Modeling Plume Stabilization by Migration Loss

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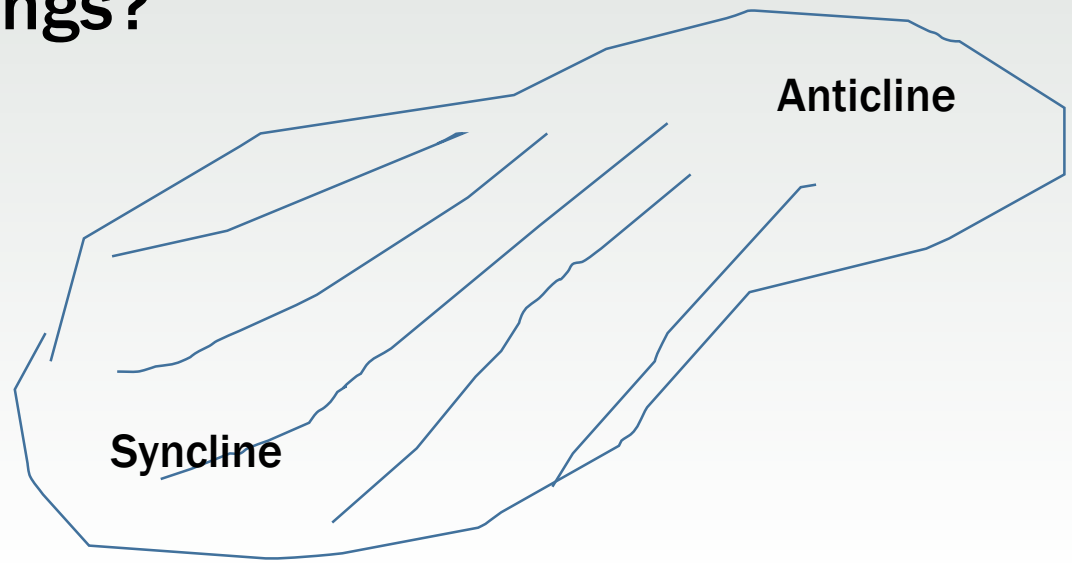
Problem Set Up

- If we want to use all the subsurface space, we need to store in dipping strata as well as closures.
- We may want to avoid structural crests:
  - Dense penetrations
  - Active production
  - Faults and salt diapers that may add uncertainty about retention

