Shale gas and the subsurface environment

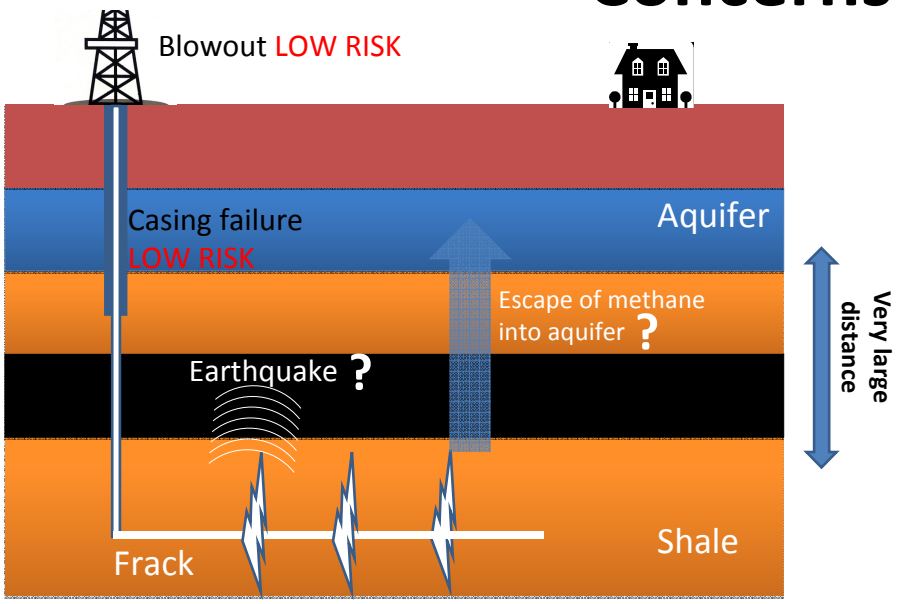
Mike Stephenson
BGS

Concerns

Cracks in a bridge on Lytham Road, Blackpool

Claim and counterclaim

Concerns



Concerns about shale gas

Peer-reviewed science: assess risk

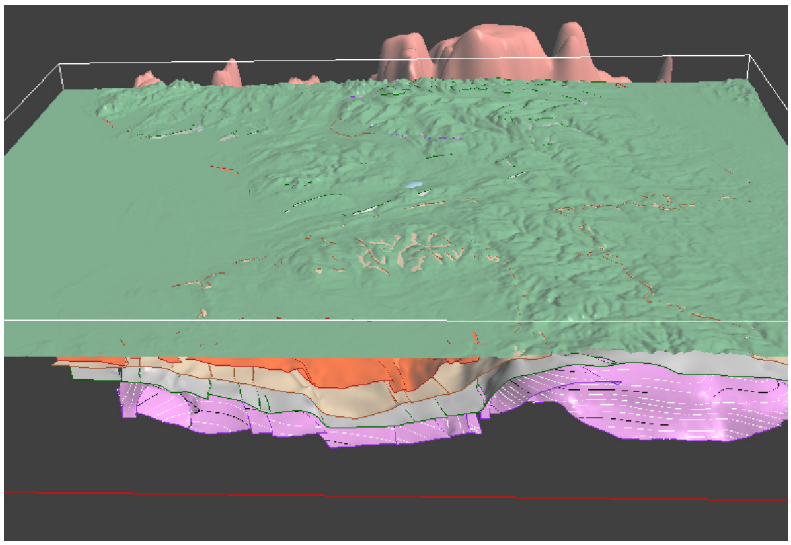
Things we don't have to worry about

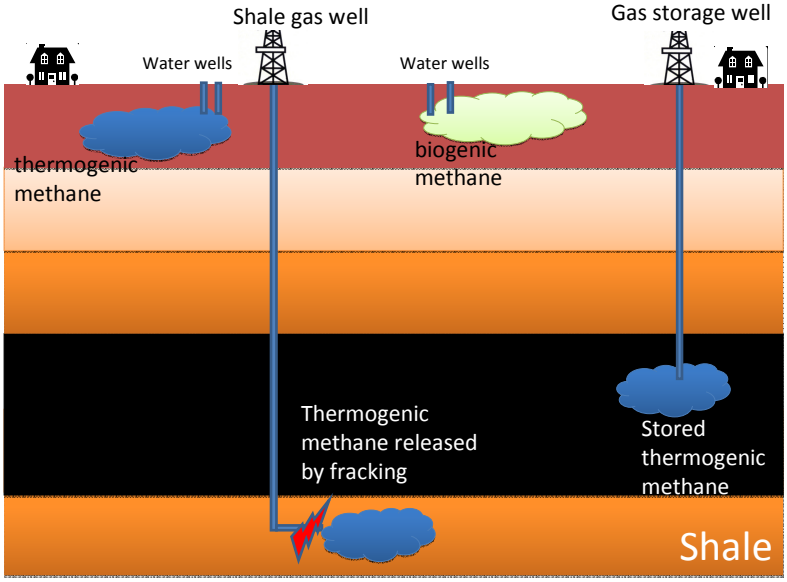
Low risk

Things we need to regulate carefully for public safety and public opinion

High

Methane contamination of groundwater





