marginal retreat for both glaciers was ~100 m. Phase two, with a slightly higher retreat rate, lasted until the 1950's, during which the Godley separated from two of its tributaries, the Grey and Maud. Total marginal retreat by the end of the second phase was ~1 km for the Classen, ~3 km for the Grey and Maud, and ~5 km for the Godley. Phase three, with the highest retreat rate, began with the formation of a pro-glacial lake at each of the three ice margins, included the separation of the Grey and Maud in 1990, and continues today. Total marginal retreat has been ~3.5 km for the Classen, ~4 km for the Grey and Maud, and ~7.5 for the Godley.

Northern Alaskan and Scandinavian LIA maximums correspond to the initiation of the recent New Zealand LIA advance. The New Zealand maximum ice extent in 1862 matches LIA maximums from Iceland, Switzerland, Southern Alaska, and British Columbia. During the retreat phase no evidence of minor readvance is observed in New Zealand, but is observed in many Northern Hemisphere retreat patterns during the 1930's. A more complete account of the retreat pattern in New Zealand could be achieved by considering the change in ice volume in addition to change in ice margin position.

9:50 AM Young, R.A.

LIMITATIONS OF DATING GLACIAL EVENTS FROM ISOLATED ORGANIC REMAINS: A UNIQUE EXAMPLE FROM MID WISCONSIN SEDIMENTS, GENESEE VALLEY, NY

YOUNG, R.A., SUNY, Geological Sciences, Geneseo, NY, 14454

The Genesee Valley, a buried bedrock basin similar to the neighboring Finger Lakes, is filled with more than 200 m of glacial drift and Genesee River alluvium. Beneath a thin cover of late Wisconsin drift, glaciolacustrine sediments dated at 33,950 to 35,350 years BP gradationally enclose a deformation till and outwash containing reworked wood, peat fragments, and mammoth bones with ages ranging from 35,300 to 47,500 yrs BP. This till rests on an interstadial floodplain dated between 39,000 and 41,000 years BP. The 32 radiocarbon ages on organic remains document a Heinrich (H-4) time-equivalent advance into a proglacial lake 35 km south of Lake Ontario. The deformation till locally truncates interstadial point bar sands along a horizon containing plant roots in growth positions. Fluvial sand dates are from wood fragments, in-place rootlets, and small pelecypod shells with periostraca. The well preserved organics and the well documented stratigraphy provide a clear example of the potential limitations involved in using isolated dates on single samples from glacial drift to infer ages of discrete glacial events. The reworked nature of the wood, peat, and bone in the deformation till is obvious from the younger age of the in-situ organics in the winter layers of the rythmites and from the younger ages of the interstadial sediments below. The 4000-year age hiatus between the deformation till and the underlying fluvial sands is probably the result of reworking by interstadial meanders rather than ice erosion, as suggested by the chronostratigraphy of the modern Genesee River floodplain. A single finite age on one wood fragment, selected from the till or from the interstadial sediments, could have resulted in either a presumed early Wisconsin age or a late Wisconsin age for the deformation till, or for the entire section. Only the well-preserved stratigraphic relationships, the preserved sedimentary structures, and the well-preserved, abundant, organic remains reveal the true age and complexity of mid Wisconsin events at this site.

10:30 AM Serefiddin, Feride

MULTIPROXY PALEOCLIMATE ANALYSIS OF LATE QUATERNARY SPELEOTHEM ISOTOPE RECORDS FROM REED'S CAVE, SOUTH DAKOTA AND RAT'S NEST CAVE, ALBERTA

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Speleothems are important paleoclimate proxy records because they are formed in very stable cave environments and the isotope records can be precisely dated with U-series mass spectrometry. Speleothems from Reed's Cave, South Dakota and Rat's Nest Cave, Alberta are interpreted as part of paleoclimate reconstructions for Western North America. Carbon and oxygen isotope records from multiple speleothems within these caves reflect the complexity of interpreting the paleoclimate signal. Isotopic variation is controlled by temporal changes in cave seepage water and temperature dependent oxygen isotope fractionation in the calcite-water system. Dominant controls on the isotope ratios can vary between drip sites and this may result in discordant signals for coeval speleothems within the same cave. Records from Eastern North America and Western Europe show evidence of cooling and warming events and millennial cycles.

