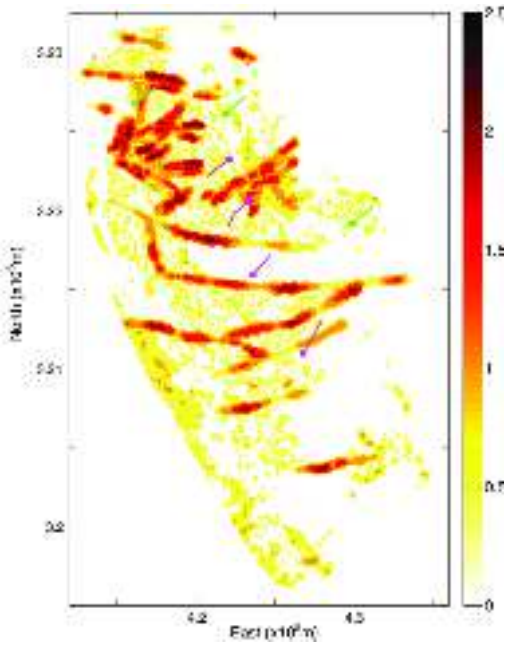
CCS and Injection Induced Seismicity

James Verdon

University of Bristol

Research Grants

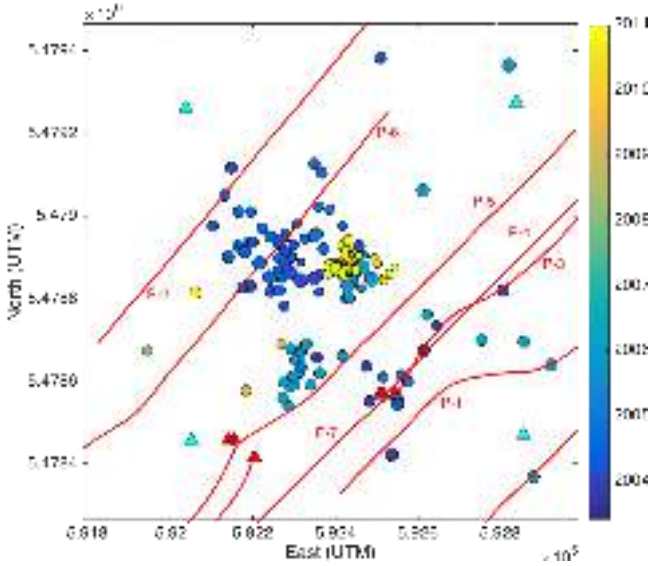


Integrated geomechanics, geophysics etc. at In Salah:

- NERC Early Career Research Fellowship
- 2011 – 2014
- Value: £300,000

SASKCO_2USER

- Canadian PTRC and US DoE
- 2011 – 2014
- Value: £150,000
- 2014-2015
- 7 research streams: Texas BEG; Schlumberger; TNO; Bisset Consulting; Uni. of North Dakota; Sask. Geo. Surv.; Uni. of Bristol



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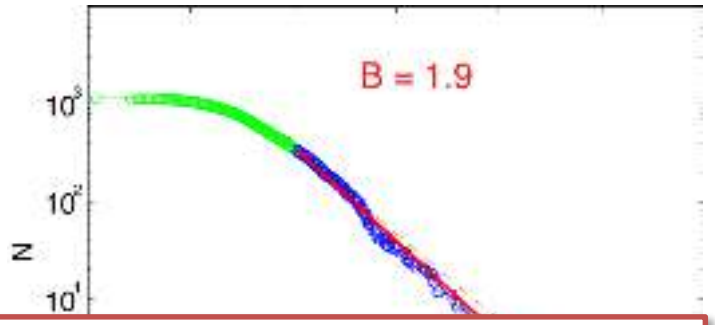
(Aberdeen)

