Fault Zone Evolution and Convergent Tectonics, SESSION 4

morphism (Vance and Holland, 1995), equivalent to approx. 10 km of denudation. Boudined lay-
ers and stretched foliations are prominent in the Steptoe (1968) recognized west-southwest directed layer-perpendicular extension and layer-perpendicular shortening in stretched pebble conglomerates of the Silurian Shaw Mountain Formation showing that extension is not restricted to pre-Silurian rocks. Thus, extension and crustal thickening were accom-
plished simultaneously in the crustal root till the present day. The widespread development of signifi-
cant crustal section. Assuming that decompression resulted entirely from tectonic denudation and that average fault dips were 10 to 30 degrees, the relative displacement of rocks above and below the attenuated zone extended was between 60 to 20 km.

Early Cacadian crustal thickening led to metamorphism at pressures up to approx. 10 kbar around the Chester dome (Kohn and Speer, 1990). Below the attenuated zone, garnet cores record higher-pressure metamorphism and contain abundant tonalitic domains. Garnet growth was interrupted by high-temperature events and are accompanied by significant crustal shortening. Garnet growth was constrained to the syn-convergence flexural normal fault systems in the Cacadian Acadian foliations, the lower multiple include unconformity textures and reflects a temperature increase caused by enhanced heat flow. Peak pseudomorphic textures were reached after extension but prior to later, dome-stage Acadian folding.

9:10 AM
Kidd, William S.
THE IMPORTANCE OF SYN-CONVERGENCE FLEXURAL NORMAL FAULTS IN THE CHAMPLAIN THRUST SYSTEM

KIDD, William S., Univ at Albany, Dept of Earth and Atmospheric Sciences, Albany, NY, 12222, HAYMAN, Nicholas W., Univ of Washington, Dept of Earth and Space Science, Box 353105 JHN 065, Seattle, WA, 98195

The Champlain Thrust System (CTS) of the Taconic thrust belt in west-central Vermont contains transverse structures and frontal ramps that were controlled by reactivated normal faults. These reactivated normal faults were inherited from a phase of syn-convergence tectonic flexure during Devonian orogeny. The syn-convergence flexural normal faults developed on the upper parts of the tectonic slices. The normal faults cut the pre-transpressional stratigraphic section, affected syn-convergence sedimentation, bounded local flysch basins, and partitioned displacement along strike. Map-unit relationships within the portion of the syn-convergence flexural normal faults that cut the pre-transpressional stratigraphic section and the stratigraphic slices do not match the corresponding structural offset are the best evidence for these conclusions. The CTS has several major flexural normal faults that are arranged in a series of nested fault systems. One lateral structure links the apparent "no-line" of the Champlain thrust with a large-displacement thrust that continues into New York. In the autochthon, the flexural normal faults are in a dominantly paleo-trench parallel orientation with a subordinate paleo-trench normal set. In the transported portion of the foreland (the parautochthon), the thrust faults display the outcrops of paleo-trench parallel normal faults. However, an out of sequence thrust that led to the emplacement of shelf rocks above the parautochthonous shale nucleated on a paleo-trench parallel normal fault in the outer shelf. The flex-
ural normal faults are partitioned along a regional strike and the distribution of sedimentary facies along the Laurentian margin and the thrust faults occupy the structural style and the distribution of sedimentary facies remains approximately 100 km wide. At geologically reasonable strain rates it would take approximately 100 years to accumulate this strain. We have measured stable isotope composi-
tions in quartz and calcite in these shadows and have combined these data with fluid inclusion data to yield a history of temperature and fluid pressure during the course of the strain accumu-
lation. The framboisim immed 
early below the Bird Mountain Thrust and allow the interpretation of fault history over a time period of a million years. We find regular variations in delta 18O of quartz, cycling from -18.5 to 20 and back to 19.2. Coupled with calcite O isotopes, data reveal a history of temperatures beginning at 250°C, failing to 200°C and increasing to 280°C. We interpret these results as indicating a period of cooling of approximately 300,000 years fol-
lowing a period of rejuvenation of these structures at 350 to 430 km a year. The isotope data are consistent with a period of high fluid pressure and both these correlate to changes in orientations of incipient detachment.

We believe that these two record episodes during which the Taconic accretionary segment was built up by thrust faults acting at a critical taper angle and two episodes of horizontal extension dur-
ing which the wedge was acting to decrease the taper angle.

