

Regional Full Waveform Inversion with Source Encoding

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We present the results of applying source encoding technology to regional full waveform inversion (FWI). With source encoding, a kernel can be computed with only one forward and one adjoint simulation, which is a massive speedup compared to classical FWI. The region of interest spans 120 degrees, covering part of North America, Asia, and Europe. Global full waveform inversion model GLAD_M25 is used as a starting model, and we selected 821,623 traces in the period band 17 s – 90 s from 786 events recorded by 11,381 stations. After 30 iterations, we see a significant data misfit reduction and sharper structural features. By comparing our new model with other existing regional and global models, we believe that source-encoded FWI has indeed moved the initial model closer to the true Earth model. Each iteration takes only ~30 minutes, which is just a small fraction of the cost required for classical FWI. This shows that source encoding can potentially bring FWI to a new level, enabling it to reach a resolution previously not computationally feasible.

