



Figure S3. Synthetic test for starting model with varying  $V_p$  and constant  $V_p/V_s$ . IA1 and IA3 were characterized by  $dV_p$  of  $\sim 2\%$  while the  $dV_p$  of IA2 was at  $\sim 6.9\%$ .  $d(V_p/V_s)$  for all anomalies was set to  $-3\%$ . The final iteration recovered only  $\sim 30\%$  of the  $dV_p$  peak anomaly in IA2. Although the  $V_p/V_s$  anomaly was constant, recovered values were largest at 120 km depth at 46%. Vertically integrated values recovered only 30% of the total anomalies. This poorer recovery is inferred to be due to the smaller size of these three anomalies.