

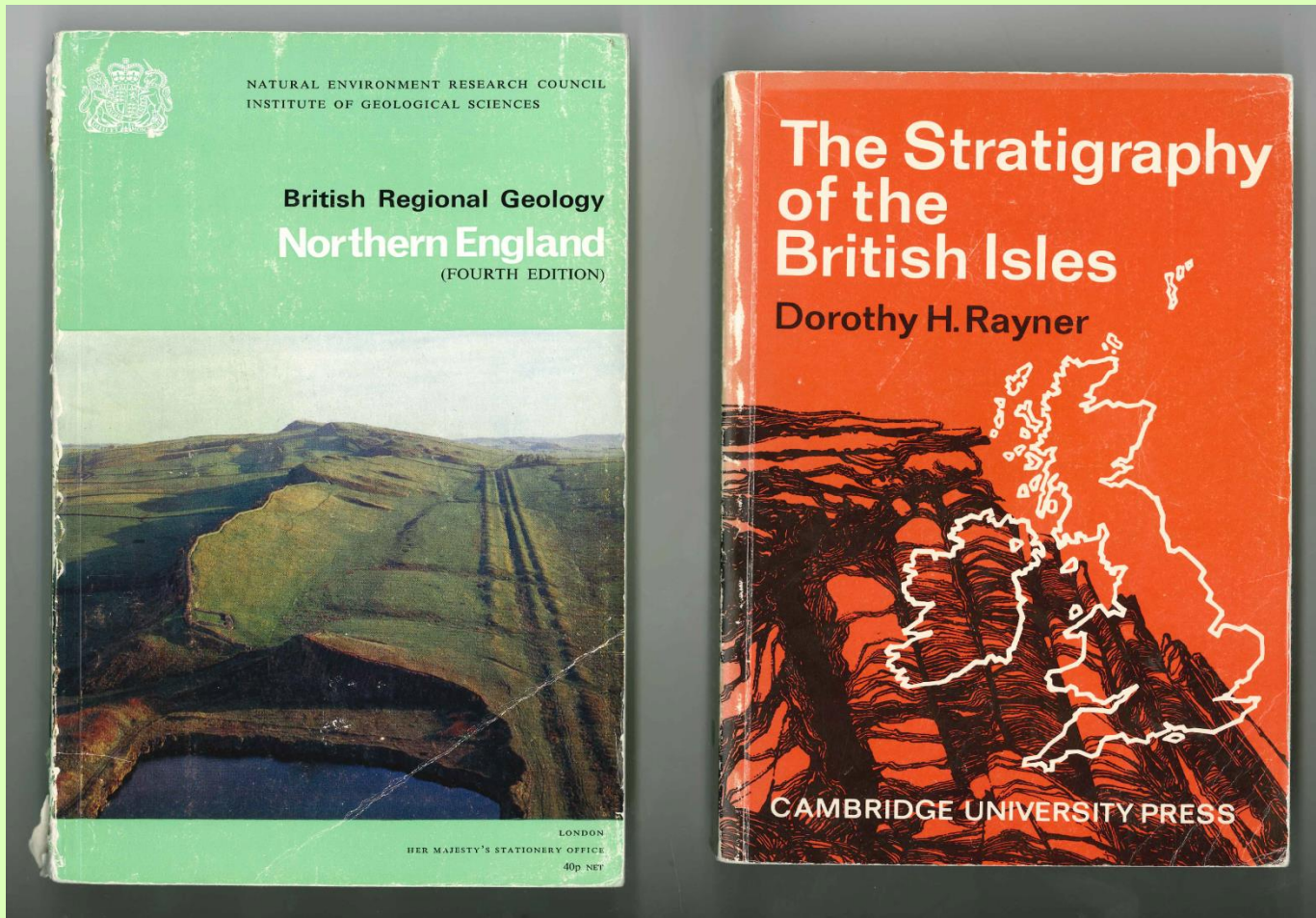
# A new, non - statistical, direction for quantitative stratigraphy

Dr Graham J Potts

University of Liverpool

[gpotts@liv.ac.uk](mailto:gpotts@liv.ac.uk)

# Stratigraphy



# Quantitative stratigraphy

- In the past “quantitative stratigraphy” has been largely statistical
- Lots of high quality work but with the exception of a few small areas of biostratigraphy it has not had much impact
- For example “A Method for Stratigraphic Correlation of Several Boreholes” (Hawkins 1984)

# The problem

- Mid-eighties Robertson's produced "multi-client" reports of parts of the North Sea. Typically 90 to 120 wells
- For example, "Central Graben, North Sea: Stratigraphy, Structure and Petroleum Geology of the Palaeocene and Eocene"  
(now trading as CGG-Robertson)





# Questions

- Did it display all of the vertical sequences present in the area?
- From the information in the diagram could we determine whether or not the diagram displayed all of the stratigraphies present in the area?
- If not, could we determine which vertical sequences had not been observed?.....

