On the nature, timing and relationships of Late Precambrian tectonic events on the southeastern (Gondwanan) margin of the Newfoundland Appalachians

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The Precambrian tectonic history of the Avalonian elements of the Newfoundland Appalachians chronicles the development of part of a larger peri-Gondwanan orogenic belt that formed in the interval between the Grenville and Appalachian orogenic cycles. These rocks form the basement of the southeastern (Gondwanan) margin of the Appalachian orogen and reveal a geologic history that is more protracted and complex than previously envisaged. Avalonian rocks east of the Dover and Hermitage Bay faults, record at least four prominent, pre-Iapetan orogenic events: ca. 760 Ma, ca. 680 Ma, ca. 630 to 600 Ma and ca. 575 to 550 Ma. Unconformities and intrusive relationships between precisely dated rocks demonstrate that amalgamation of major, distinctive tectonic entities occurred at least twice prior to the deposition of a Cambrian platformal cover, which is widely but not accurately viewed as the fingerprint of the Avalonian orogenic cycle. Coeval Precambrian tectonic events are recorded in similar Precambrian rocks preserved inboard of the type Avalon Zone, in southwestern Newfoundland, where the composite Avalonian block, with a Silurian cover, overthrusts mid-Ordovician Dunnage Zone. The observed leading edge of the composite Avalonian block was the focus of a widespread and complex Silurian tectonothermal event which reactivated fundamental Precambrian structures.

The oldest recognized events are likely linked to coeval generation of Pan African ophiolites early in the evolution of that orogenic belt. The next youngest event, largely compressional in nature, is recorded in arc-related volcanic and associated plutonic and metamorphic complexes in the southwestern Avalon Zone (s.s.) and in coeval Avalonian (s.l.) rocks in the Hermitage Flexure region. These rocks locally form the basement to 630 to 600 Ma sequences that deposited during the third, and perhaps most diagnostic Avalonian tectonic event. Arcs and marine basins that formed in the Avalon Zone (s.s.) during this interval were inhomogeneously deformed prior to onset of volcanism and plutonism related to a final 580 to 550 Ma event, synchronous with the rift-drift transition on the Laurentian margin of Iapetus. These diverse elements of the composite Gondwanan margin of the Newfoundland Appalachians were variably dispersed or otherwise separated prior to the Cambrian, allowing significant Cambrian to earliest Ordovician tectonothermal events to be recorded on the inboard margin of this block while platformal sediments were being deposited elsewhere.