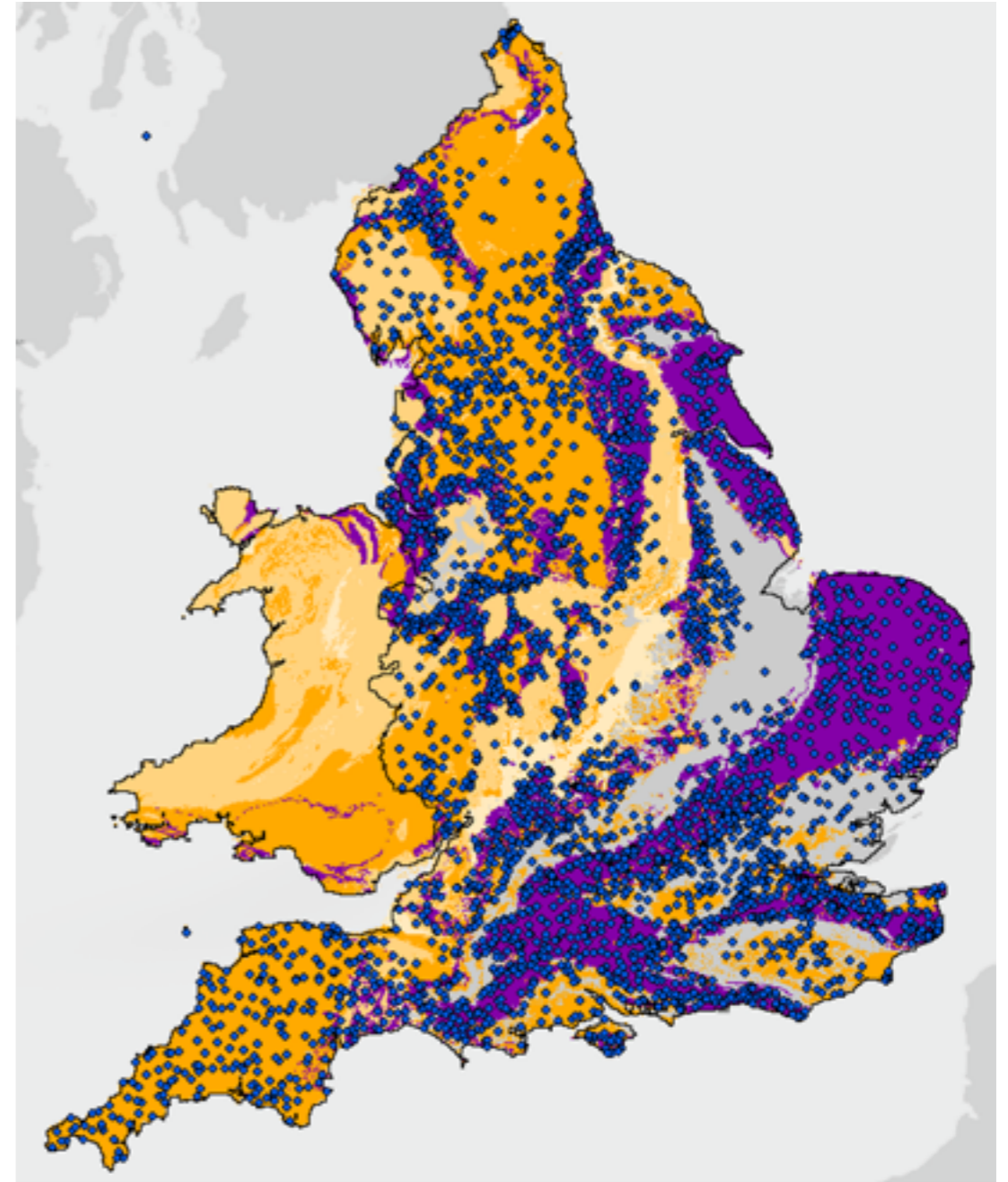


Liquidean distance

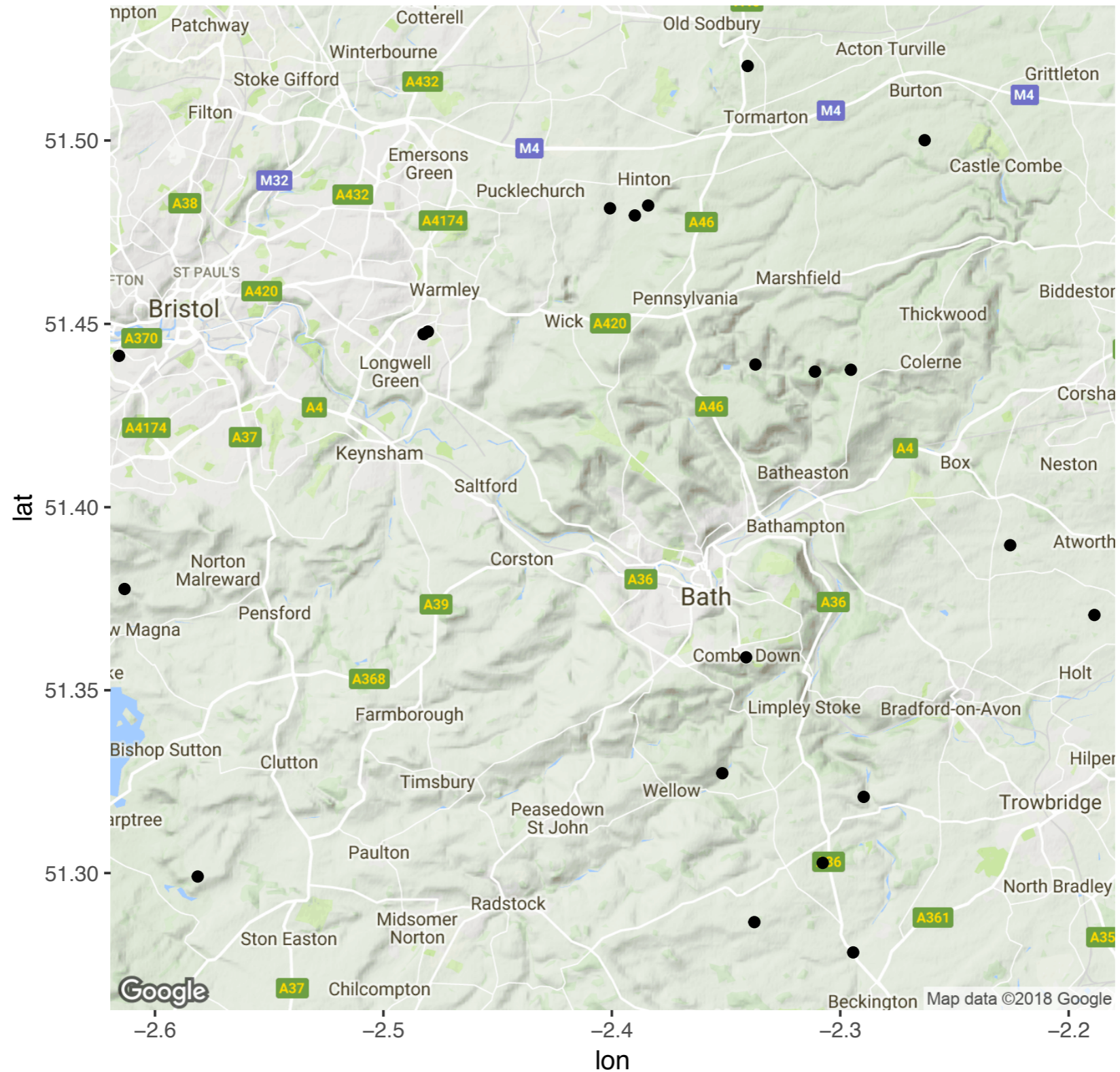
Jordina Francès, Elizabeth Gray, Malena Sabaté, Theresa
Smith, Hanneke Wiersema

Groundwater network