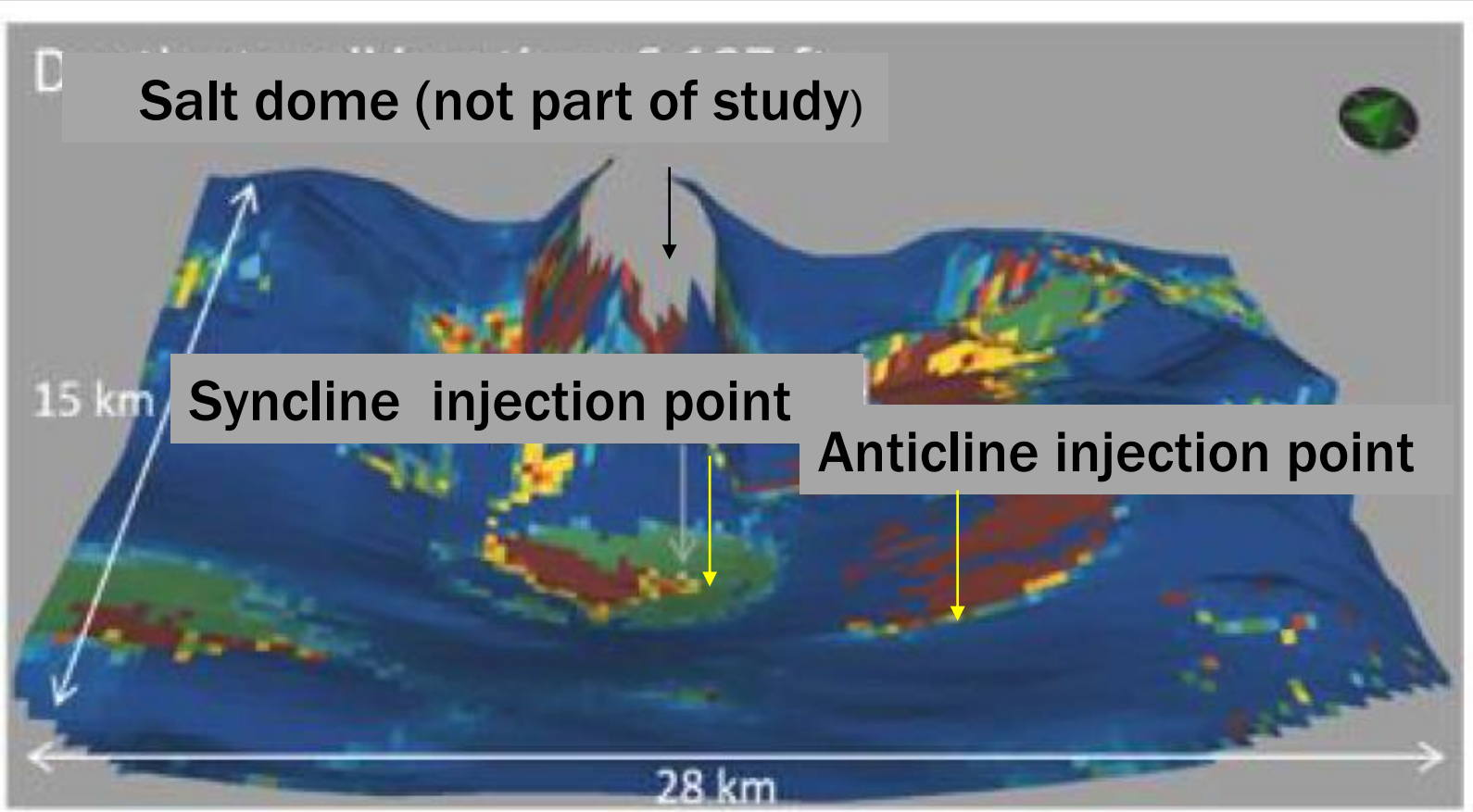
Problem statement

- How much CO_2 can we inject in a syncline before the plume expands to access the anticline?
- What is the value of a lease or easement for storage in these two settings?



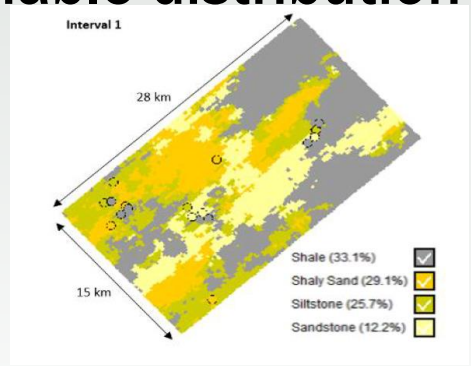
Approach

- Characterize a salt withdrawal basin
- Build static model
- Run fluid flow model injecting several amounts in anticline and in syncline

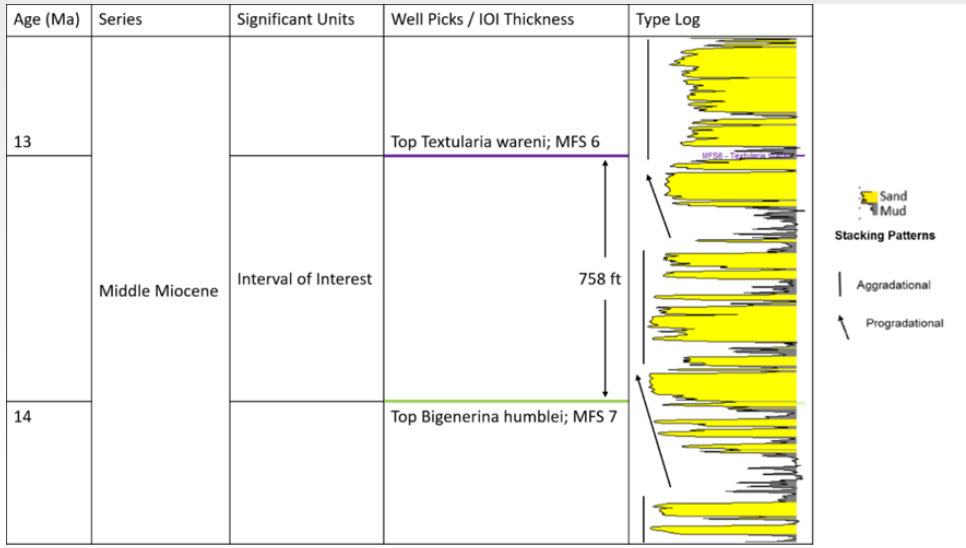


Novel problems addressed

- Sediment character is different in syncline than adjacent anticline
- Few penetrations in syncline
  - Use a combination of seismic attributs and probabilistic facies models to allocate a reasonable distribution of sandstones and mudstones in the study area



