TACONIC OROGENY: ABORTIVE SUBDUCTION OF THE NORTH AMERICAN CONTINENTAL PLATE?

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The sequence of events in the Taconic Orogeny can be correlated with those expected in the abortive subduction of a continental margin. (1) Block faulting (Tinmouth phase of Rodgers 1971) results from the bending of the lithospheric plate as the continent approaches the trench. (2) As the continental rise and slope approach the trench, their deposits are scraped off, filling the trench to produce: islands (Taconic phase), debris shed back onto the shelf (itself depressed by approach toward the trench), and the low-Taconic gravity slides. (3) Subduction of the continental crust which is under the shelf and slope produces hard rock (high Taconic), basement (Musnetcong), and Champlain-type thrusts, cleavage, and eventually metamorphism. (4) As relative motion of the 2 plates stops and the ex-downgoing slab heats up, slow uplift, erosion, and eventual unconformity (Hudson Valley phase) result.

A typical subduction rate (8 cm/yr) provides a speedometer to check the timing. Events 2 and 3 took about 2 graptolite zones = 4-8 my = 320 -640 km subducted, reasonable in terms of width of present continental margins. Event 4 took 10-30 my, a reasonable time for thermal re-equilibration of the ex-downgoing slab. Before onset of the Acadian Orogeny 40-80 my (= 3200-6400 km of plate motion) elapsed, ample time for the plate pattern to change. In Newfoundland the sequence of events occurred 10-20 my (= 800-1600 km of subduction) earlier than in the Taconics; this difference is reasonable if small plate formation (cf. present margin of India and Pacific Plates) permits subduction to stop at some places and continue elsewhere.

Theoretical simulation of certain mechanical aspects of the model is possible and will be discussed.

TWINNING IN CATAPLEIITE

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Catapleiite, $Na_2ZrSi_3O_9 \cdot 2H_2O$, from Mt. St. Hilaire, Quebec, is monoclinic (pseudo-hexagonal and pseudo-orthorhombic), I2/c with a = 12.779 b = 7.419, c = 20.157Å and $\beta = 90.41^\circ$. Crystals are invariably polysynthetically twinned (by pseudo-merohedry and reticular pseudo-merohedry) in directions intersecting at angles of 30°, 60° and 90°. The size of the individuals may be macroscopic, microscopic or submicroscopic. Single crystals are optically biaxial with $2V_z = 40^\circ$, but 2V for finely twinned crystals varies from 0° to 40°. At least six twin laws were observed, the operations of which, singly or combined, produce monoclinic, orthorhombic and hexagonal symmetries with or without doubling of a and b cell parameters. The descriptions and symmetry of the most commonly observed twins are:

$[100]_{180^\circ}$	Imam	a=12.78,	b=7.42,	c=20.16Å,	
$[001]_{180^\circ}$	Imam	a=12.78,	b=7.42,	c=20.16Å,	
$[110]_{180^\circ}$, ± k	A2/a	a=25.56,	b=14.84,	c=20.16Å,	$\beta=90^\circ$
$[130]_{180^\circ}$, ± k	A2/a	a=14.84,	b=25.56,	c=20.16Å,	$\beta=90^\circ$
(110) + (110) (110) + (310)	C2/c	a=25.56,	b=14.84,	c=20.16Å,	$\beta=90^\circ$
$[130]_{180^\circ}$ + $[110]_{180^\circ}$ + $[100]_{180^\circ}$, ± k	$P6_3/mcm$	a=14.84,		c=20.16Å,	

The precession cone-axis photographs proved powerful in distinguishing twins of the same apparent twin symmetry, such as those resulting from $[100]_{180^\circ}$ or $[001]_{180^\circ}$, and from $[110]_{180^\circ}$ or (310) as twinning plane.

POST BRONZE-AGE VALLEY ALLUVIATION NEAR ROME

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Many ancient Roman structures built in stream valleys in central Italy were subsequently buried by several meters of alluvium and are now being exposed by erosion. An alluvial terrace along the Treia River, a Tiber River tributary which has undergone significant aggradation, was studied to ascertain the chronology and cause of the alluvial events and the relation they might have to human activity. The site selected is adjacent to the archaeological excavation of the ruins of the Faliscan city of Narce.

Excavation of two long trenches and many auger holes revealed the stratigraphy of the terrace from which the following sequence of events is inferred: (1) aggradation prior to 2200 BP, but with an unknown starting date, (2) degradation from 2200 to 1800 BP, (3) aggradation between 1800 and 1200 BP, (4) minor degradation from 1200 to 1000 BP, (5) aggradation between 1000 and 200 BP, and (6) degradation to the present stream channel position after 200 BP. Older sediments are below the modern water table and could not be dated, but several earlier periods of aggradation and degradation are indicated.

The ages are derived primarily from potsherds in the alluvium, supplemented by two radiocarbon dates. As a consequence, the age control is relatively loose. However, the major events correlate well with alluvial sequences elsewhere in Italy as well as with the sequence of European climatic changes during the late Holocene. It is inferred that climatic changes caused the valley aggradation and degradation, while man's role in the events was a passive one.

THE GIBBS FRACTURE ZONE: THE LINK BETWEEN EUROPE AND NORTH AMERICA PRIOR TO THE OPENING OF THE ATLANTIC?

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Recent seismic and marine magnetic measurements made across the Gibbs Fracture Zone eastward from 30°west longitude clearly show that the eastern limits of the fracture zone may be extended to east of 17° west longitude. Projection of the structural trend of the fracture zone to the east and west of the Mid-Atlantic Ridge offset area shows a remarkable linearity with the Hercynian Frontal Zone that first existed in Europe and northeastern North America prior to the present phase of the opening of the North Atlantic Ocean. The only gaps in this alignment occur in the vicinity of Porcupine Ridge and Bank (off the west coast of Ireland) and on the deeply sedimented continental slope and shelf off the northeast coast of Newfoundland. Crustal rotation is suggested as an explanation for the missing data near the Porcupine Ridge area. This alignment, therefore, is offered as a possible clue to the predrift position of the continents, and as a clue to the age and origin of the Gibbs Fracture Zone.