

Results of integrated seismic mapping, within the Firth of Forth in the offshore Midland Valley of Scotland, are presented and illustrate aspects of the subsurface structure and tectonic evolution of the Upper Devonian to Carboniferous succession. Evidence for three main phases of tectonic activity has been recognized: (1) Late Devonian to Dinantian fault-controlled subsidence; (2) basin-wide Silesian subsidence, localized inversion and growth folding; (3) Late Silesian dextral transtensional and transpressional strike-slip faulting. During the first phase of tectonic activity, the NNE-trending Mid Forth Fault is interpreted to represent a Late Devonian to Dinantian extensional fault, with a small, mainly Dinantian depocentre developed in the hangingwall block that has subsequently been inverted during Silesian times. A major Late Devonian to Dinantian depocentre also occurs in the hangingwall block of the NE-trending offshore continuation of the Crossgatehall Fault, although it remains unclear whether this mainly Dinantian depocentre was developed during pull-apart as a result of extension or transtensional strike-slip fault movement. The NNE-trending Leven Syncline and Mid Forth Anticline within the hangingwall block of the Mid Forth Fault are interpreted as Silesian synsedimentary growth folds that formed during the second phase of tectonic activity. The peak of this activity occurred during intra-Westphalian B to Westphalian C times. In the third phase, the ENE-trending Inchkeith Fault Zone is interpreted as a Late Silesian transtensional–transpressional strike-slip fault that dextrally offsets the axial trace of the Leven Syncline. Evidence from the Firth of Forth could provide support for regional tectonic models involving mainly dextral strike-slip fault activity during Devonian–Carboniferous times, or mainly sinistral strike-slip during Devonian to Early Carboniferous followed by dextral strike-slip during Late Carboniferous times, for the development of the Upper Devonian and Carboniferous succession. However, the latter model is preferred as it provides the more convincing explanation for our interpretation that the NNE-trending Mid Forth Fault represents a Late Devonian to Dinantian extensional or transtensional fault that was inverted during Silesian times. This inversion may therefore reflect a major change in the regional stress field.