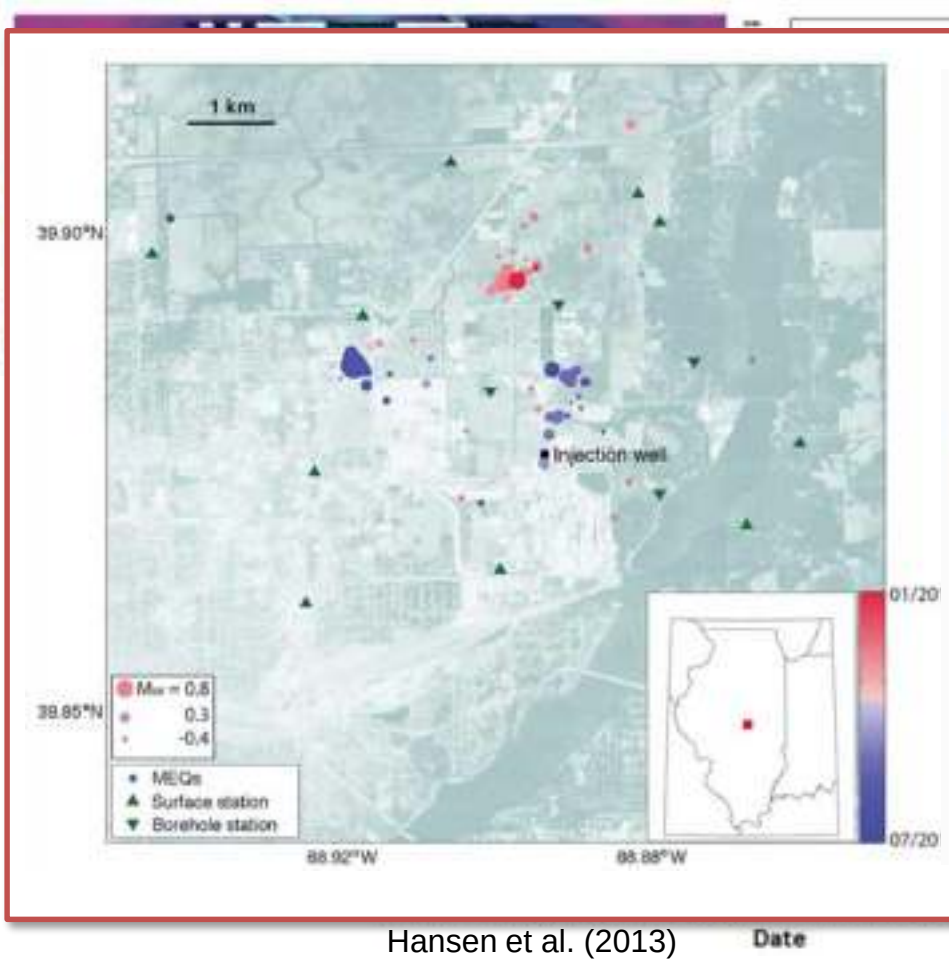
Anna Stork
(UoB)

Anna Horleston
(UoB/Terradat)

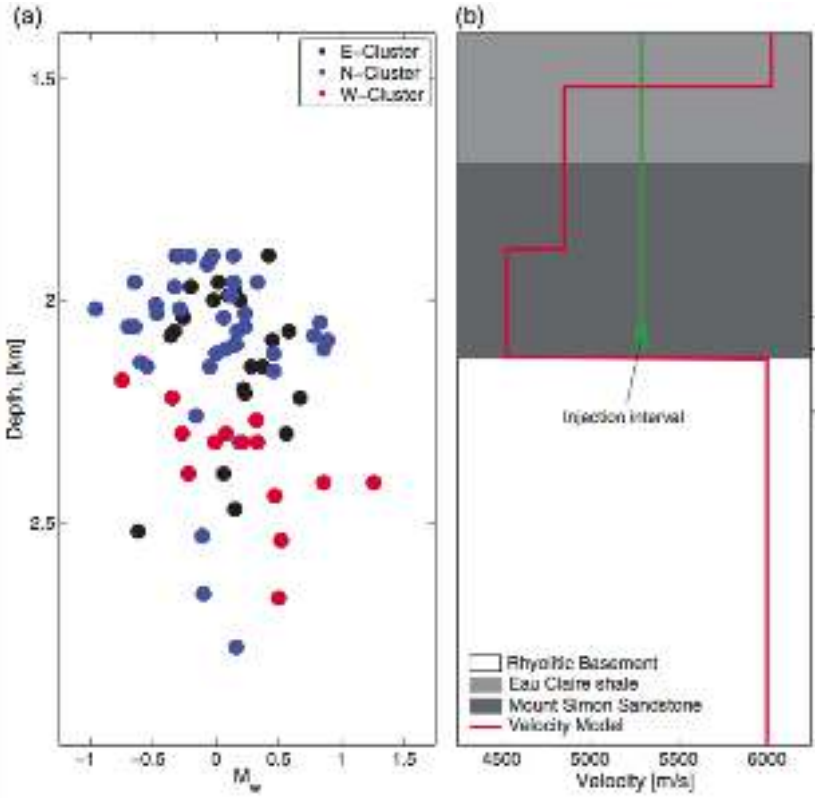
Atkinson et al. (2016)

