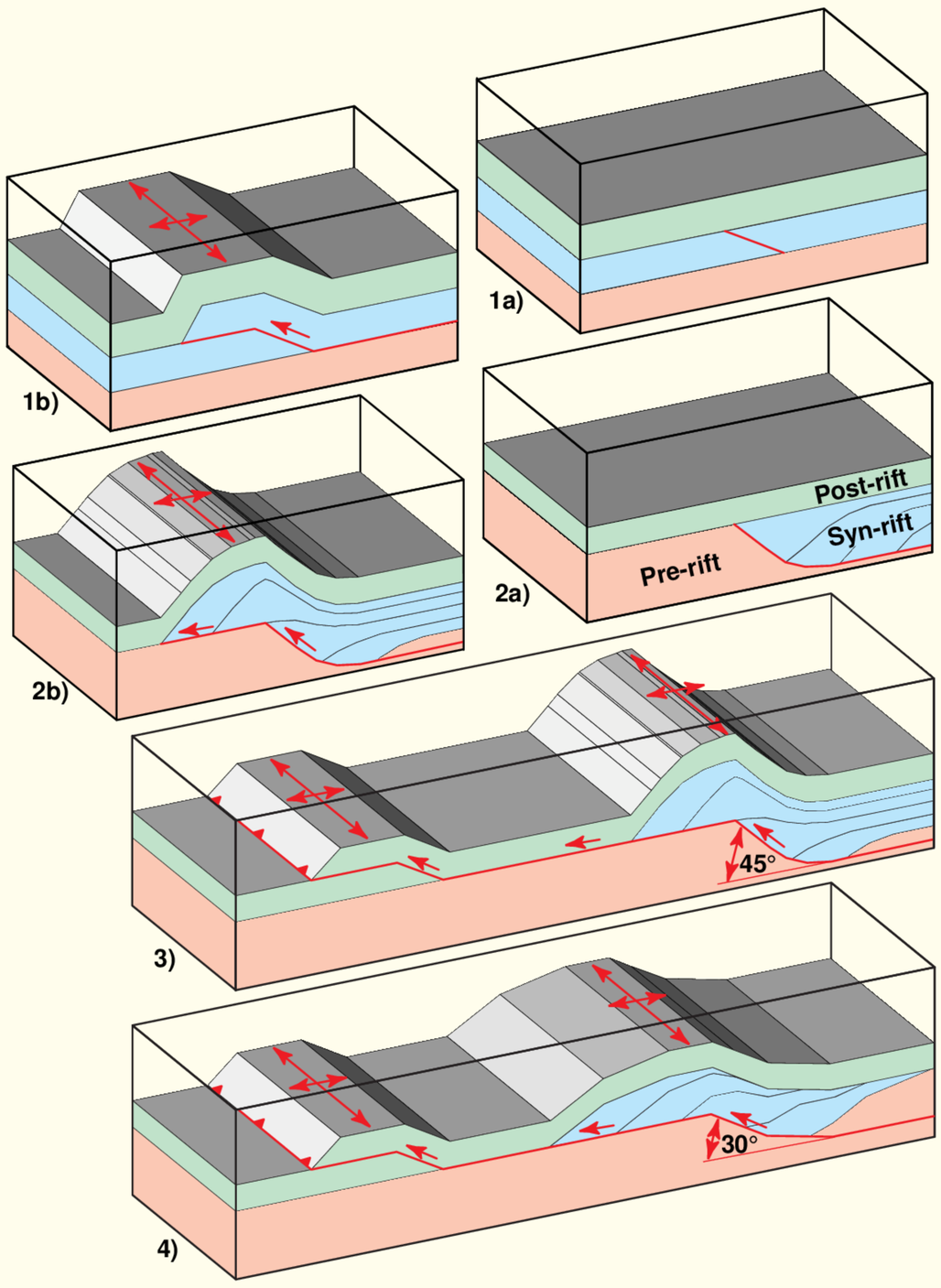
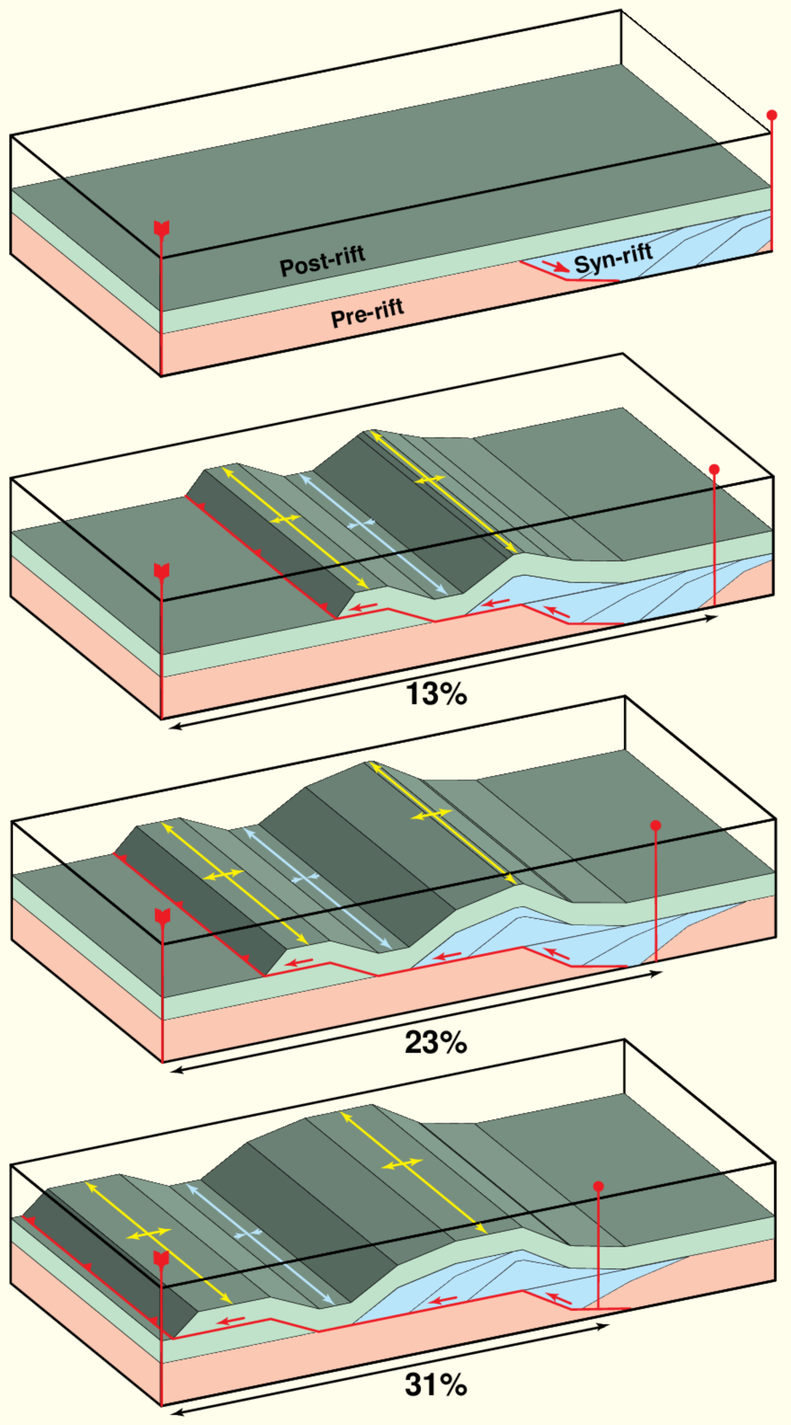
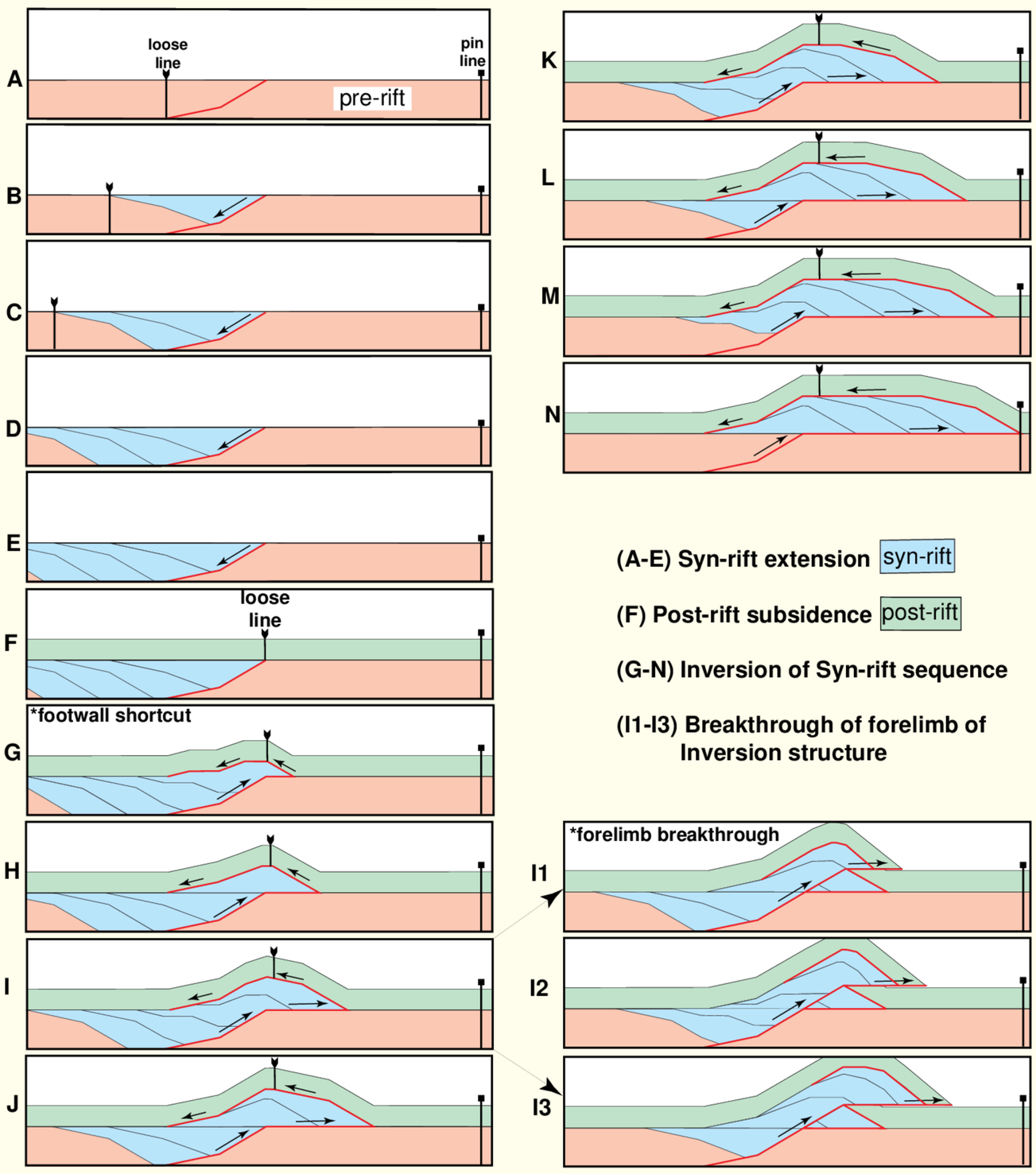
Models of Tectonic Inversion

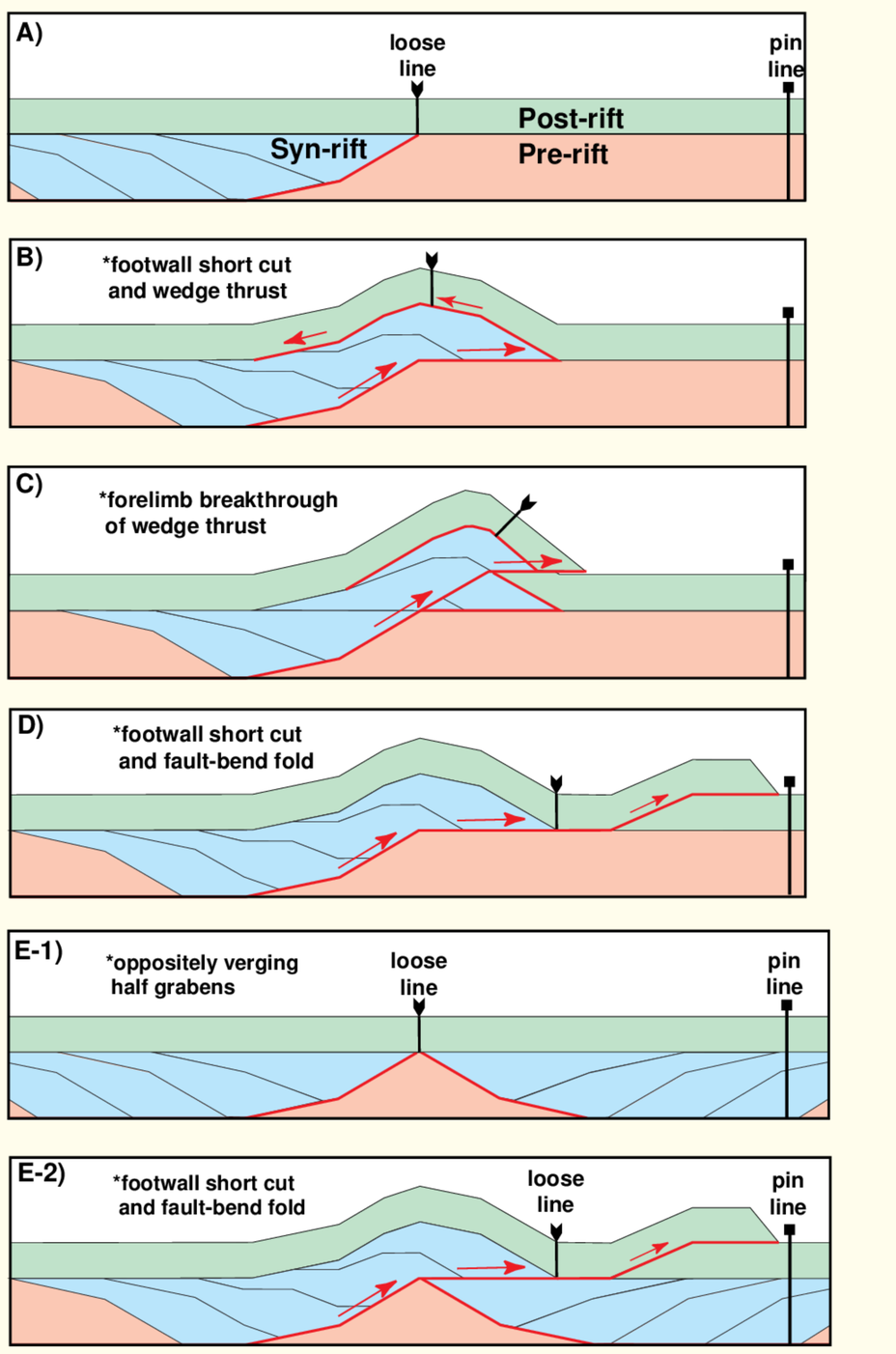


Left)
The tectonic evolution of the Atlas mountains involved newly formed fault-bend and fault-propagation folds (1a-1b) combined with reactivated syn-rift faults and footwall short cut faults (2a-2b). The geometry and amount of displacement of the original normal fault (2a-2b, 3 & 4) control the geometry and structural style of the resulting ramp anticline. Reactivated rift faults will transport previously deformed rocks along footwall short cut faults and newly formed thrust faults.

Right)