- Thick section: Model one part of the stack in detail and then upscale



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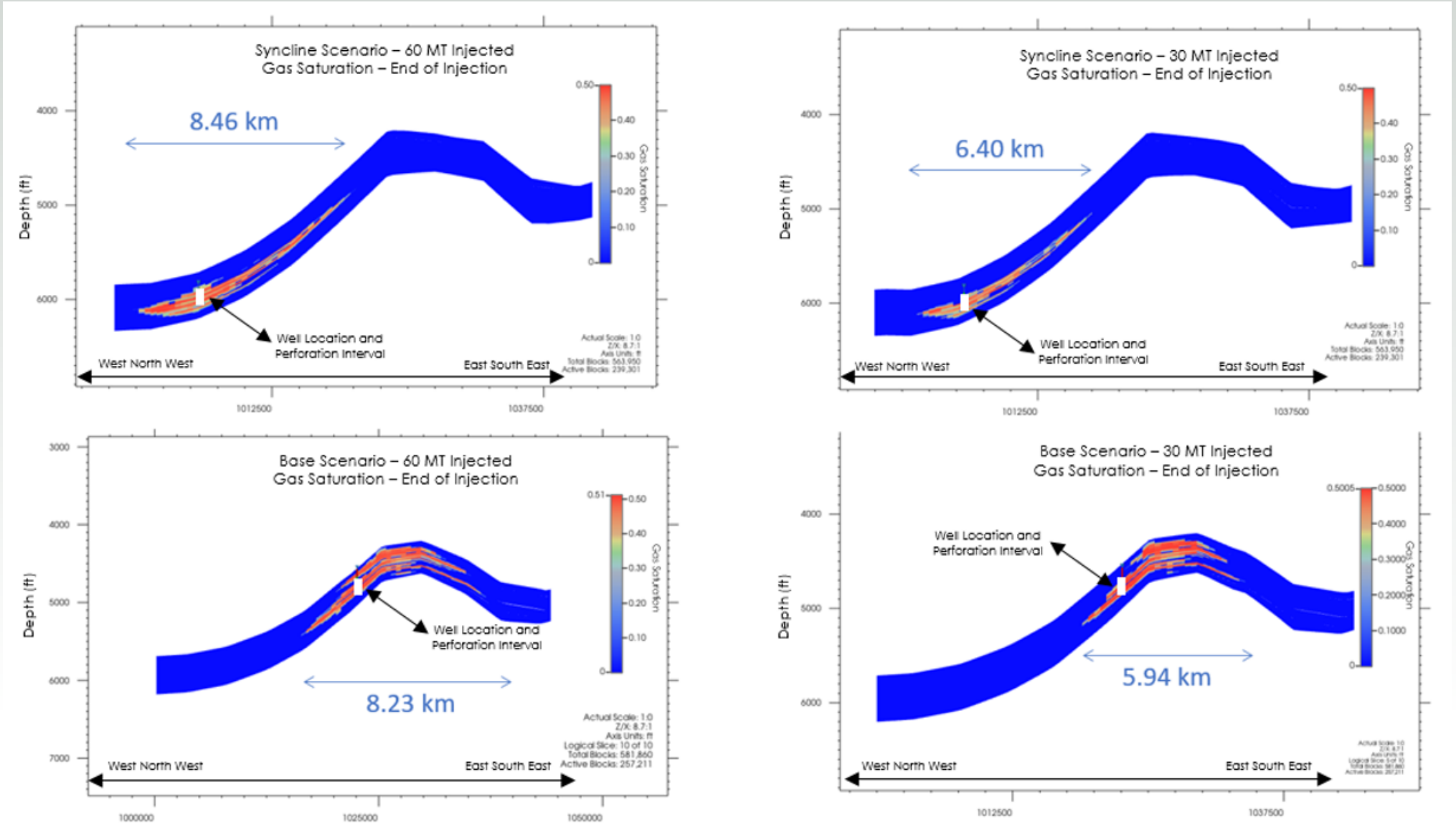
Model results



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Model results

Case	Plume migration distance after 30 years of continuous injection (km)	Plume migration distance 100 years after injection stops (km)
Syncline scenario – 60 MT	8.46	10.74
Syncline scenario – 30 MT	6.40	8.69
Base scenario – 60 MT	8.23	8.23
Base scenario – 30 MT	5.94	5.94

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Conclusions

- Injection in syncline did not reach anticline crest in model
- The vertical rise in the syncline injection was limited compared to the more compact anticline injection, which had greater vertical migration. Storage security with respect to confining system improved in the syncline
- The per acre value of stored CO_2 would be less in the syncline- would that imply that the lease or easement cost would be less?