A ruck, a ramp and imbricate stack, but no culmination – the Dundonnell sector of the Caledonian Moine Thrust Belt, Northwest Highlands of Scotland.

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The Dundonnell Culmination in the Moine Thrust Belt of NW Scotland has been interpreted as the type example of an antiformal-stack duplex in a fold-and-thrust belt (Elliot & Johnson 1980; Boyer & Elliot 1982; Butler & Matthews 2009). Much of this interpretation has been based on the primary Geological Survey of the region (Peach et al. 1907). These early geologists identified a WSW-ENE elongate antiformal structure formed in Neoproterozoic (Torridonian) and Cambro-Ordovician sedimentary strata immediately beneath the Moine Thrust. The Moine Thrust was shown to be deformed by this structure, thus providing evidence for the foreland-propagating nature of the thrust belt. The antiformal axis was shown to be aligned oblique to the trace of the Moine Thrust Belt, and to the (top-to-WNW) thrust transport direction.

Much less well known is that along strike from the culmination, the primary survey also identified an approximately 200 m wide linear belt of "generally contorted schist" in the Moine rocks structurally above the Dundonnell antiform. The 19th century survey field slips identify a WSW-ENE trending "RUCK".

New geological mapping does not support an antiformal-stack duplex at Dundonnell. There is no folded repetition of the stratigraphy or lithology across the culmination; instead moderate to steep SSE-dips are observed right across the structure. On the south side of the structure, clastic rocks immediately beneath the Moine Thrust are intensely mylonitic; in contrast on the north side undeformed, massive sandstone dominates, within which there is little or no evidence for ductile deformation. We instead interpret the Dundonnell structure as a steeply-inclined imbricate stack, lacking antiformal upright folding. The imbricate stack bulges up and displaces both the ductile and brittle Moine Thrust.

The northern limit of the Dundonnell imbricate stack is defined by a brittle or brittle-ductile fault breaching the Moine Thrust; the Loch an Daimh Fault. This fault continues WNW and also defines the northern limit of the so-called 'ruck' in the Moine rocks. This 'ruck' is a transpressional flower structure positioned on a WSW-ENE trending oblique lateral ramp. We argue that the Dundonnell stack has been constructed on that same ramp. The Loch an Daimh Fault clearly displaces the Moine Thrust but does not displace the structurally lowest thrust plane at Dundonnell, instead it flattens and roots southwards into the brittle base of the thrust pile.

North of Dundonnell, the Ullapool Thrust Sheet comprises Archaean gneisses and Neoproterozoic sedimentary rocks; this thrust sheet terminates southwards at Dundonnell. We propose that the Dundonnell Stack, and the transpressional flower structure in the Moine rocks, are constrained by the oblique lateral ramp corresponding to the southern limit of this thrust sheet.

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