Can we tell them apart?

Sometimes we can....

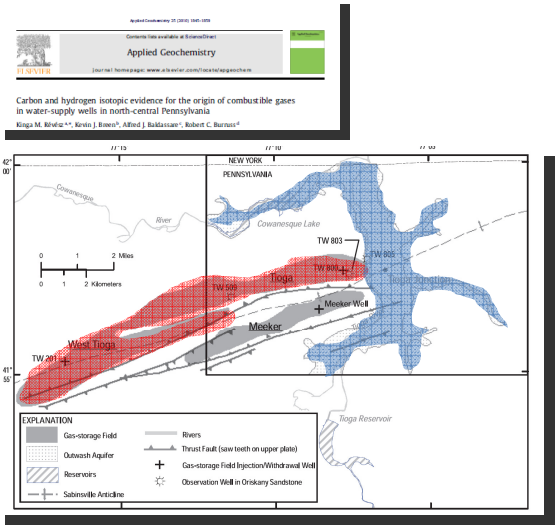
- $\delta^{13}C$ CH_4
- Gas mixture
- ^{14}C

Two peer-reviewed papers

very few of them!

Contamination from gas storage?:

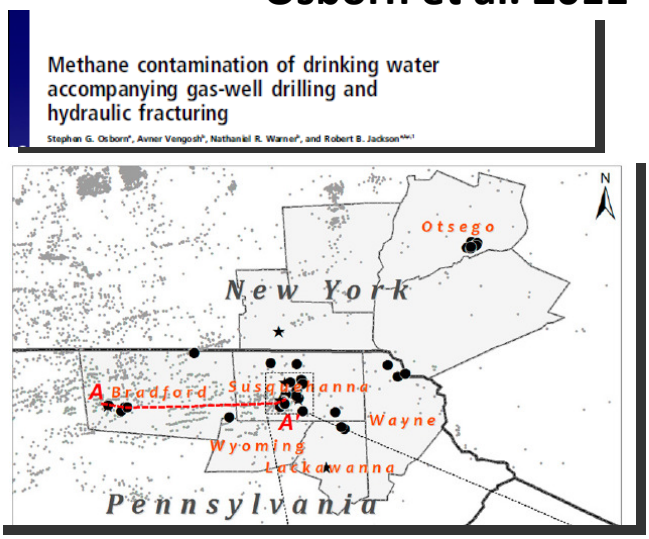
Révész et al. 2010



- Water wells contained
  - biogenic methane
  - thermogenic gases probably from storage field
  - Also mixtures of thermogenic and biogenic
- Not sure how storage field was leaking

Contamination from fracking?