University of BRISTOL



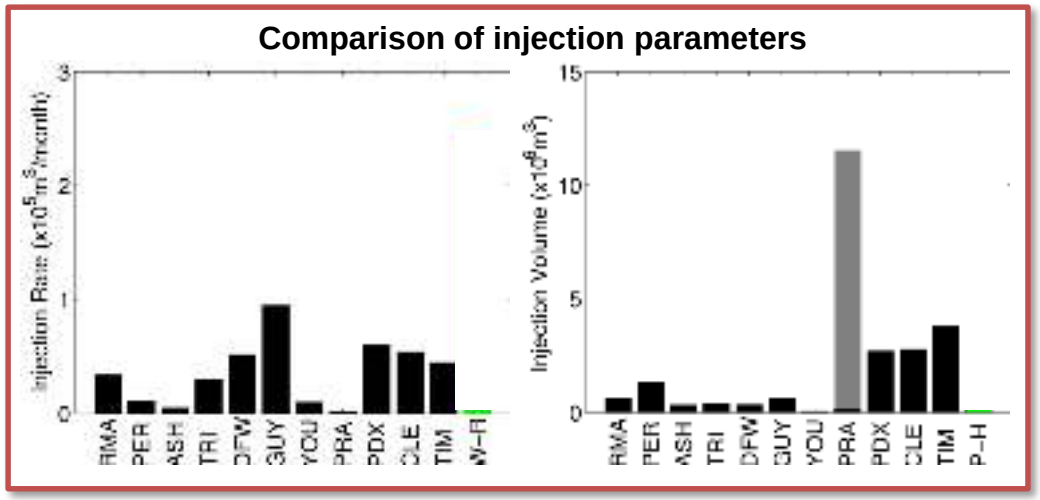


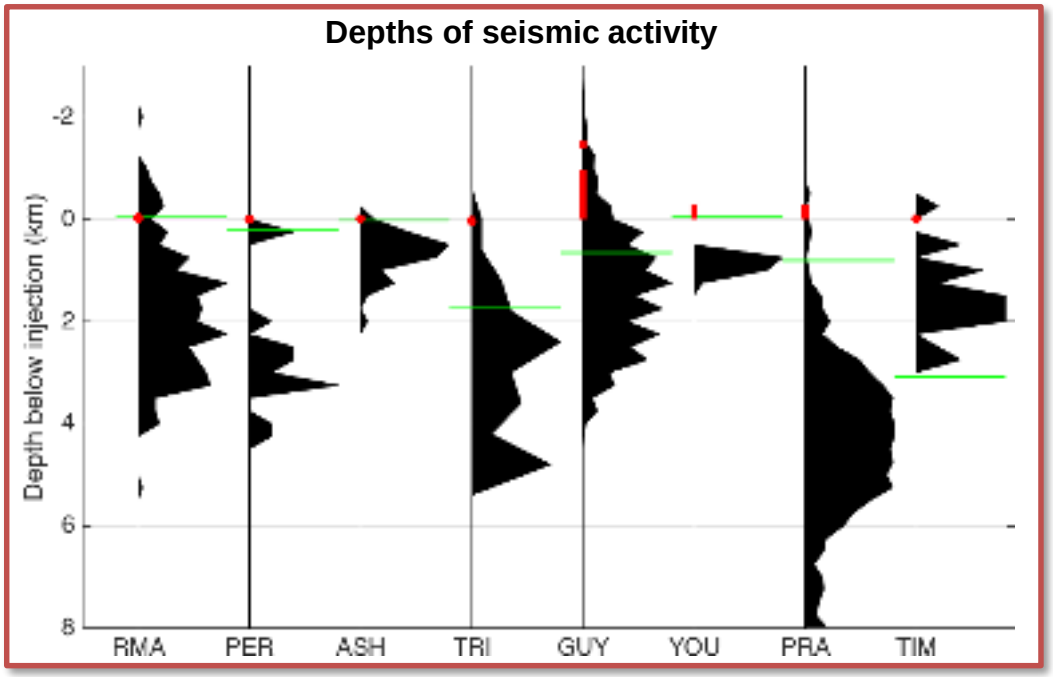
Hansen et al. (2013)