Reactivation of pre-existing faults and the inversion of extensional half grabens can lead to significant amounts of shortening. The southern margin of the Atlas mountains are believed to have deformed in a similar manner as the models to the right. Uplift of the graben bounding fault resulted in the formation of a more efficient low-angle thrust. Continued shortening across the rift margin resulted in the accomodation of strain by new fault-bend folds southward out of the rift basin (see transect A-A'). The uplift and inversion ofsyn-rift sedimentary rocks up the older syn-rift fault creates a fault-bend fold over the ramp as the fault steepens. These strata are then transported along the newly formed low-angle thrust fault.







Above) **Computer models were used in this study to simulate the structural relationships found in the field and on seismic reflection data in the Atlas mountains. A computer program by Wilkerson and Associates (Fault II) was used to create a listric normal fault with an assocated hanging wall rollover (A-E). A post-rift phase was added (F), and pin and loose lines to measure displacement. The above model then assumes that shortening is accomodated by a new thrust between the post-rift and pre-rift strata in the footwall of the previous normal fault. Shortening is achieved by the formation of a wedge thrust (G-N). Further deformation and shortening occurs by a forelimb breakthrough (I1-I3). This style of deformation may have taken place along the northern margin of the Atlas mountains along transect A-A'.**

Above) **Some possible variations related to inversion tectonics and fault reactivation are:**
A) the initial formation of a syn-rift listric normal fault and associated hanging wall rollover.
B) uplift and inversion result in the formation of a wedge style thrust
C) followed by a forelimb breakthrough
D) reactivation of the syn-rift fault may lead to new thrusts and fault-bend fold style deformation
E1-E2) opposing half grabens may lead to reactivation of one or both of the grabens. These structures offer attractive structural relationships for hydrocarbon traps.