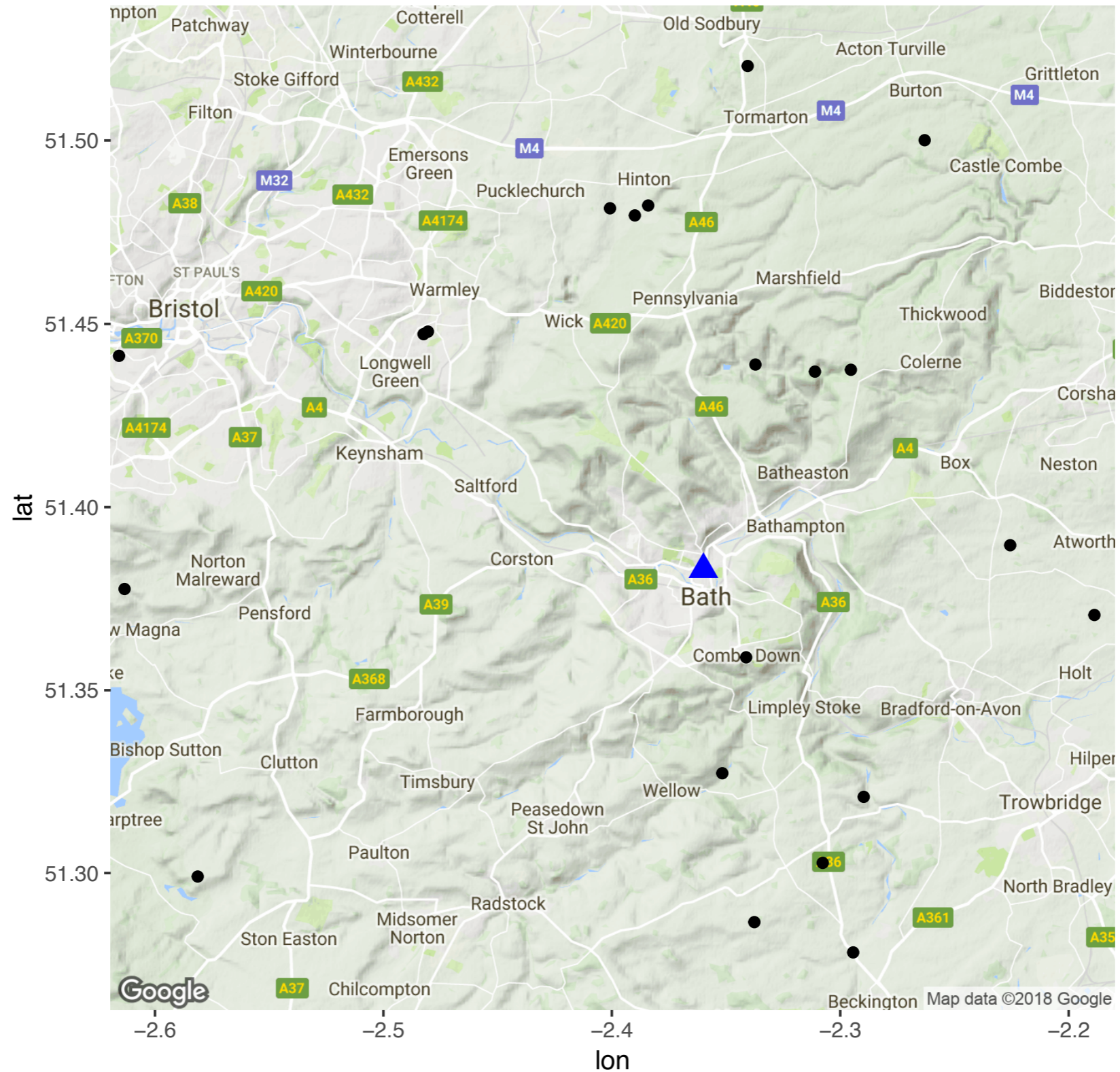
- A map of Nitrate Vulnerable Zones is made using ordinary Kriging.
- Currently, covariance structure is assumed to depend only on distance between points.