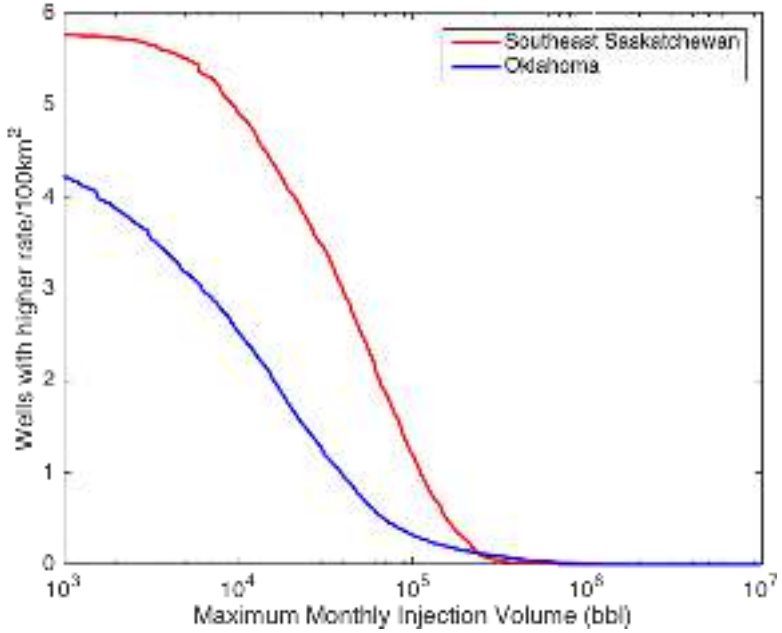
Kaven et al. (2015)