Combining oxygen isotope data with hydrogen isotope data from fluid inclusions provides a useful multi-proxy approach to paleoclimate modeling. Besides the water present in inclusions, additional water is obtained on heating the speleothem calcite to over 800°C; this suggests that water is strongly bound to the calcite, a type of lattice water. Sub-zero FTIR (Fourier-transform infrared) spectroscopy experiments show that the water that is visible at 3400 cm-1 is not liquid, fluid inclusion water. This implies a possible isotopic fractionation between structural water and macroinclusion water. Current work shows a shift of ~ 20 to 30 per mil in the D/H when measured in high temperature calcination experiments (and compared to fluid inclusions). This shift could represent fractionation of lattice bound water.

10:50 AM Selleck, Bruce

PALEOHYDROLOGICAL IMPLICATIONS OF STABLE ISOTOPES IN GROUNDWATER AND QUATERNARY CALCITE CEMENT, CENTRAL NEW YORK STATE

SELLECK, Bruce and BARAN, Janet, Colgate Univ, Geology, 13 Oak Drive, Hamilton, NY, 13346

Calcium carbonate cementation in kame terrace gravel is a widely distributed phenomenon in south-central New York. Clasts of cemented gravel conglomerate are also present, suggesting that pre-late Wisconsin cementation. In situ carbonate cements consist of isopachous pore-lining and pore-filling prismatic fabric (phreatic cement). The presence of phreatic cement fabrics above the present water table suggests either higher water tables in the past or precipitation of cement in groundwater ponded above low-permeability zones as ephemeral 'perched' water table aquifers. Pendant, microstalactitic, and crustose meniscus cements of vadose origin are also. Conglomerate clast cements are commonly single-layer isopachous prismatic calcite.

d13C values suggest that carbonate ion in calcite was derived from a mixture of isotopically lighter (more negative) soil organic CO2 and heavier atmospheric CO2 or marine limestone carbonate. 14C dating suggests limited 'dead' carbonate from limestone, so an atmospheric source for the heavier carbon is preferred. The heaviest carbon isotope signatures are found in vadose cements, supporting the conclusion that isotopically heavy carbon in the system had an atmospheric source. d18O data from in situ cements suggest precipitation of calcite at local groundwater temperature (~13oC) from waters having a d18OSMOW of – -8 to -11 per mil. Modern local groundwater has d18OSMOW in the range of –10 to –12, consistent with the values predicted. Cement from transported clasts resembles in situ phreatic cements in terms of d13C, but averages 2-3 per mil heavier in d18O. This suggests that the clast cements precipitated from isotopically heavier waters or at lower temperatures than in situ cements.

Modern water isotope characteristics of the northern Appalachian Plateau of New York are strongly influenced by proximity to Lake Ontario that provides a source of isotopically light water to local hydrologic systems via lake effect precipitation. Our data suggest that the Great Lakes had a lesser influence on the pre-late Wisconsin water isotope system than today.

11:10 AM Bosley, Andrew C.

IDENTIFICATION OF PALEOCLIMATIC CYCLES DURING THE HOLOCENE USING GRAIN SIZE ANALYSIS OF SEDIMENTS CORED FROM LAKE MOREY IN FAIRLEE, VT

BOSLEY, Andrew C., BIERMAN, Paul, NOREN, Anders and GALSTER, Josh, Univ of Vermont, Geology, Burlington, VT, 05405

Since the final retreat of the Laurentide ice sheet (~14,000 cal 14C), sediments have been deposited in glacially formed lakes across New England. Analyses of the stratigraphy and physical properties of these sediments can be used to determine when storms happened in the past and whether or not such storms were grouped in space and time or whether they occurred as random one time, high-energy events. Previous analyses (loss-on-ignition, magnetic susceptibility, and X-radiography) of the sediments cored from Lake Morey suggest that the storms happen in a cyclical manner, separated by long periods of relatively quiet, low-energy depositional environments.