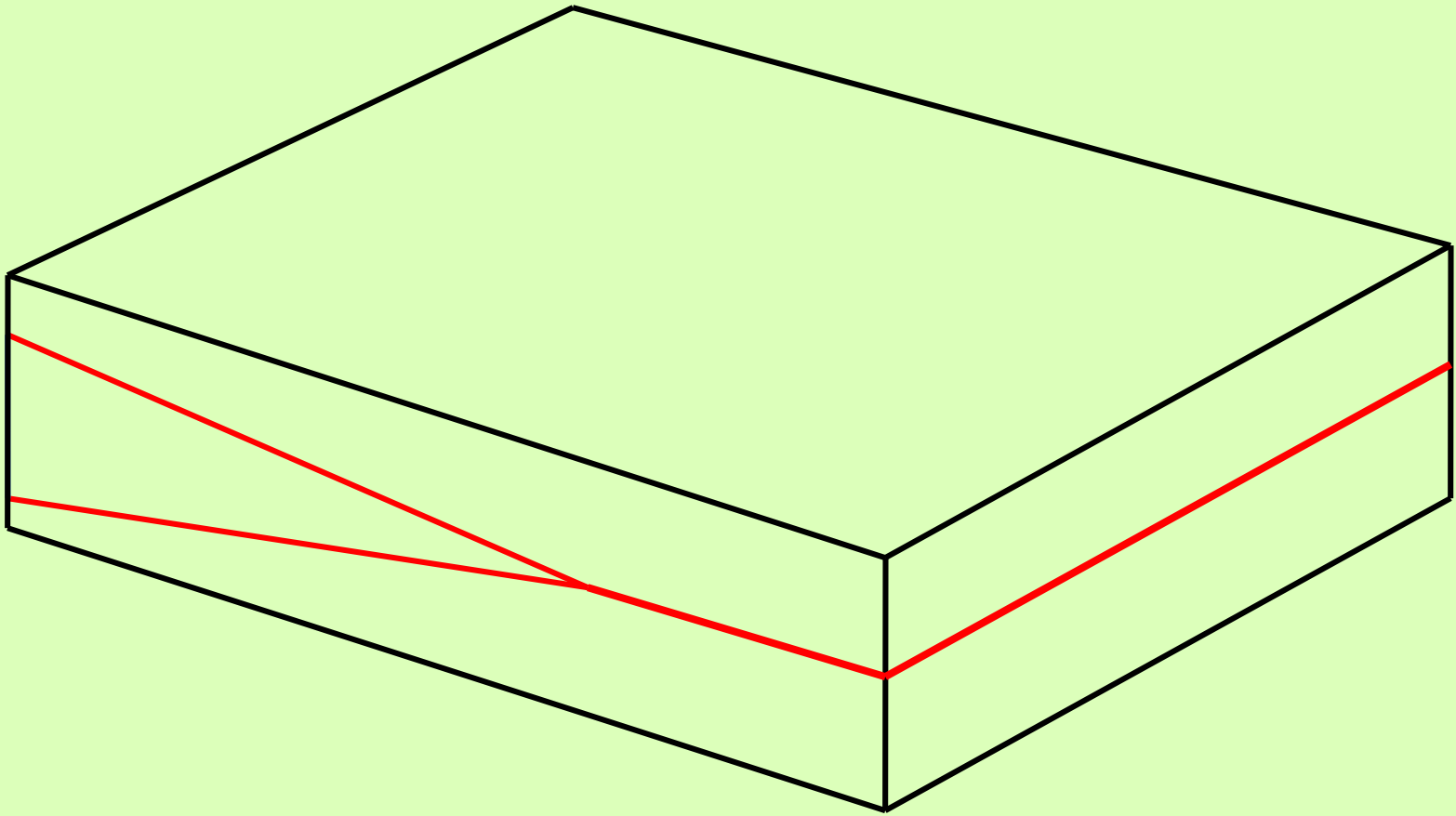
# Well prognosis

- These are the kinds of questions that underpin well prognosis
- For well prognosis we need to predict what happens between and beyond our data
- For successful well prognosis we need a more systematic and quantitative approach
- Replace “gut - feeling”