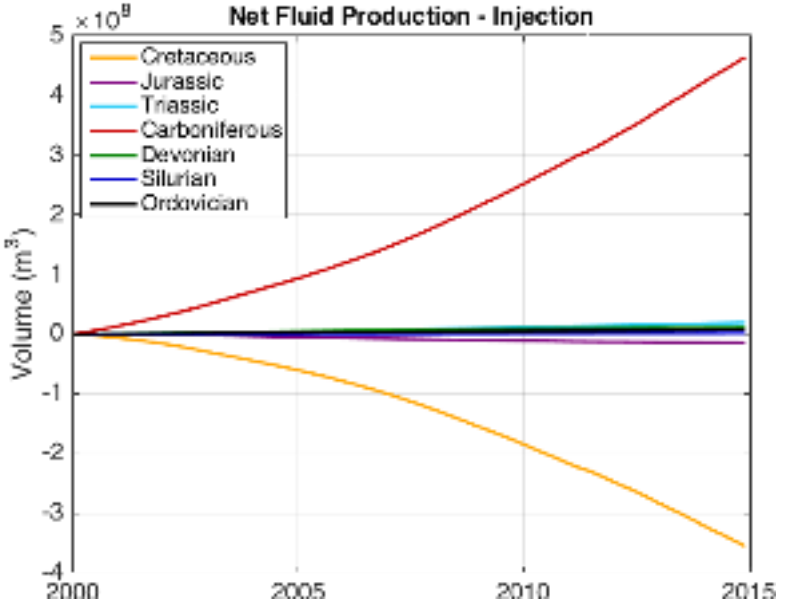
IMPLICATIONS OF IIS FOR CCS

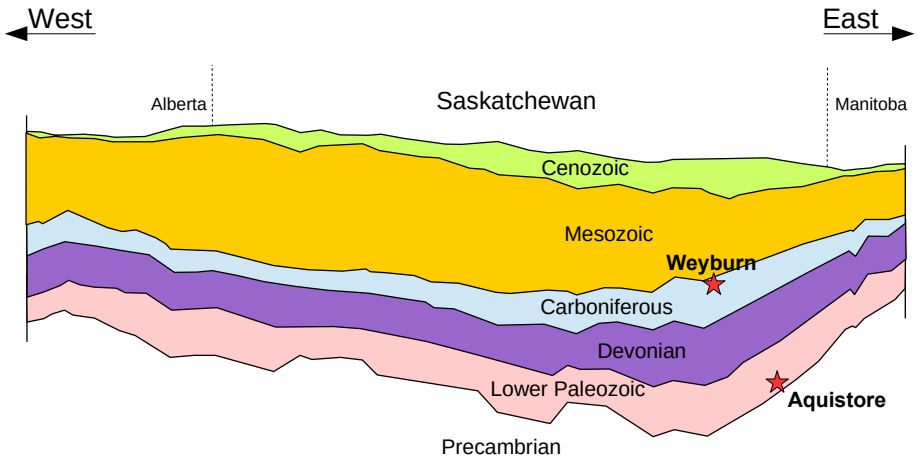


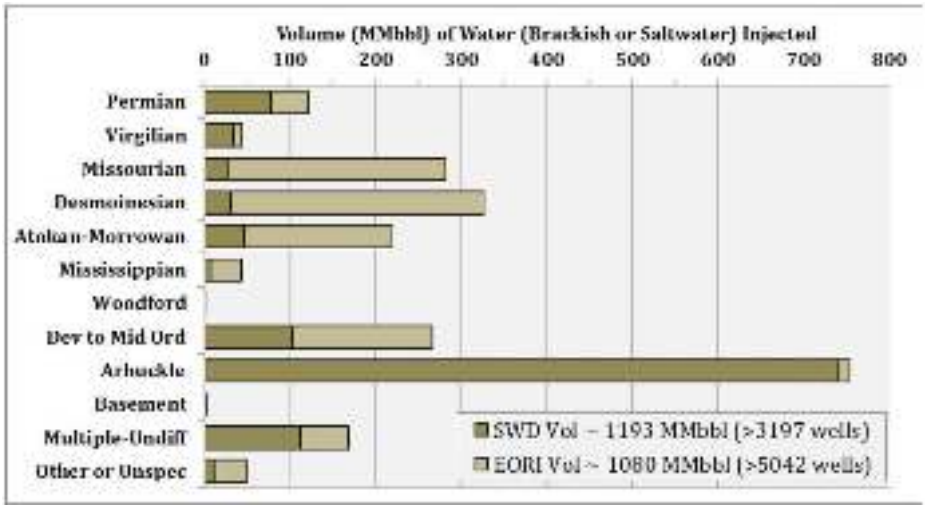


Implications of IIS for CCS