The continuous sediment core taken from Lake Morey reaches down to ~12,800 year old (calendar years) sediments. A Coulter Laser Diffraction unit (LS230) has been used to determine the grain size of several consecutive samples at 1 cm intervals starting at the top of the core. Inorganic grain size is a physical characteristic directly related to the energy of the incoming flow at a given point in time (determined by radiocarbon dating). Using these data, I have found that suspected periods of greater storminess exhibit larger, better sorted grains, whereas intervals between storms have smaller, less well sorted grains.

Together with other core analysis techniques, grain size analysis is an important tool for elucidating the intensity of past storm events. Its correlation with other data suggests that it should be considered as another useful method of paleostorm detection in sediment cores.

11:30 AM Milligan, James

TREE-RING ANALYSIS OF A MEDIEVAL OLD-GROWTH FOREST AT NELLIE JUAN GLACIER, SOUTHERN ALASKA

MILLIGAN, James and BARCLAY, David J., SUNY Cortland, Department of Geology, PO Box 2000, SUNY Cortland, Cortland, NY, 13045

Nellie Juan Glacier is a small iceberg-calving tongue situated on the western side of Prince William Sound, southern Alaska. Ice descends steeply in a narrow valley from the northern Sargent Icefield to terminate in a tidewater lagoon that has opened during glacial retreat over the past 100 years. Scattered along the shores of this lagoon and exposed in stream gullies are many subfossil tree stumps and logs; tree-ring records from these logs record climate in this area when the trees were alive and enable the Little Ice Age advance of Nellie Juan Glacier to be reconstructed in considerable detail.

Fieldwork in July 2000 complimented and expanded on previous sampling efforts in June 1992. A total of 37 new stumps and logs were sampled to add to the 16 earlier samples, and some of the 1992 logs were relocated and their positions fixed with GPS to provide a more detailed spatial picture of the subfossil forest. Tree-ring samples have been cross-dated with living trees at the lagoon entrance and show that the subfossil forest was alive from at least AD 1034 to 1608. Six trees were over 400 years old when they died and the preservation of many of the samples is excellent, making this one of the best subfossil tree-ring sites in southern Alaska. Preliminary analysis of the ring-width data shows strong decadal signals, and comparison with local climate records suggest that trees at this site are primarily responding to summer temperatures.

Consideration of the exact location of each subfossil tree and the year when it died allows the most recent advance of Nellie Juan Glacier to be reconstructed with great detail. Between 1539 and 1605 the terminus advanced at between 25 and 35 m/yr. This is similar to advance rates recorded at modern glaciers, and reflects control of the terminus position by the rate at which a stabilizing terminal moraine shoal can be reworked and advanced down-valley.

11:50 AM Heumann, Rebecca

USING A FACE EXPERIMENT TO MEASURE THE AMOUNT OF CARBON TRANSFERRED FROM THE ATMOSPHERE TO THE SOIL BECAUSE OF CO2 FERTILIZATION

HEUMANN, Rebecca, KAFKA, Alan L. and HARRISON, Kevin G., Boston College, Geology and Geophysics, 140 Commonwealth Avenue, Chestnut Hill, MA, 02467

Elevated carbon dioxide levels may be increasing the transfer of carbon from the atmosphere to soil. To test this CO2 fertilization hypothesis, we collected soil cores from the Free-Air Carbon-Enrichment (FACE) facility in the Duke forest in 1996 and 2000. CO2 fertilization occurs when elevated carbon dioxide levels enhance plant growth. Preliminary results show that the elevated rings accumulated mineral-bound soil organic carbon twice as fast as the ambient rings. Nitrogen accumulation showed the same trend. There was considerable variability in the CO2 fertilization response, which may be related to the availability of phosphorous in the soil at the FACE site. The response of this forest to elevated atmospheric carbon dioxide levels suggests that CO2 fertilization may be increasing soil carbon storage in similar closed-canopy forests and slowing the build-up of atmospheric carbon dioxide.