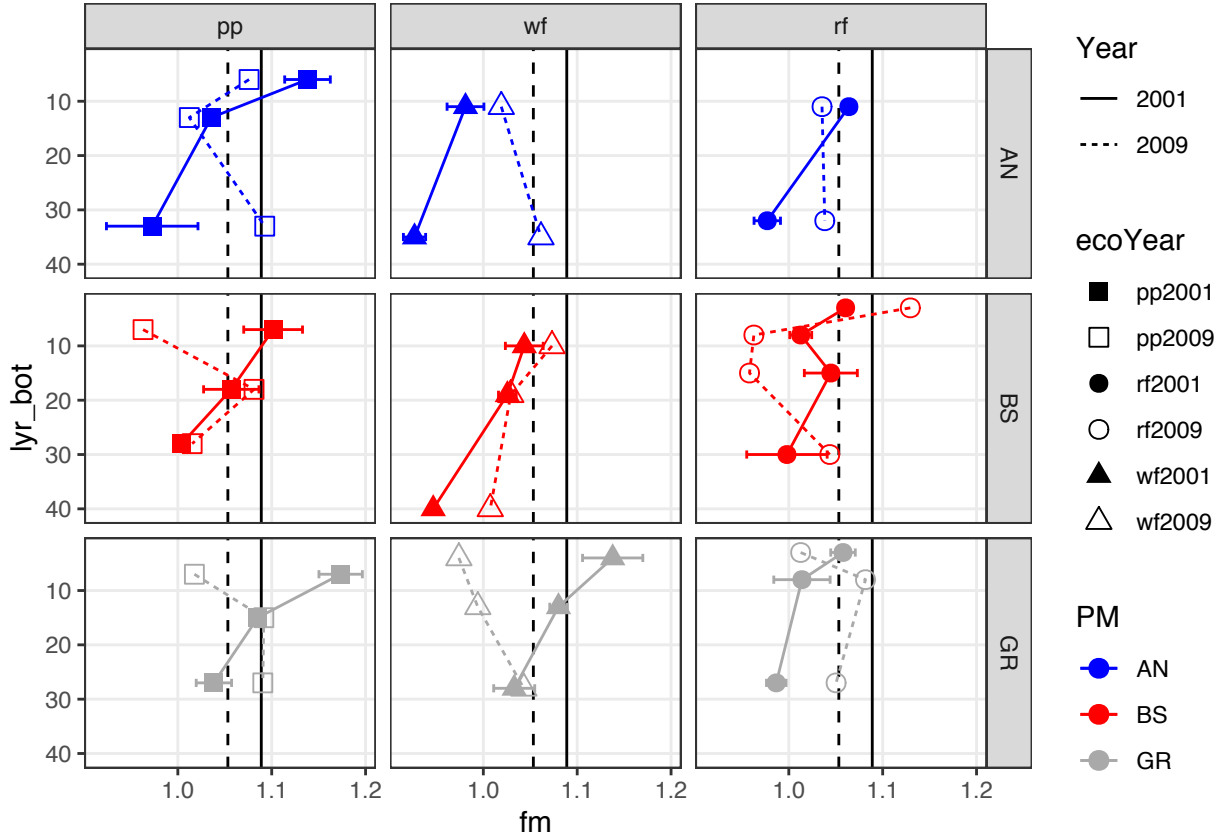*Caption:* Mean Δ^{14}C by depth for each site in 2009. Error bars not shown as only a single replicate profile was analyzed per site.

Fit splines to 2009 data to predict at 2001 depths

Soils collected in both the 2001 and 2009 sampling campaigns were sampled by horizon, but the depth intervals differed between the two sampling years. In 2009, full profiles were excavated for each site, as opposed to the shorter profiles collected in 2001 from the GR and AN sites. Radiocarbon was measured on all three replicate profiles at each site for the 2001 samples, but only for one of the replicate profiles at each site in 2009, e.g. ANpp rep2, etc.

In order to compare the radiocarbon profiles between 2001 and 2009, we interpolated both radiocarbon and carbon stock data at 1 cm intervals for each site in the 2009 dataset, and then summed the carbon-stock-weighted radiocarbon values for each depth interval sampled in 2001. A monotonic cubic spline fit was used for the carbon stock interpolation (Wendt and Hauser 2013), and a mass-preserving spline was used to fit the radiocarbon data (Bishop, T.F.A., McBratney, A.B., Laslett, G.M., (1999) Modelling soil attribute depth functions with equal-area quadratic smoothing splines. Geoderma, 91(1-2): 27-45).

Fig. 4. Mean profile Δ^{14}C for all sites in 2001 and 2009

Caption: Solid symbols connected by solid lines show fraction modern by depth for each site in 2001; error bars show ± 1 standard deviation. Open symbols conneted by dashed lines show interpolated values of fraction modern measured in 2009. Solid and dashed vertical lines show the fraction modern of the atmosphere in 2001 and 2009, respectively, for reference.