Noncylindrical single phase folding, an example: the Oldham anticline, Meguma Terrane, Nova Scotia

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Cylindrical folds are traditionally represented as a classical approximation for single phase fold geometry. The Meguma Group of Nova Scotia represents an interbedded sandstone/slate stratigraphy predominantly deformed by a single phase of folding in the mid-Paleozoic. Non-cylindrical fold properties have been reported for this deformation but not well documented.

On the basis of published data and field-checking, a test area, near Oldham, Halifax County was selected for detailed study to examine possible non-cylindrical models. Detailed mapping and structural analysis of approximately 200 outcrop locations in this area shows the Oldham anticline to be a 2 km by 20 km upright periclinal (i.e., noncylindrical) structure terminating to the northeast and southwest. The northeast termination of the fold is best approximated by a conical rather than cylindrical geometry with a cone axis plunging 56 at 056 and a 40 ± 20 apical angle. Adjacent beds show roughly parallel cone geometries. The study shows

the northeast termination "dying out" described by the widening cone, increasing wavelength and decreasing amplitude. The cone profile shows greater angularity and tightness in its centre than in its termination.

This style of geometry is interpreted to indicate a diachronous, progressive propagation model for fold development. In this model the fold axis initiates at a point, amplifies and propagates parallel to the incipient fold or cone axis. If other folds throughout the Meguma Terrane developed in a similar fashion, regional fold structure may in fact be a composite of noncylindrical, en echelon and "locked folds" rather than simple cylindrical structures. Diachronous fold development may reconcile apparently conflicting field observations of the relative timing of cleavage and fold formation in the Meguma Group.

Auriferous fluids are known to have permeated and been trapped in Meguma Group structures. The noncylindrical properties and fold tightness of the Oldham anticline appear to control the location of the Oldham Gold District deposit. Such properties may be used as exploration tools for locating future prospects elsewhere. Structural analyses should test the assumption of cylindricity when possible for noncylindrical geometries may significantly enlighten geological interpretations.