9:50 AM
Crespi, Jean M.
EVIDENCE FOR LIMITED VOLUME CHANGE DURING SLaty CLEAVE DEVELOPMENT IN THE TACONIC ACCRETIONARY WEDGE, NORTHEASTERN USA

GOLDSTEIN, Arthur, Colgate Univ, Dept of Geology, Hamilton, NY, 13436-1398

Short-term history of thrust faults is reflected in cycles of seismic energy accumulation and release or stable sliding (10^8 to 10^9 years). Long-term history is recorded in the volume of plate boundary interactions (10^8 to 10^16 years). Intermediate term (105-106 years) is more difficult to discern. In the Taconic slate belt of eastern NY and western VT, we have identified very large pyrite framboisim pressure shadows which record the strain history during the Taconic orogeny. The pressure shadows record three episodes of large coaxial strain resulting in a cumulative strain of approximately 100%. At geologically reasonable strain rates it would take approximately 100 years to accumulate this strain. We have measured stable isotope composi-
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9:50 AM
Crespi, Jean M.
EVIDENCE FOR LIMITED VOLUME CHANGE DURING SLaty CLEAVE DEVELOPMENT IN THE TACONIC ACCRETIONARY WEDGE, NORTHEASTERN USA


Calculations of volume change in shear zones provide one means of understanding fluid flow in the crust, large-magnitude volume loss suggesting large fluid fluxes and constant-volume defor-
mation suggesting closed-system behavior and diffusive mass transport. Although simple in theo-

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Crespi, Jean M.
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branch Cayuga Inlet during initial retreat from the VHm north of Spencer. This blockage of Cayuga trough by the valley glacier and an outlet through the VHm at Port Hope formed an initial high-level Lake Enfield, which existed at about 1250 feet (380 m). The Pony Hollow outlet was abandoned as the Cayuga trough glacier retreated far enough north to allow water to escape between the glacier and the north side of Benjamin Hill south of Newfield. As the elevation of Lake Enfield lowered, a drainage divide developed just south of the headwaters of Fish Kill near Newfield at a modern elevation of 1175 feet (358 m), separating Lake Enfield into two bodies (including a short-lived southern lake we name Lake Newfield). Meltwater escaping via this outlet created an ice dam at an elevation of 1090-1140 feet (332-348 m) into the west side of the main Cayuga Valley wall south of Newfield. The bench is marked by kettle topography, likely from ice that calved from an ice margin at Lake Enfield. Lake Enfield gradually dropped to the 1130-foot (354 m) level through outlet drainage and quickly disappeared. Subsequently, water from Lake Enfield continued to use the Fish Kill outlet, carving a spillway which is preserved today. Thus the small high-level lakes had complicated histories, strongly affected by both ice dynamics and local outlets and overflows.

11:30 AM Astley, Beth N.
EVIDENCE FOR HOLOCENE LAKE-LEVEL CHANGE FROM TWO LAKE CHAMPLAIN WETLANDS
ASTLEY, Beth N., CREREL - Anchorage, 724 Quartermaster Road, Door 1, PO Box 5646, Fort Richards, AK, 99505
Sixteen radiocarbon-dated cores from two lakewide wetlands in Lake Champlain indicate that lake-level has risen in three distinct phases during the Holocene. During phase I (10,000-7,500 yr B.P.), lake level rose rapidly in response to a similar rapid isostatic rebound which increased lake volume by raising the still standing lake outflow level. This was followed by a stillstand during phase II (7,500-5,000 yr B.P.), most likely associated with glacial forearc collapse. Renewed isostatic rebound of the still at a slower rate continued to cause lake-level to rise during phase III (5,000-0 yr B.P. - Present). It is estimated that lake level has risen approximately 8 meters in the northern end of Lake Champlain in the last 9,300 yr B.P. with a greater magnitude of lake-level rise in the central and southern end of the lake due to differential lifting of the basin. Isostatic rebound has been the long-term control on lake-level change throughout the Holocene, with climate change acting as a second control.