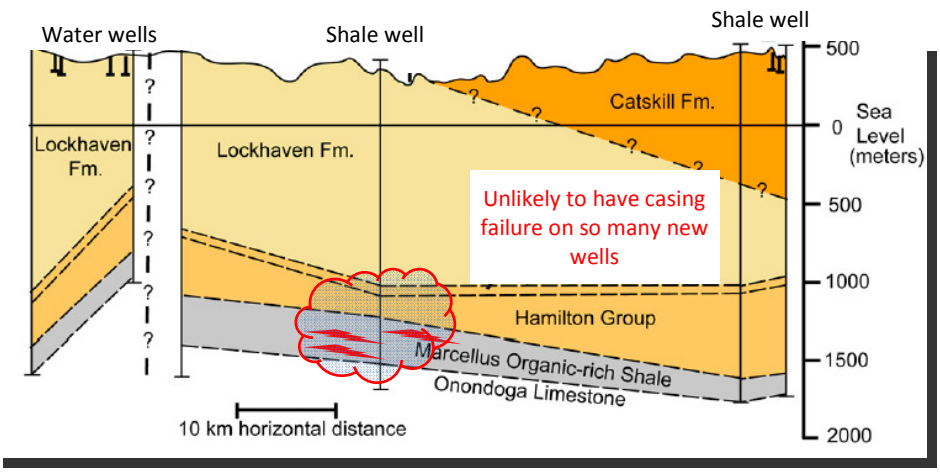
Osborn et al. 2011



- Studied:
  - Methane in shallow water wells in shale gas areas
  - measured methane content and $\delta^{13}C$

What did they find?

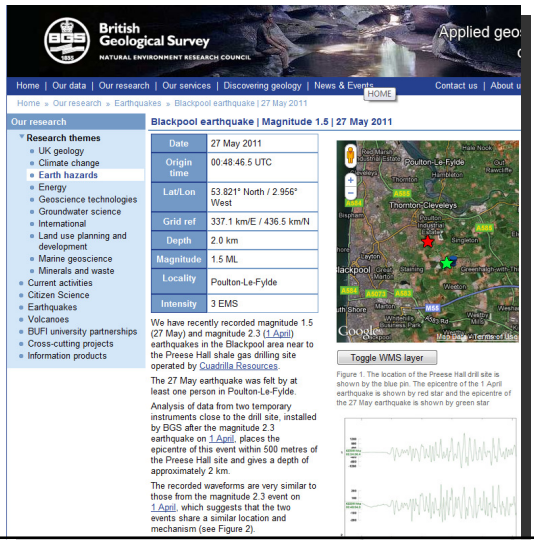
- Higher methane concentrations in water wells close to shale gas wells
- $\delta^{13}C$ suggests thermogenic
- Authors then say '*likely to be shale gas from the fracking*'
- No evidence of contamination with fracking fluids



Maybe thermogenic methane but **not** from fracking?
Difficult to tell without baseline values ...
Baseline should feed into regulation

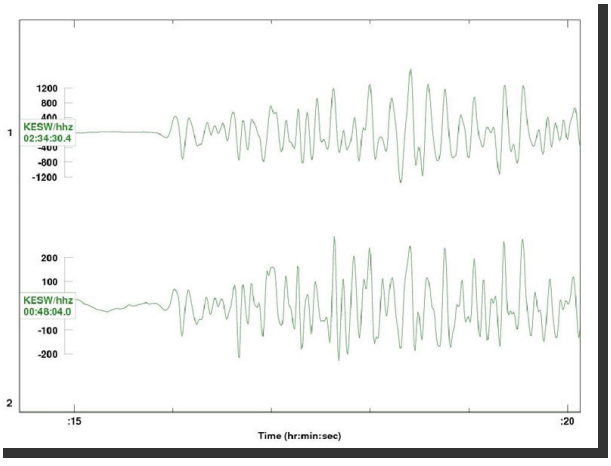
Earthquakes at Blackpool

- Largest on 1 April
- magnitude 2.3
- felt >50 people



Comparison of signals

- Comparison of signals from the 1 April and 27 May
- Waveforms very similar, so similar origin



We conclude that the earthquakes were a direct consequence of the fluid injection during fracking

Damage

- Damage very unlikely to have been caused by earthquake
- **BUT**
  - We need to know how to monitor
  - Monitoring will improve public confidence

Conclusions

- Almost all the risk is known, understood and manageable (e.g. oil and gas industry)
- For newer risks
  - Distinguish between what matters and what doesn't
  - Learn how to monitor
- Peer reviewed science important