Water quality estimation



Water quality estimation



First approach

DISTANCE

- For a given set of coordinates $X = \{\bar{z}, \bar{A}, \bar{R}\}$ where \bar{z} is the location, \bar{A} is a vector indicating the corresponding aquifer, and \bar{R} indicates the rock types present.
- We define the distance

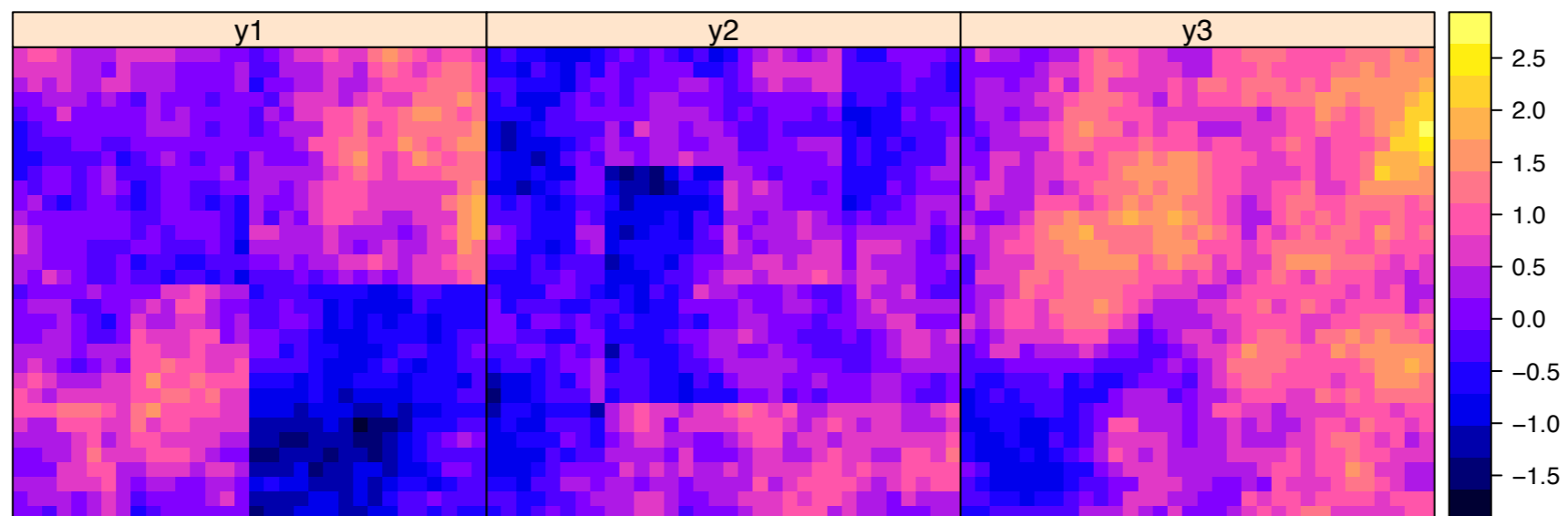
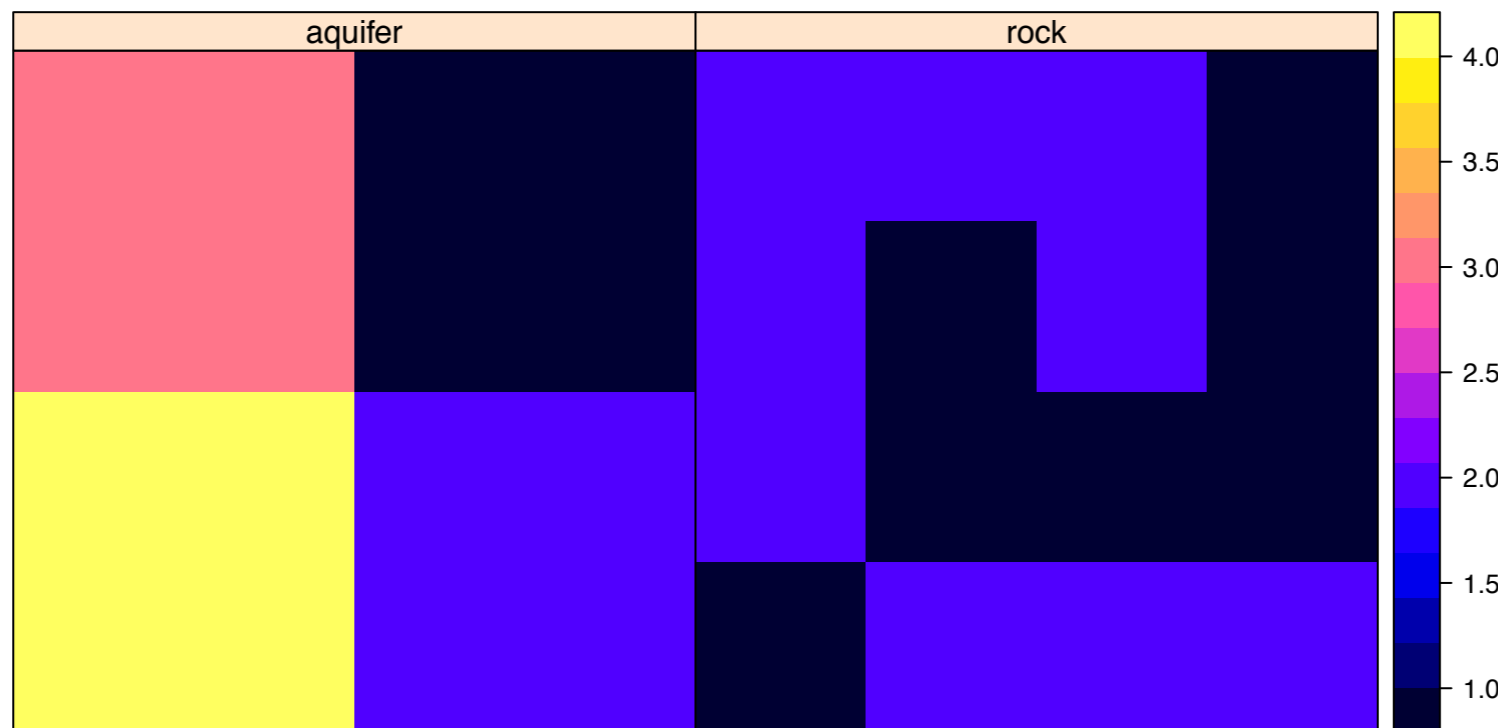
$$d_X = \sqrt{(1 - \alpha - \beta)d_z^2 + \alpha d_A^2 + \beta d_R^2}.$$

so the covariance of our model is

$$\Sigma_{ij} = \sigma^2 \exp\left(\frac{-d_{Xij}^2}{\tau}\right).$$

First approach

$$X = \{E, N, A_1, A_2, A_3, A_4, R\}$$



What we tried

NEXT STEP

- Prediction and performance
- Estimate all parameters (α , β , scale and variance)
e.g. using MCMC
- See if the fun covariance matrix works better