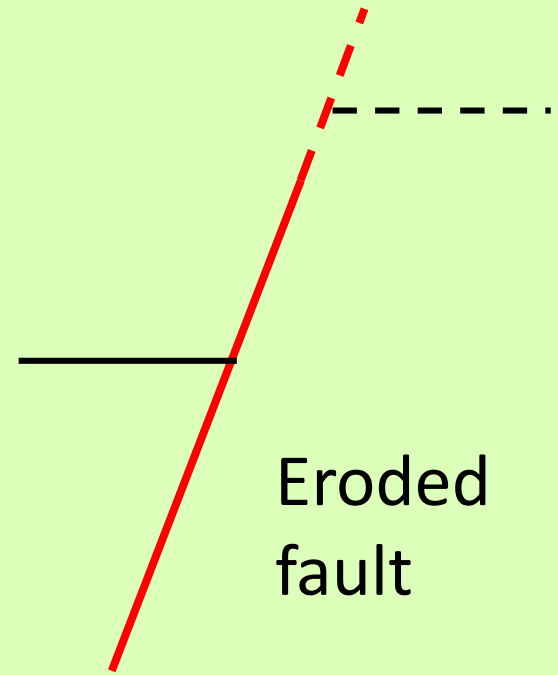
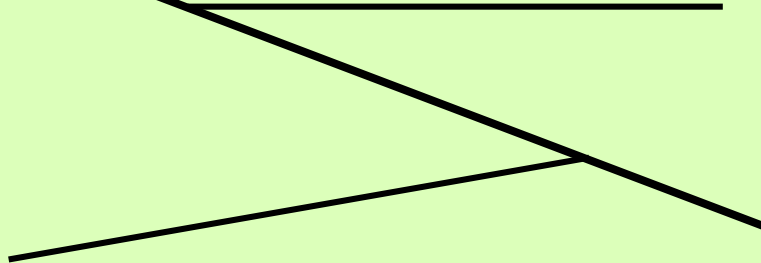
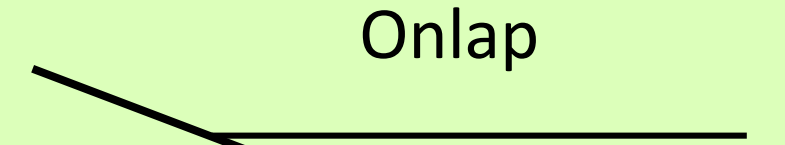
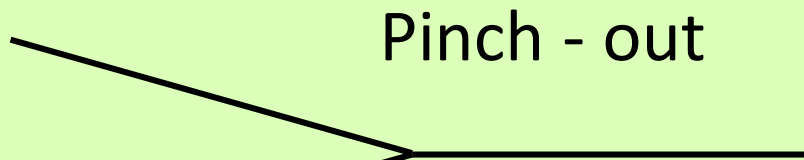