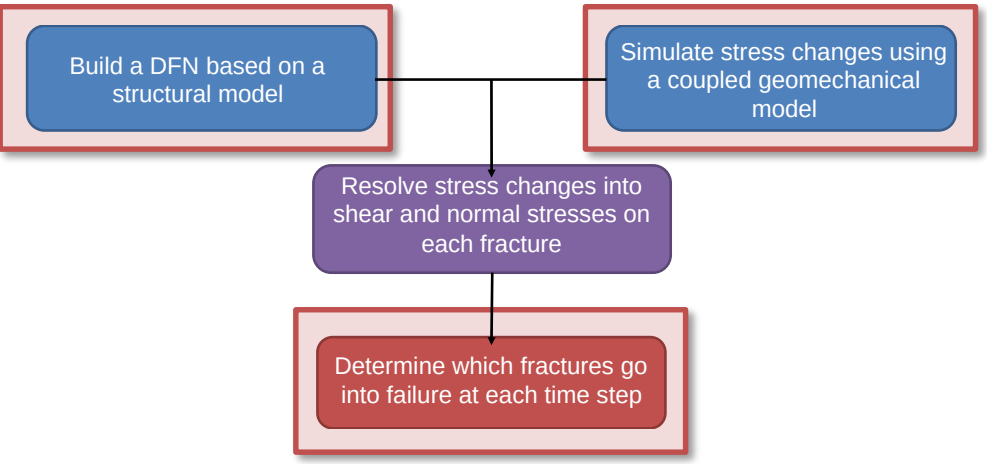


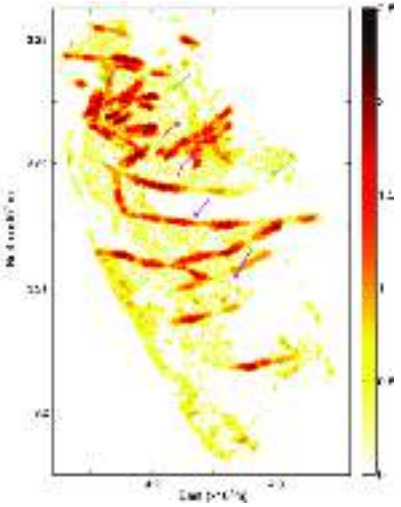


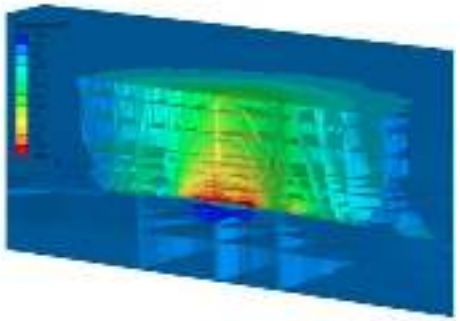


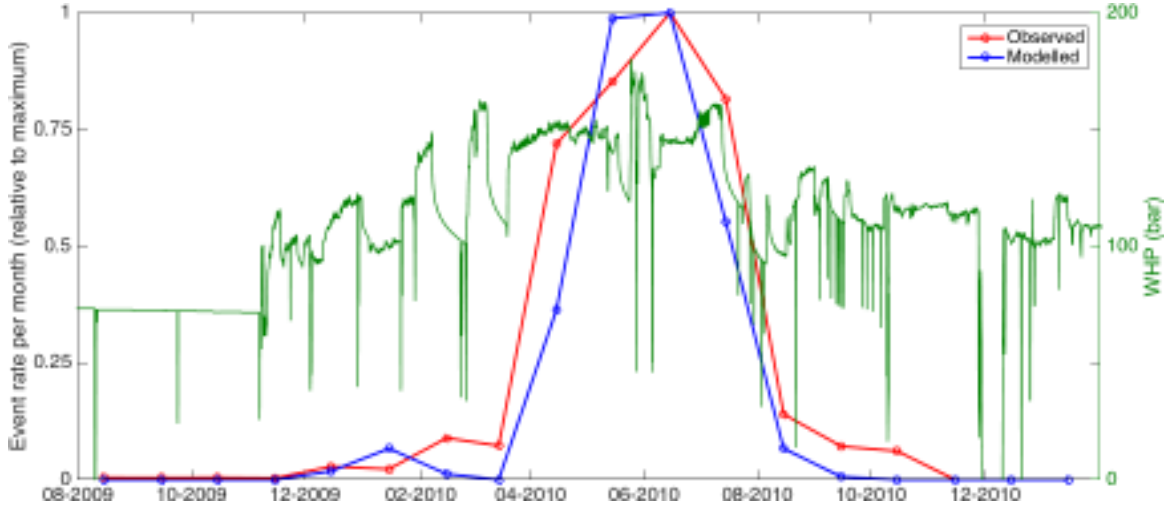
Murray (2014)