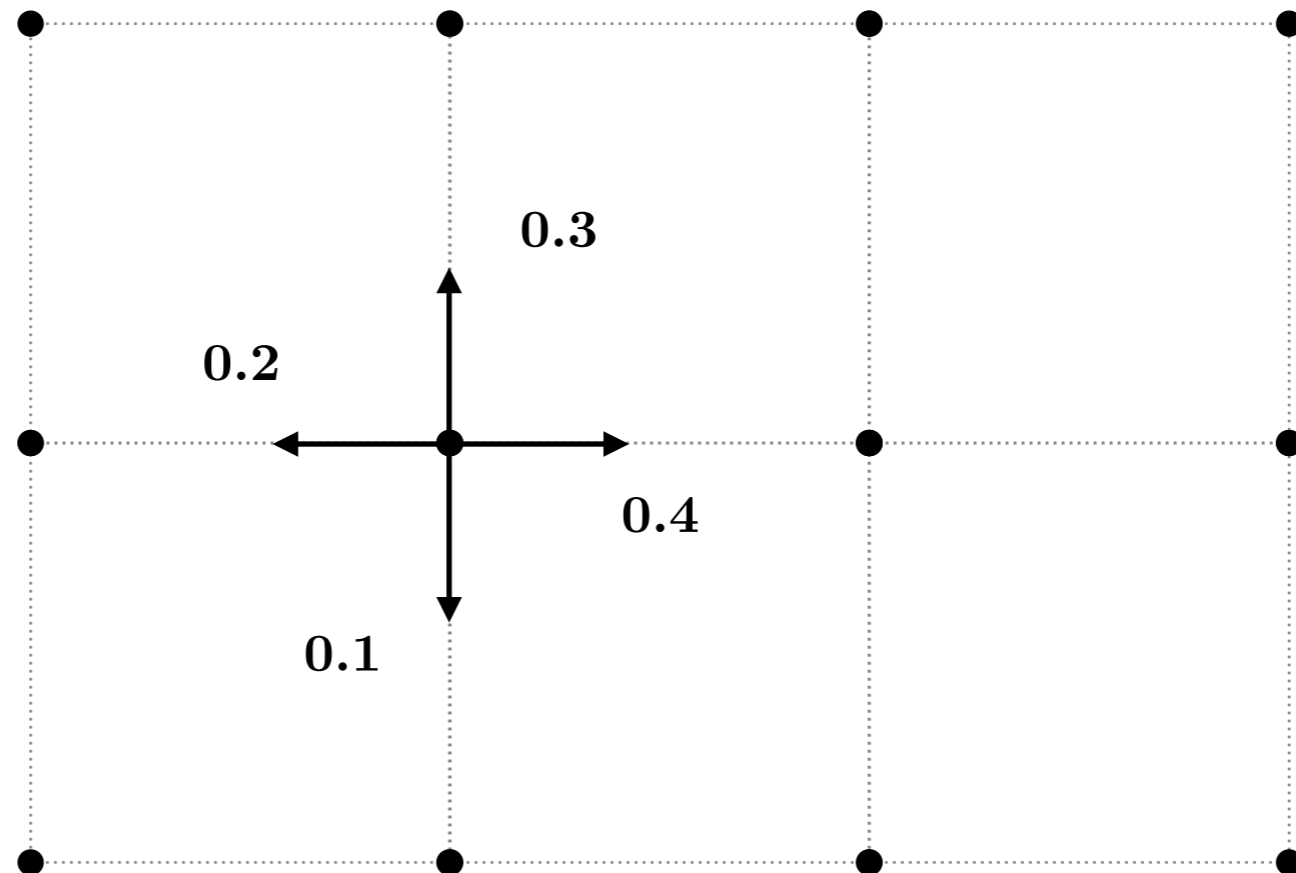
First approach

SPECIAL CASE: DECOUPLED AQUIFERS

- Infinite distance between boreholes in different aquifers \rightarrow zero correlation
- Block diagonal matrix
- Geodistance contribution within aquifers based in rock types

