Bacon age-depth model

Memory: how much accumulation rate at a particular depth depends on the accumulation rate above

$$\omega \sim Beta(a_\omega, b_\omega)$$

in which
1) a_ω is the mean memory value, set as 0.7 as default
2) b_ω is the memory strength, set as 4 as defaul

Accumulation rate distribution

$$\alpha_j \sim Gamma(a_\alpha, b_\alpha)$$

in which
1) a_α is the user-defined parameter *mean accumulation rate*
2) b_α is the shape of gamma distribution, set as 1.5 as default

Accumulation rate at core subdivision j

$$x_j = \omega x_{j+1} + (1-\omega)\alpha_j$$

in which
1) x_j is the accumulation rate of subdivision j
2) ω is the memory, i.e. dependency of accumulation rate on subdivision above
3) $0 \le \omega \le 1$
4) α_j is prior information related to the mean accumulation rate of the core

Neotoma pollen core records
- Pollen sample data
- Site information
- Age controls

Filter pollen core records:
1. ≥ 3 age controls
2. Max. interval between age controls ≤ 3000 yrs
3. ≥4 pollen samples

Subset of pollen records appropriate for the Bacon age-depth model
- Pollen sample depths
- Age controls (radiocarbon dates are calibrated by IntCal13)

Sediment accumulation model

$$G(d,\vartheta,x) = \vartheta + \Sigma x_j \Delta c + x_{i+1}(d-c_i)$$

in which
1) d is the depth of pollen sample
2) Δc is *the section thickness*
3) c_i is the depth of a subdivision where $c_i \le d \le c_{i+1}$
4) j is an integer between 1 and i
5) ϑ is a constant

Sediment accumulation model estimated using self-adjusted MCMC
Posteriors: *age controls*
Priors: mean accumulation rate & subdivision thickness

Prior parameter values: from Goring *et al.* 2012

mean accumulation rate:
- 5 yr/cm
- 10 yr/cm
- 20 yr/cm
- 50 yr/cm

section thickness:
- 5 cm
- 10 cm
- 15 cm
- 20 cm

Reconstructed ages under prior parameter values

Select best age and related prior parameter values:
1. interpolated ages are sequential by depth
2. extrapolated ages are reasonable
3. minimizes the distance between reconstructed ages and age controls

Best Bacon age reconstruction