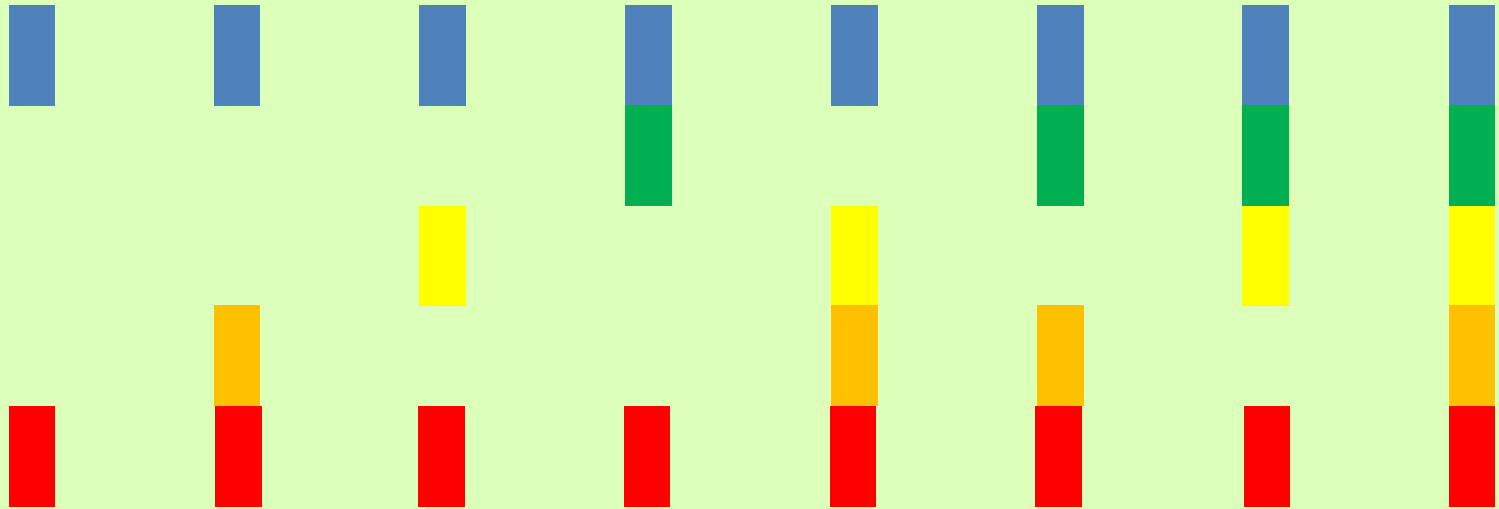
# Terminations



# Terminations

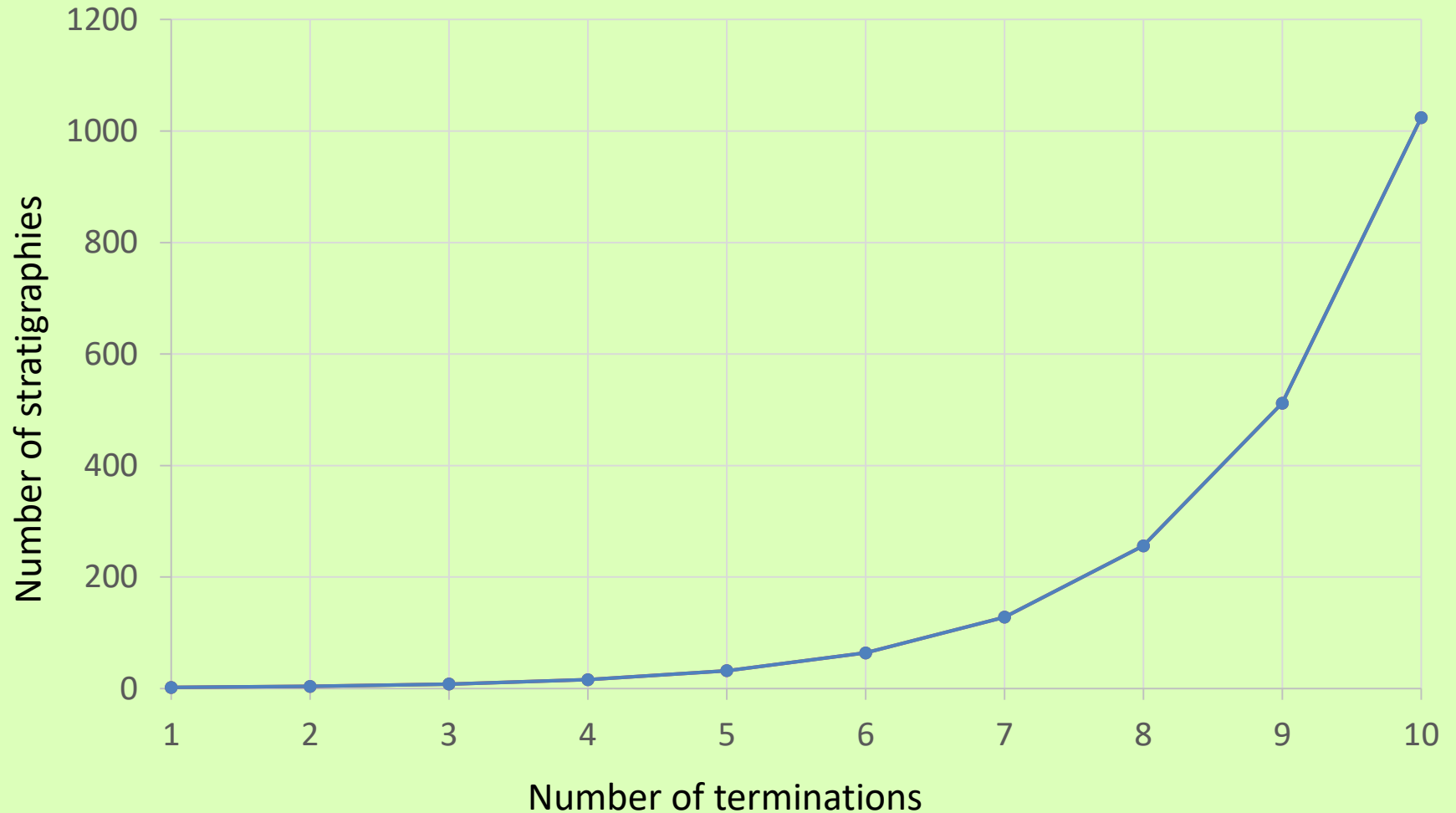


# Number of vertical sequences