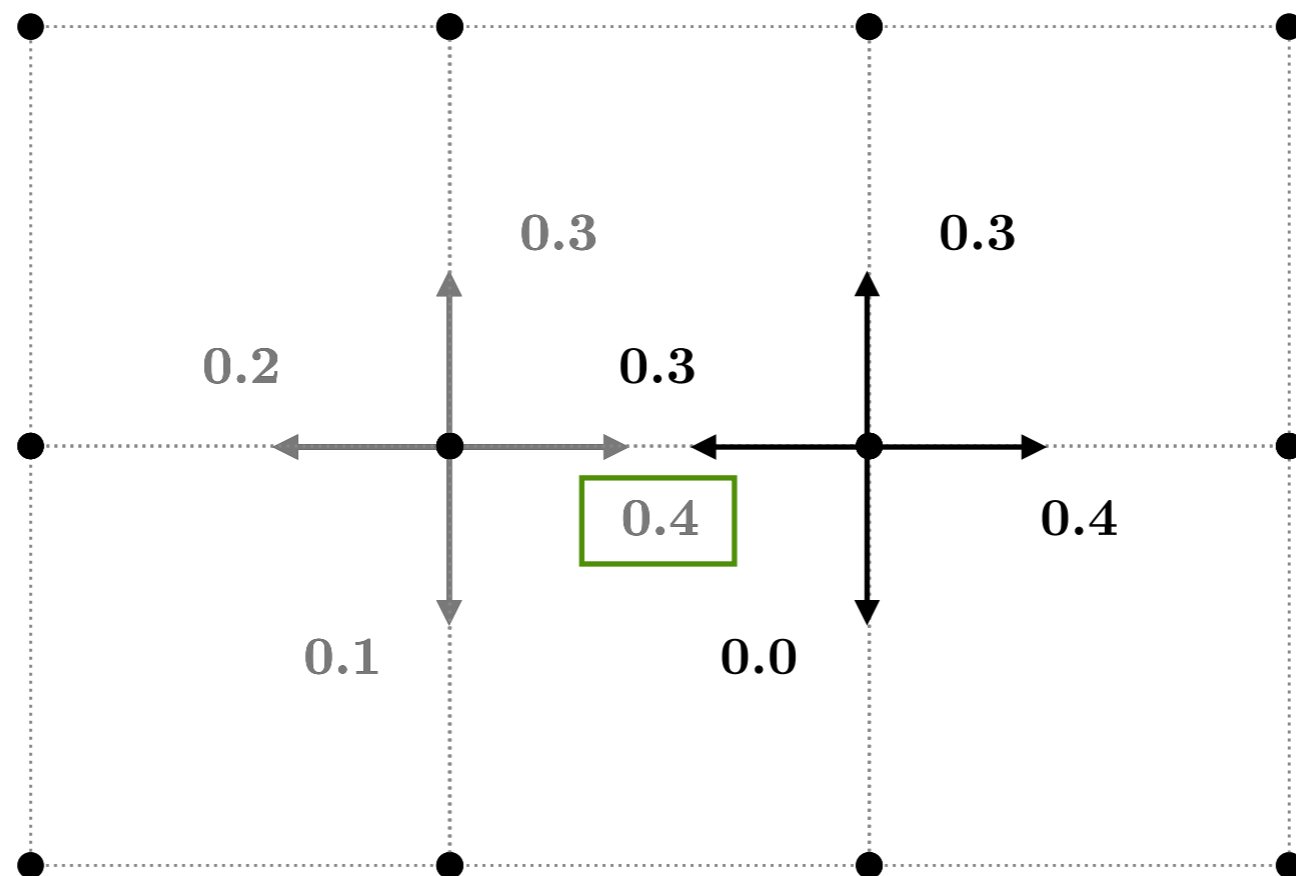
Alternative approach

DIFFUSION MODEL



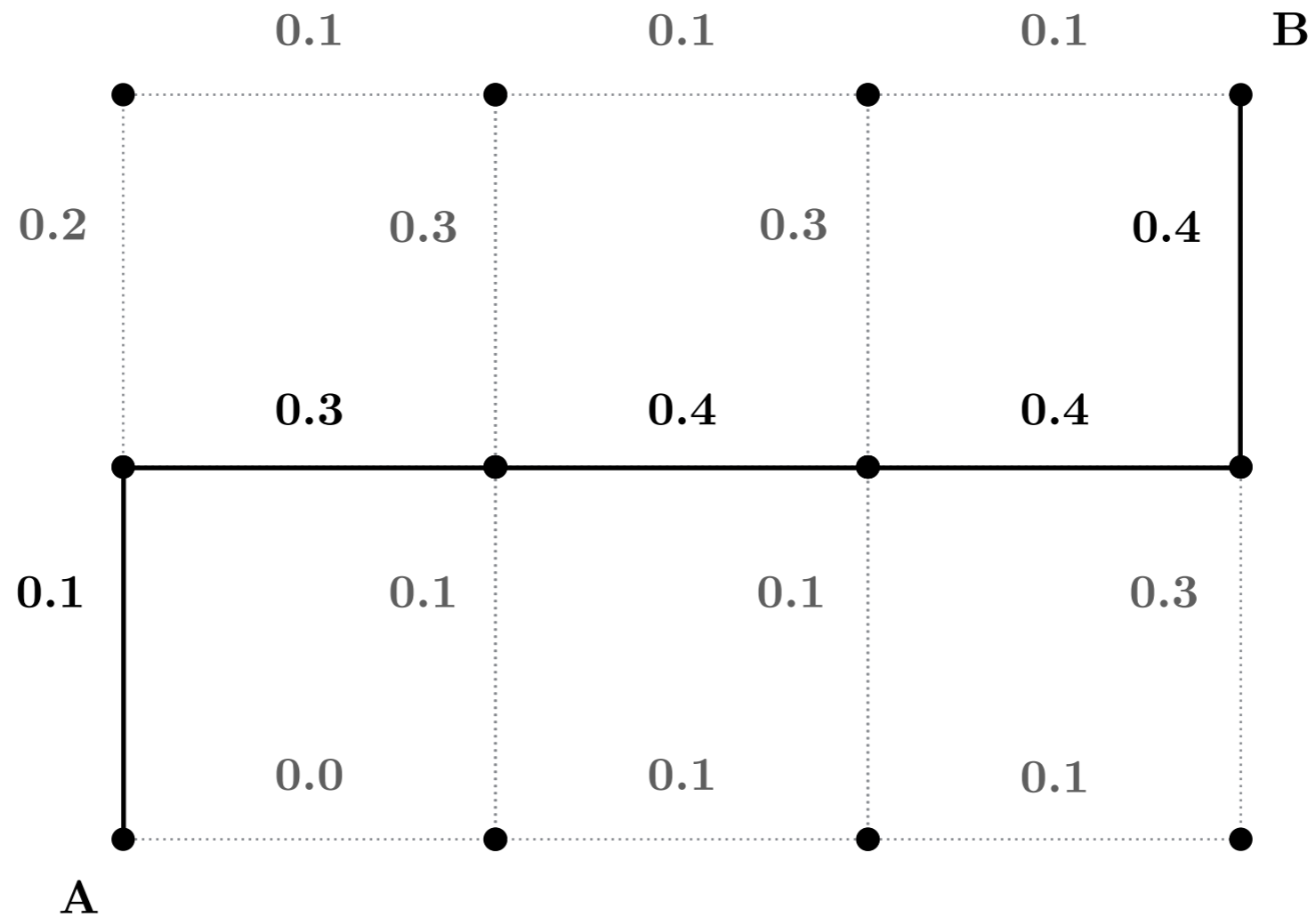
Alternative approach

DIFFUSION MODEL



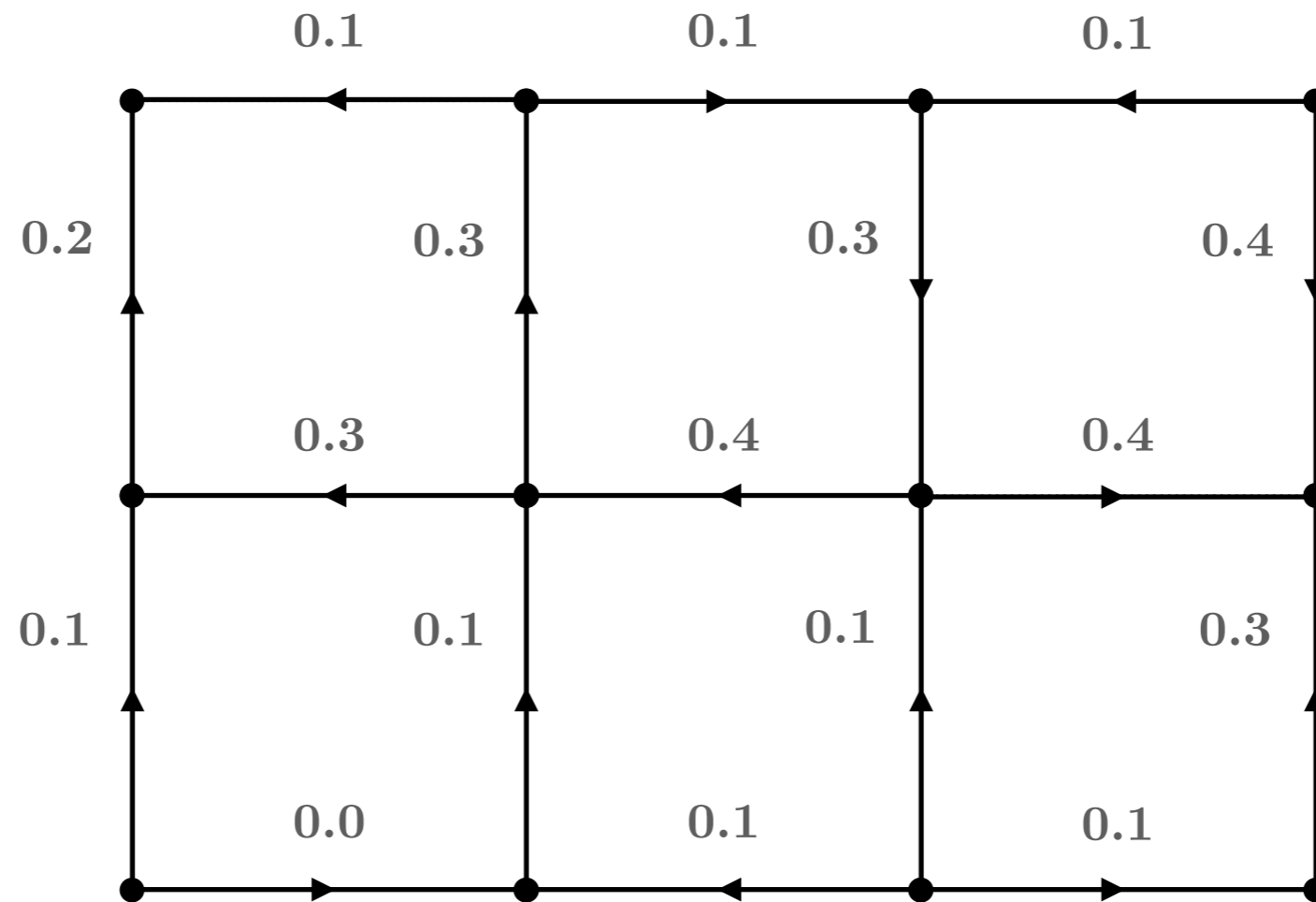
Alternative approach

DIFFUSION MODEL

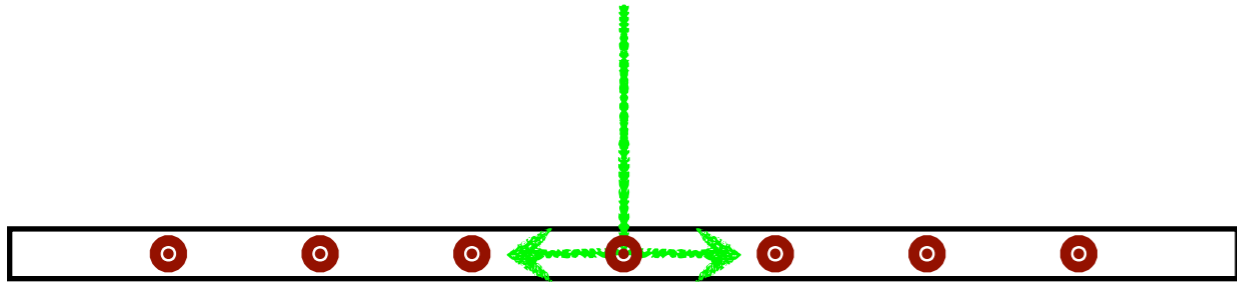