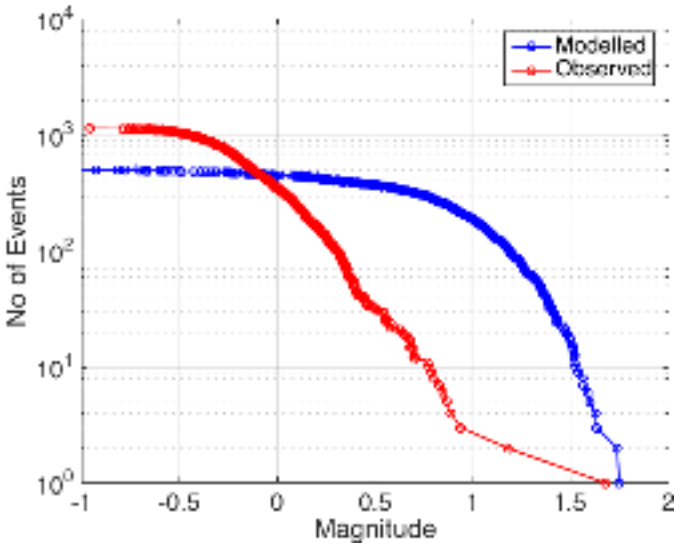
Modelling IIS Numerically







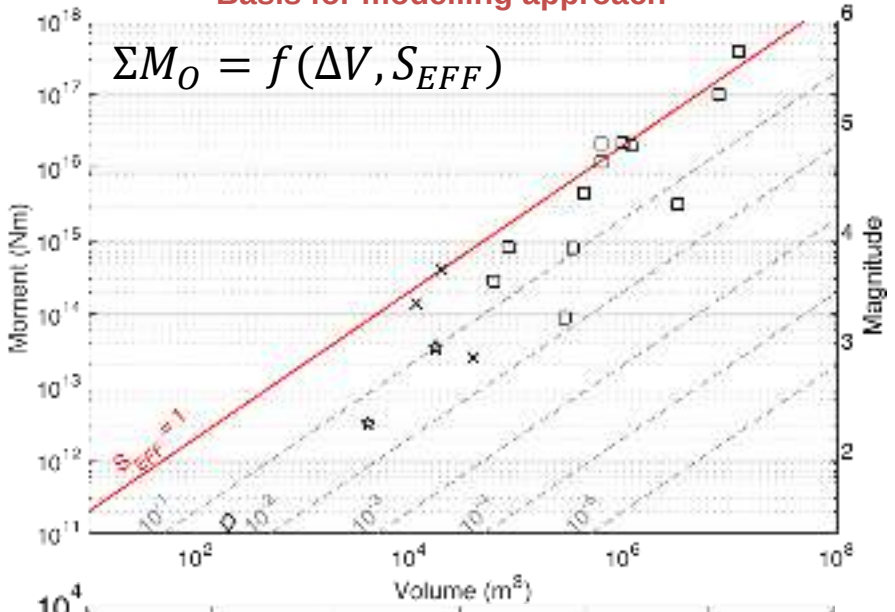




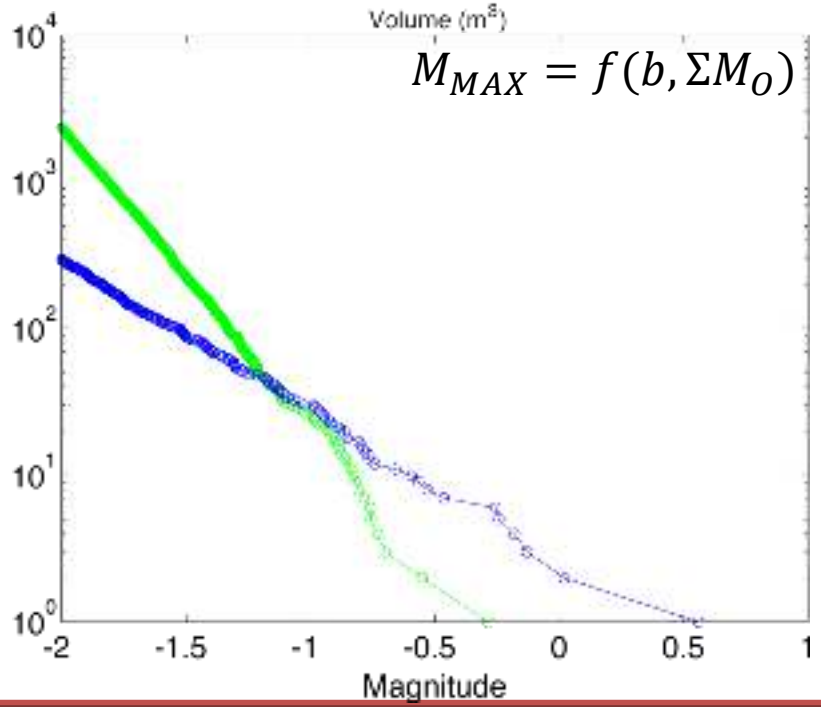
MODELLING IIS STATISTICALLY

Basis for modelling approach

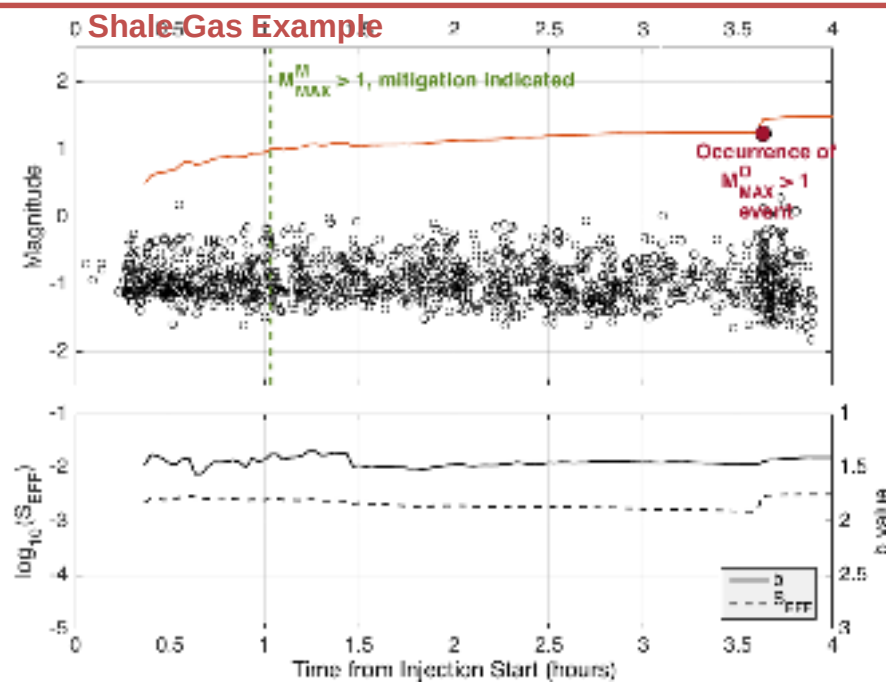
$$\Sigma M_O = f(\Delta V, S_{EFF})$$



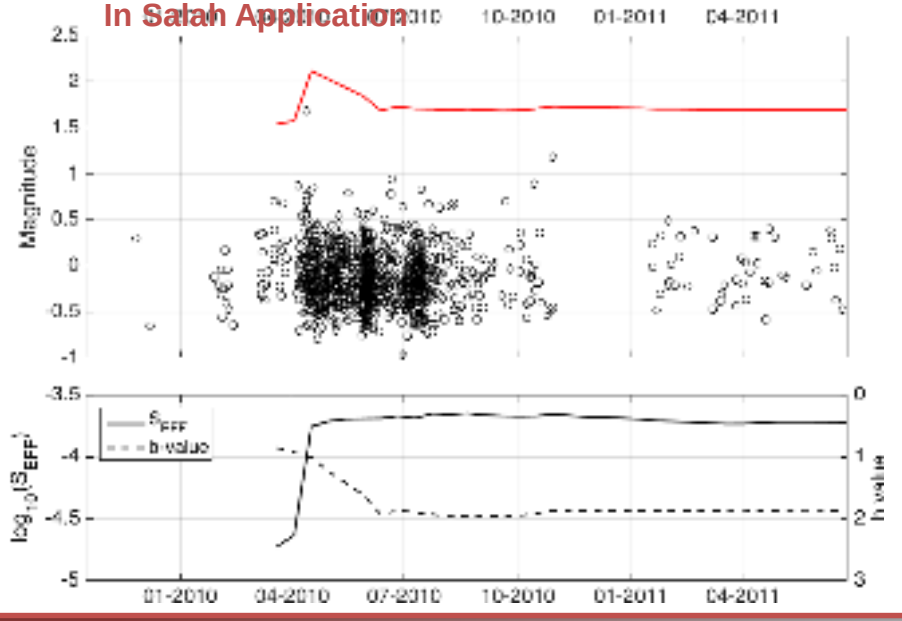
$$M_{MAX} = f(b, \Sigma M_O)$$



Shale Gas Example



In Salah Application



Conclusions

- **Induced seismicity and geomechanics are crucial factors for any future CCS site:**
  - This must be factored in to site selection
  - Monitoring systems must be used

- **At some point, a CCS site will trigger induced seismicity. What protocols do we put in place for this?**

- **Operational protocols:**
  - Traffic-light schemes?
  - Seismicity forecasting?
  - Risk assessment?

- **Public communication:**
  - Likely to be very different in different countries/regions
  - Social acceptance remains a barrier to CCS