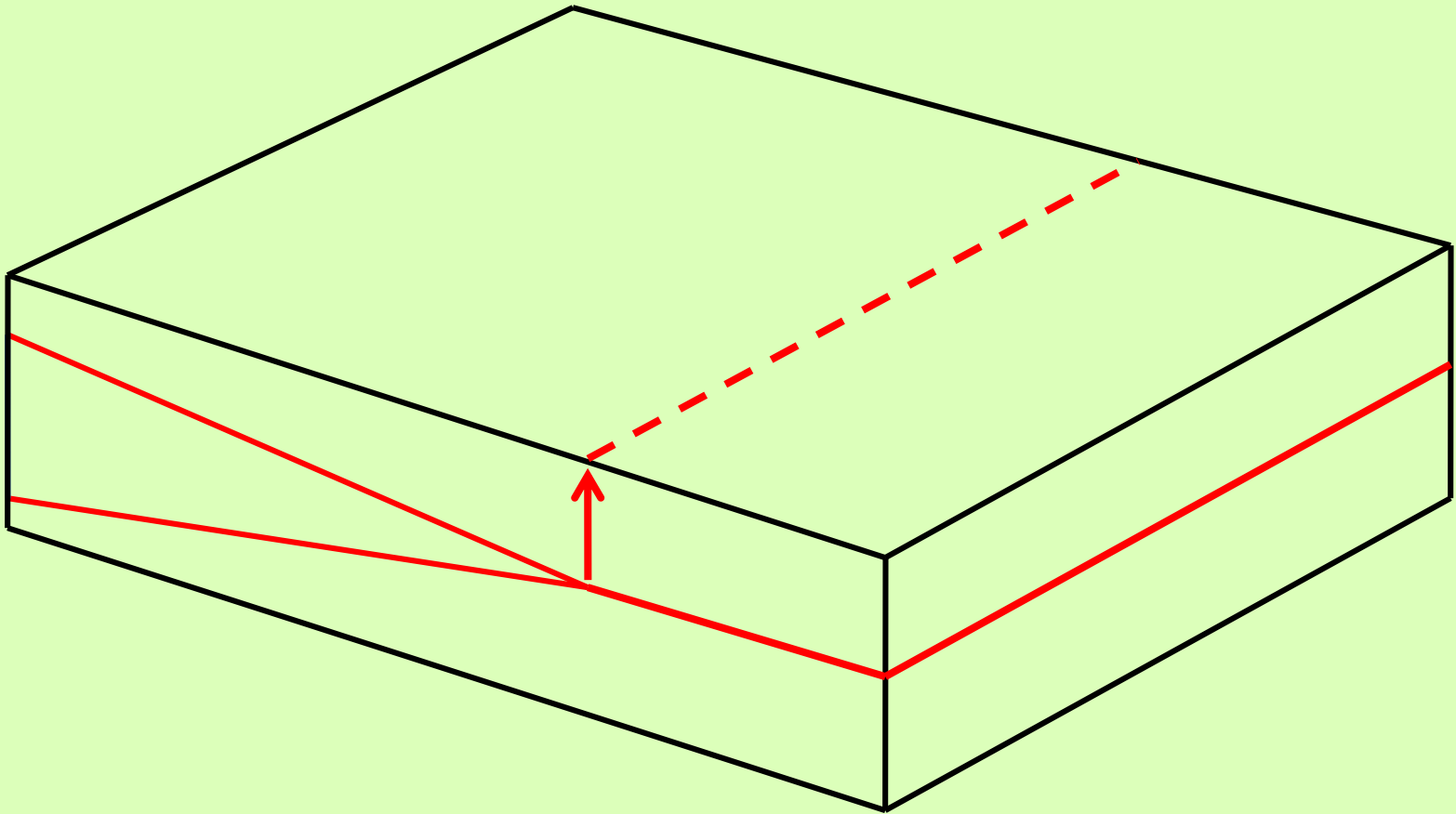


- For a given number of terminations ( $t$ ) the number of vertical sequences can be determined

