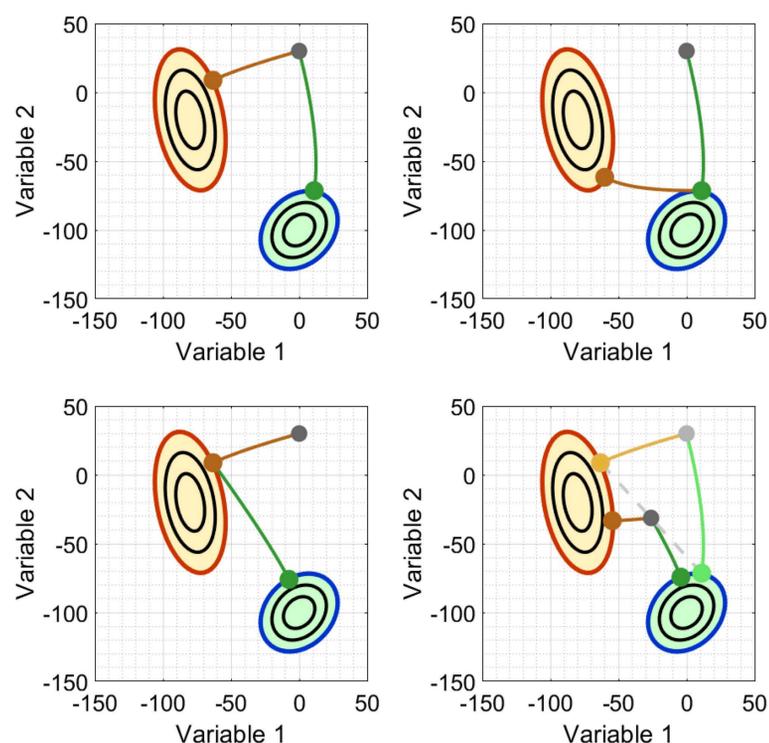


Targeted null-space shuttling for time-lapse FWI

Scott Keating* and Kris Innanen

Inversion null-space

- **Inversion null-space**: the set of models that produce good data and prior fit
- Changes in starting model change the location in the null-space of the inversion result
- Time-lapse inversions involve a null-space for each dataset
- Many different time-lapse methodologies effectively navigate the null-space by changing the starting model for each inversion
- Choosing an optimal methodology can be very difficult!

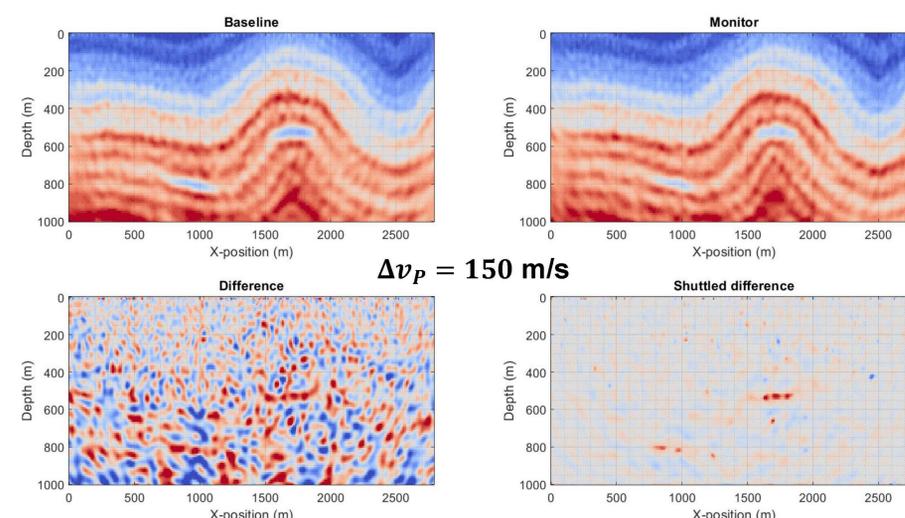
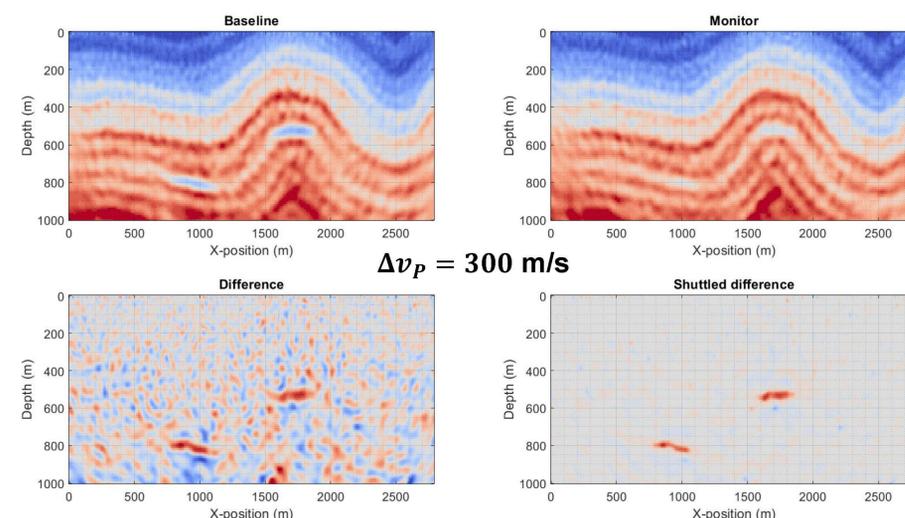
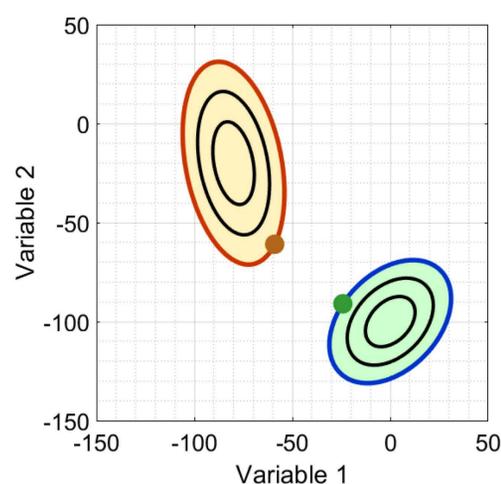


Targeted shuttling

- We would like to get time-lapse results that minimize the effects of noise and acquisition changes
- In this sense, the **minimum possible** time-lapse change may be ideal
- It is hard to find the initial models that will produce a minimum difference
- We can instead use **targeted null-space shuttling** (Keating and Innanen, 2021) on our inversion outputs to search for the optimal models within the null-space

Numerical examples

If the time-lapse changes are well constrained by the data, the minimum difference should approximate the true time-lapse change



If the time-lapse changes are not well constrained by the data, the minimum difference should be close to zero