SESSION 4, 8:15 AM
Monday, March 12, 2001
S2. Fault Zone Evolution and Convergent Tectonics: A Symposium in Honor of Rolfe Stanley
Sheraton Burlington: Emerald Salon I
8:30 AM Robinson, Peter
SUBDUCTION ZONE TECTONICS COMES TO NEW ENGLAND: FOLLOWING THE ROLFE STANLEY ATTENTION TO EARTHQUAKES
Several workers related features of the Taconic foreland of New England to subduction processes, but Rolfe Stanley was the first to carry these ideas deep into the hinterland even into the marine influence. In 1986 he helped develop the eastern New England story with his mentor, John Roberts, he used a comparative approach to explain New England tectonics. Here we apply this approach to understand the nature of subduction and collision between Laurentia and Baltica during middle Paleozoic in Scandinavia, and between Laurentia and Avalonia in middle and late Paleozoic in New England. Tectonostratigraphic relationships and geochronologic data in Scandinavia indicate that development of NW-directed subduction and related thrust imbrication gradually stepped onward and deeper into the Baltica craton, carrying previously metamorphosed rocks over cooler rocks of the craton margin. Most remarkable were rocks that were subducted as deep as 125 km at ~407Ma and then exhumed at "plate tectonic rates" to 60 km by continued thrusting over about ~6 m.y., synchronous with high-level extensional faulting. The essential shunt of this compressive activity in this ocean ~430Ma, except minor peneplanation, testifies that subduction was not due to buoyant exhumation following delamination of a lithospheric root. A well developed stratigraphy and igneous geochronology in New England suggests there was a similar system related to SE-directed subduction of a Sillian margin of Laurentia beneath Avalonia. Here, however, no exhumed products of deep-seated cool metamorphism are found, but instead voluminous magmatism progressing in a wave from coastal New England in latest Sillurian ~423Ma to the Connecticut Valley region in Mid Devonian ~390Ma, and additional heat and magmatism in Late Devonian through Mississippian, Late Pennsylvanian, and Permian. The location of magmatism both in the overriding and subducting plates, and occurrence of mantle- and crust-derived melts speaks for one, or several events of lithospheric delamination in this part of the continental collision zone.

8:50 AM Karabinos, Paul
ACADIAN EXTENSION IN WESTERN NEW ENGLAND
KARABINOS, Paul, Williams College, Dept. Geosciences, Williamstown, MA, 1207
A dramatic feature of the geology of western New England is the thinness of some Paleozoic units east of the Green Mountain and Berkshire massifs in southeastern VT and western Mass. compared to equivalent units north, west, and south of the massifs. These structurally thinned units are widely interpreted as preserving a Taconian accretionary wedge and arc complex. The attenuated nature of these units may be most conspicuous around the Chester dome where rocks lithologically equivalent to the Pinney Hollow, Ottauquechee, Stowe, and Missisquoi Formations are locally one to two orders of magnitude thinner than they are elsewhere. P-T paths for rocks structurally below the attenuated zone in the Chester dome suggest 2.5 kbar of decompression during Acadian meta-
SESSION NO. 4

S2. Fault Zone Evolution and Convergent Tectonics: A Symposium in Honor of Rolfe Stanley

8:15 AM, Sheraton Burlington, Emerald Salon I
Keith Klepeis, and Marjorie Gale, Presiding

8:15 AM
Introductory Remarks

8:30 AM
Robinson, Peter*, Terry, Michael P., Gee, David G., Tucker, Robert D.: SUBDUCTION ZONE TECTONICS COMES TO NEW ENGLAND: FOLLOWING THE ROLFE STANLEY APPROACH TO THE HINTERLAND [2592]

8:50 AM
Karabinos, Paul*: ACADIAN EXTENSION IN WESTERN NEW ENGLAND [2580]

9:10 AM
Kidd, William S.F., Hayman, Nicholas W.: THE IMPORTANCE OF SYN-CONVERGENCE FLEXURAL NORMAL FAULTS IN THE CHAMPLAIN THRUST SYSTEM [1661]

9:30 AM
Goldstein, Arthur*: INTERMEDIATE-TERM HISTORY OF THRUST FAULTING IN THE TACONIC ACCRETIONARY WEDGE [2785]

9:50 AM
Crespi, Jean M.*, Goldstein, Arthur: EVIDENCE FOR LIMITED VOLUME CHANGE DURING SLATY CLEAVAGE DEVELOPMENT IN THE TACONIC ACCRETIONARY WEDGE, NORTHEASTERN USA [2546]

10:10 AM
Break

10:30 AM
Rankin, Douglas W.*: ORDOVICIAN SEDIMENTARY BRECCIA AND MAGNETITE-COTICULE METASILTSTONE, NORTHEAST KINGDOM, VERMONT [2396]

10:50 AM

11:10 AM
Mosher, Sharon*, Massell, Christina G., Wertz, Karah, Coffin, Millard F.: STRAIN ACCOMMODATION ALONG THE MACQUARIE RIDGE COMPLEX: TRANSITION FROM TRANSSTENSION TO TRANSPRESSION ALONG AN ACTIVE PLATE BOUNDARY [2202]

11:30 AM

11:50 AM
Solar, Gary S.*, Tomascak, Paul B.: IS THERE A RELATION BETWEEN TRANSPRESSIVE DEFORMATION AND PLUTON EMPLACEMENT IN SOUTHERN MAINE? [2473]