# Number of vertical sequences



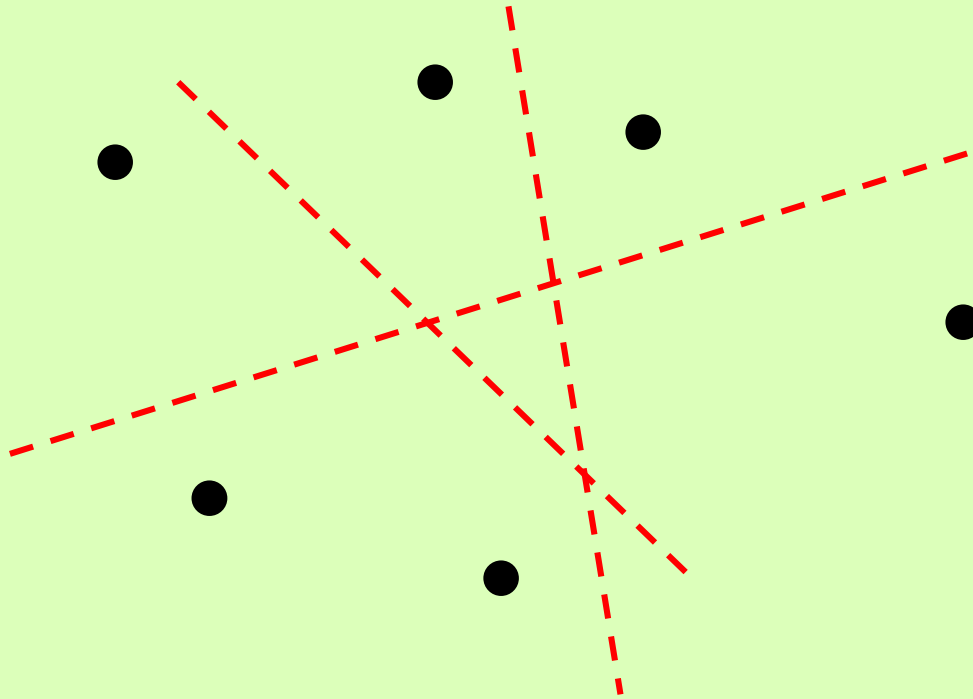
# Terminations



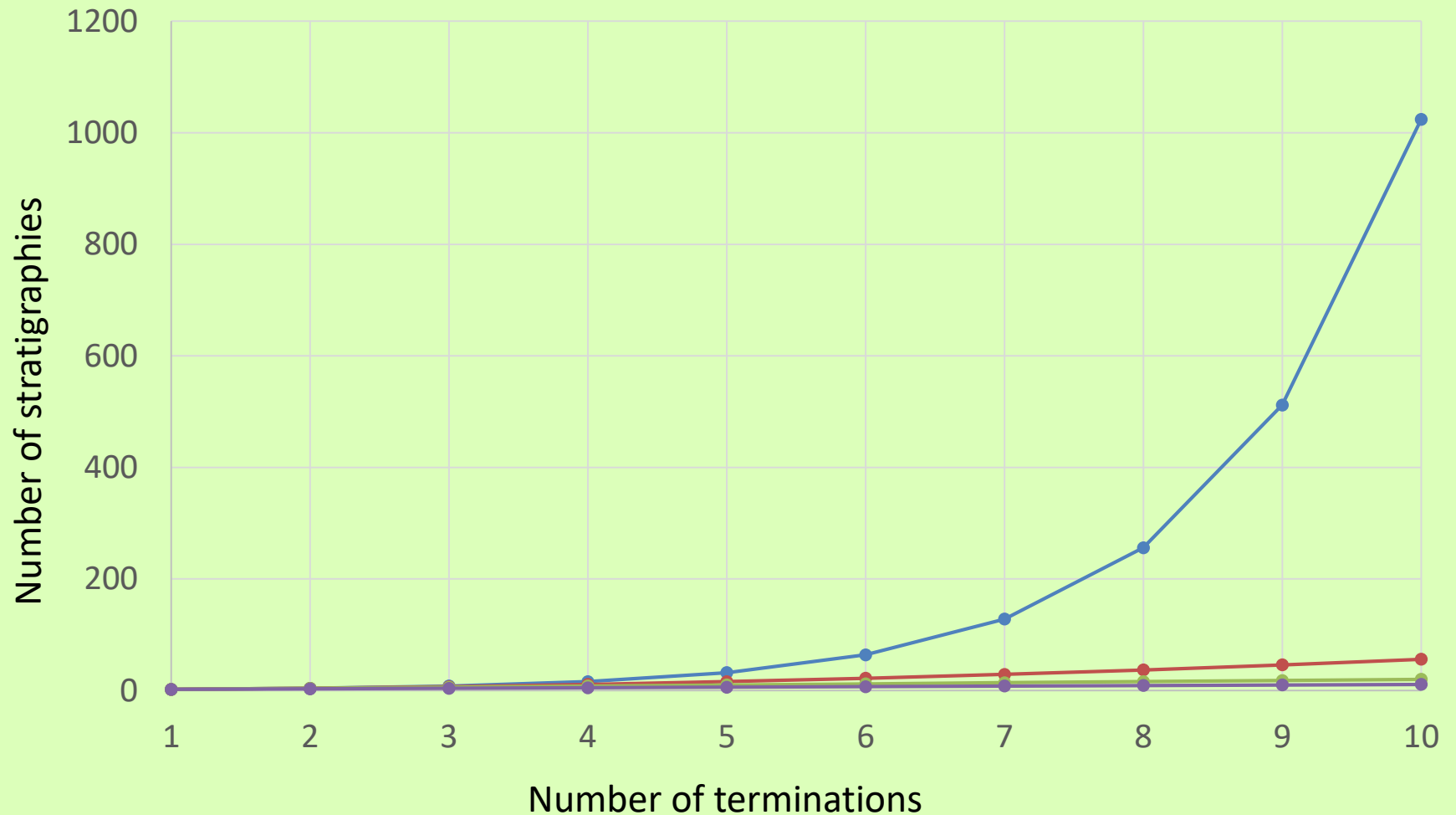


# Terminations

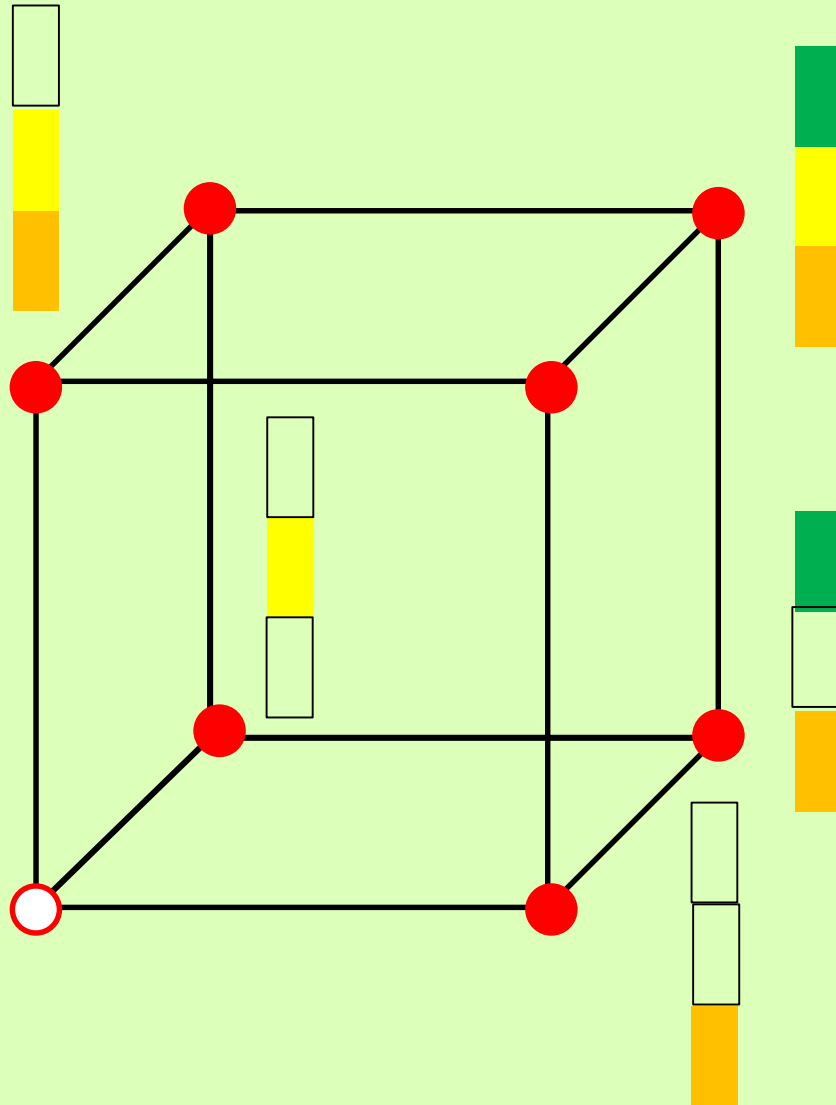
- For a collection of wells



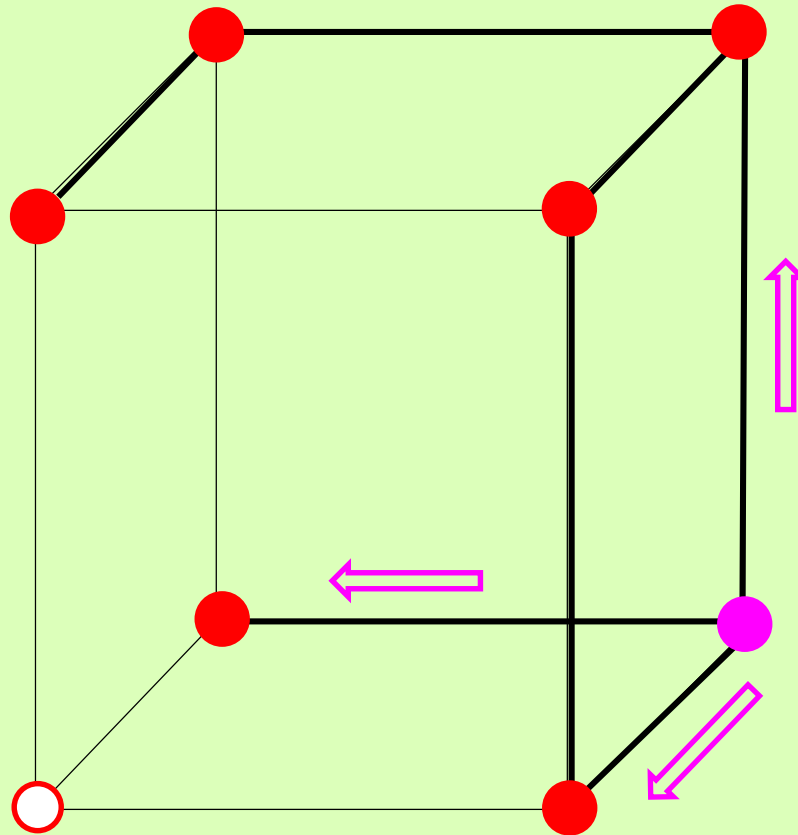
# Number of vertical sequences



# Number of vertical sequences



# Predictions



# Summary

- There is a small number of termination line patterns found in the Earth but they can create complex stratigraphies
- For each pattern the number of vertical sequences that may be present can be calculated
- Each pattern has associated with it a shape that may be used to analyse and predict spatial distributions of vertical sequences



# Summary

- The approach can be used:
  - to assess the completeness of the data set
  - for well prognosis
  - to select optimum configurations of fence diagrams
  - .....