Alternative approach

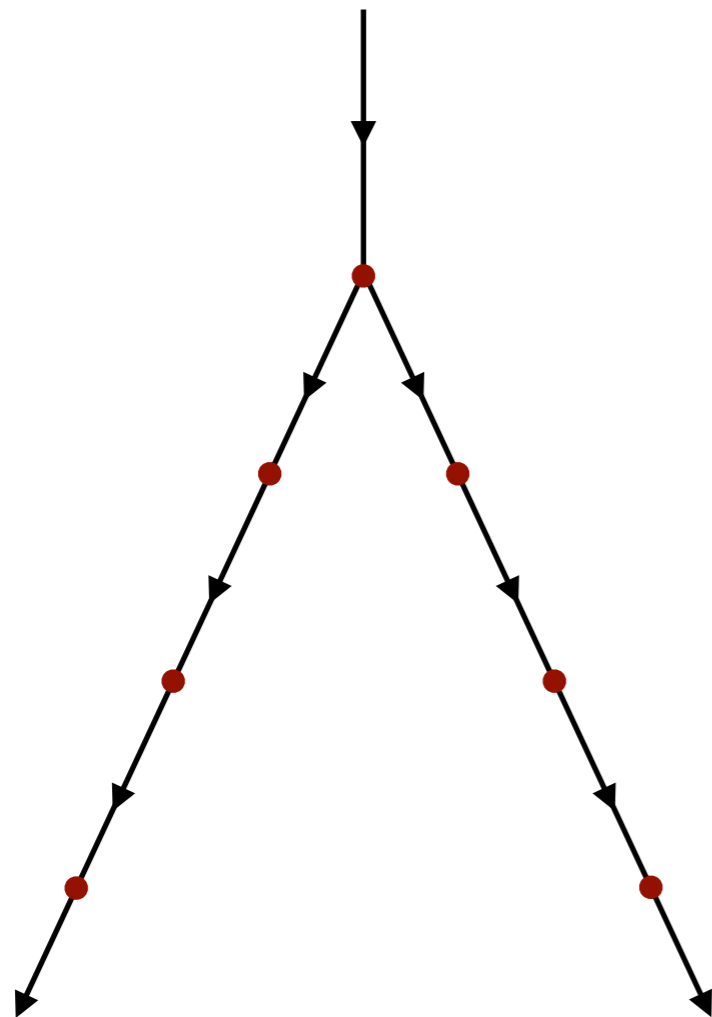
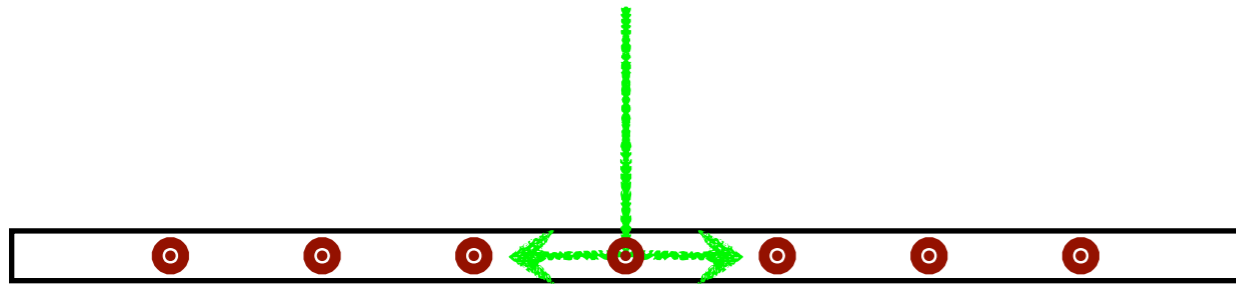
TIME DEPENDENT CORRELATION



Alternative approach



Alternative approach



TIME DEPENDENT CORRELATION

- Correlation in Δt if
 - direct correlation in Δt
 - difference of path to most recent common ancestor is Δt
- Amount of correlation
 - transported mass
 - decay in time/distance
 - path physical properties

Bath, Bath and North East Somerset at scale 1:300,000

[Other maps](#) [Data search](#) [Text only version](#)