SESSION NO. 5

T4. Deformation, Metamorphism, and Melting: Interactions in the Crust I

10:45 AM, Sheraton Burlington, Emerald Salon II
Tracy Rushmer, Gayle C. Gleason, and Michael Brown, Presiding

10:45 AM
Introductory Remarks

10:50 AM
Brown, Michael*: Solar, Gary S.: PROCESSES THAT LINK FERROPLACITOLITH, MELT-DEPLETED CRUST AND PERALUMINOUS GRANITE [1940]

11:10 AM
Marchildon, Nathalie*, Brown, Michael: MELT SEGREGATION AND DEFORMATION INTERACTIONS IN CRUSTAL ROCKS: CONSTRAINTS FROM MIGMATITES IN THREE CONTACT AUREOLES, MAINE, USA [2192]

11:30 AM
Barnes, C. G.*, Yoshinobu, A., Prestvik, T., Nordgulen, O.: MIGMATIZATION ASSOCIATED WITH EMPLACEMENT OF MAFIC PLUTONS, HELGELAND NAPPE COMPLEX, NORWEGIAN CALEDONIDES [2204]

11:50 AM
Rushmer, Tracy*, Antognano IV, Angelo, Brearley, Adrian J.: GEOCHEMICAL SIGNATURES OF RAPID MELT SEGREGATION IN THE CRUST [2300]

SESSION NO. 6

T8. Paleoecology and Paleobiology of Oxygen Controlled Faunas (Sponsored by Paleontological Society)

8:30 AM, Sheraton Burlington, Emerald Salon II
Christopher McRoberts, and David Lehmann, Presiding

8:30 AM
Vacca, David A.*, Sheldon, Amy L., Over, D. Jeffrey: GEOCHEMISTRY OF A MODERN ANOXIC ENVIRONMENT AND IMPLICATIONS FOR ANCIENT ANOXIC ENVIRONMENTS [2688]

8:50 AM
Lehmann, David F.*: DYSOXIA AND HIGH SEDIMENTATION RATE: A BAD COMBINATION DURING THE LATE ORDOVICIAN [2550]

9:10 AM
Harnik, Paul G.*, Brett, Carlton E., Ross, Robert M.: MIDDLE PALEOZOIC DYSOXIC FAUNAS AND ECOLOGICAL-EVOLUTIONARY TURNOVER EVENTS: A MIDDLE DEVONIAN CASE STUDY [2317]

9:30 AM

9:50 AM
McRoberts, Christopher A.: PALEOBIOLGY OF THE TRIASSIC "FLAT CLAM" HALOBIA IN OXYGEN-DEFICIENT MARINE FACIES [2514]

SESSION NO. 7

T10. Undergraduate Research I (Sponsored by Geology Division, Council on Undergraduate Research) (Posters)

8:30 AM, Sheraton Burlington, Lake Champlain Exhibition Hall
Authors will be present from 9 to 11 AM

Booth #

7
Green, Jeremiah S.*, Chamberlain, Steven C., Robinson, George W., Bailey, David G.: REDISCOVERY OF THE CLASSIC LOCALITY FOR 'GIESEKITE' NEAR NATURAL BRIDGE, LEWIS COUNTY, NEW YORK [2766]

8

9

10
Sorozgini, Blair*, Goring, Matthew, Gates, Alexander E., Valentino, David: MIDDLE PROTEROZOIC A-TYPE GRANITE PLUTONISM IN THE WESTERN HUDSON HIGHLANDS, NEW YORK [2840]

11
Trotter, Amanda E.*, Brady, John B.: SYENITIC COMPOSITE DIKES AT CAT COVE, SALEM, MASSACHUSETTS [2816]

12
Hall, Sarah R.*: PETROGENESIS OF XENOLITHS IN MICOCENE BASALTS OF NORTHEASTERN OREGON [2746]

13
Wilson, Sharon A.*, Coleh, Raymond A.: GEOCHEMICAL ANALYSIS OF SILURO-DEVONIAN MAFIC DIKES IN EAST-CENTRAL VERMONT [2414]

14
Able, Lindsey M.*, Brady, John B.: LAWSONITE PSEUDOMORPHS IN THE SCHISTS OF SYROS, GREECE [2698]

15
Arsenault, Michelle, Brady, John B.: CALC-SILICATE MARBLES OF SYROS, GREECE [2711]

16
Richard, Jill E.*, Markley, Michelle J.: ORIGIN OF BLUESCHIST BRECCIA, SYROS, GREECE [2785]