paleosols. The repetitious stratigraphy may be representative of regional megastorms that have passed through the area, or may reflect local severe thunderstorms capable of triggering hillslope erosion. The long term goal of this research is to compare the records of alluvial fan deposition with the presence of terrestrial sediment layers in lake cores taken from the same geographic region (see abstract by Noren et al., this meeting).

BTH 44 Noren, Anders J.

A REGIONAL RECORD OF HOLOCENE STORMS FROM TERRIGENOUS LAKE SEDIMENT, NORTHERN NEW ENGLAND

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Little is known about spatial and temporal patterns of major Holocene storm events in New England; however, lakes in this hilly terrain preserve sedimentary archives that may reveal such patterns. We have retrieved thirteen 6-meter sediment cores from seven small (0.03 to 2 sq. km), deep (13 to 30 m) Vermont lakes with steep drainage basins. Several analyses (visual logging, magnetic susceptibility, X-radiography, and loss-on-ignition) document stratigraphic variability in sediment character.

In each core, several layers of coarse-grained, mineral-rich sediment with abundant macrofossils of terrestrial plants punctuate the otherwise fine-grained, organic-rich gyttja matrix. The character of these coarse layers leads us to believe that they originated as terrestrial sediment eroded from the uplands during severe storm events. If this hypothesis is valid, the ages of these terrigenous layers correspond to the approximate dates of large storms that passed over the lakes' drainage basins.

For example, radiocarbon dates from such layers in a 4.5m core from Echo Lake suggest that increased hillslope erosion occurred at approximately 1250, 1100, 800, 700, and 360 14C years BP, and throughout the last 250 years. Whereas the most recent period of erosion may partly be due to deforestation and other land-use practices since European settlement in the area, the earlier erosive episodes were probably caused by large storms. Coherence between dates of terrigenous layer deposition in cores from different lakes and other records of hillslope erosion (see Jennings, et al., this meeting) may reveal the spatial scales at which large storms have operated in this region during the Holocene.

BTH 45 Messina, Paula

THE PARADOXICAL ROLE OF EPISODIC FLOODING IN THE FORMATION OF GIANT DESICCATION POLYGONS ON NORTH PANAMINT PLAYA, DEATH VALLEY, CALIFORNIA

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North Panamint Playa in Death Valley National Park is host to numerous desiccation fissures, spring mounds, and drainage pits which are in varying stages of development, plant overgrowth, and deterioration. While mapping playa surface features in May, 1999 using Differential GPS for comparison to historic aerial photographs, we witnessed the formation of new fissures on the playa surface following a flooding event. Deep-penetrating desiccation fractures probably form as clays dehydrate at depth during extended drying periods. Sediment-laden water from infrequent storms discharges onto the playa; some of which drains into these fractures. On the dry playa, the top 10-20 centimeters of sediment is more densely cemented by salts and clays than the more friable, sandy sediment below the surface. Fissures and pits form where the moistened surface layer collapses into these fractures. Fissure lengths range from several meters to more than a kilometer. Fissures become host to shrubs and grasses which gradually entrap aeolian sediments. Shrub-covered pits and mounds are common at fissure intersections. Many pits and mound endure long after older fissures have faded and new fissures have formed. Fissures, pits, and mounds on playas provide important food, shelter, and water sources for desert wildlife. Roads, such as Highway 190 which crosses the playa, affect flooding patterns and fissure development. Modern fissure patterns and dispersion of wildlife remains on Death Valley playas are models for interpreting ancient clastic dikes and bone beds in the fossil record.

BTH 46 Couroux, E. G.

EOLIAN DUNE EROSION IN THE CHIHUAHUAN DESERT

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El Paso lies in the northern Chihuahuan desert. The topography consists of wide, flat, desert basin floors interrupted by discontinuous mountain ranges. This study focuses on a portion of the Tularosa Basin floor, located north of Orogrande, New Mexico and south of the Sacramento Mountains. The desert floor is primarily a mosaic of wind blown sand dunes varying in age. The different types of dunes are susceptible to erosion in varying degrees. The purpose of this study is to evaluate the different rates of erosion and deposits of wind blown sand within vegetated dunes, coppice dunes and interdunes / playas. Geologic and hydrologic techniques are being applied to determine how the native soils vary in their susceptibility to erosion. Water retention, percentage of clay within the soil, surrounding topography and the amount of sand movement is being measured to determine the severity of erosion. Coppice dune sand shows evidence for short distance of transportation while vegetated dunes and interdunes / playas show up to eight times less mobility. Vegetated dunes appear to be a good candidate as a source for coppice dune sand. Further evaluation is being conducted to monitor seasonal influence upon the rates of erosion between the dune types and Remote Sensing techniques are being applied to aid in the mapping of different dune forms.

BTH 47 Nguyen, Tammy

DETERMINING THE EFFECTS OF DEVELOPMENT ON STREAM EROSION USING DENDROCHRONOLOGY

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As development occurs in a watershed, the percent of land impervious to water increases, causing more stormwater runoff to enter nearby streams. When this occurs, the higher volume of water causes erosion of the banks and bed of the stream. By examining the eccentricity of tree rings the time of erosion can be dated because tree growth patterns differ on flat and sloped surfaces. Of the three 'leaning' trees sampled from the banks of the Christina River in Newark, Delaware, only one proved to have initially grown on a surface undisturbed by erosion, and only for the first year of growth. Erosion rates in the sampled reach were estimated o be 0.09 m/yr and 0.25 m/yr. Eccentricity showing in rings of trees up to 40 years old suggests that erosion has been occurring in the Christina River since the 1950s.

BTH 48 Bourgeois, Joanne

SORTED STONE CIRCLES ON A TSUNAMI-SWEPT BEACH, KAMCHATKA PENINSULA, RUSSIA

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Sorted stone circles are present on the backbeach region of a shoreline that was swept by a tsunami in 1969 (23 November). The area under study ('Stolbovaya') is just north of Cape Kamchatskiy, on the Bering Sea coast, at about latitude 56.6-56.7 degrees, on an unoccupied coastline. The tsunami was triggered by an earthquake (M7.7) north of the triple junction (Pacific-Eurasian-North American plates), at about latitude 57.8 degrees. Closer to the epicenter, the tsunami was observed on the Ozhemaya Peninsula to have reached heights of 10-15 m locally, and 5-7 m at several localities.

Our observations at Stolbovaya are the first known record of the 1969 tsunami from this remote location. The evidence for the tsunami at Stolbovaya consists of a thin gravelly layer in marine terrace soils, landward of a 6- to 8-m-high, vegetated beach ridge. The tsunami deposit directly overlies a distinctive volcanic ash from the 1964 Shiveluch eruption, supporting its attribution to the 1969 earthquake and tsunami.

Based on observations of other tsunamis of this magnitude (runups of 5-10 m), we believe that the 1969 tsunami would have destroyed the surface expression of any sorted stone circles that existed prior to the event. If we are correct, the circles must be active enough to have reformed since 1969.

BTH 49 Fyodorova, Anna I.

SILICA DISSOLUTION AND THE DEVELOPMENT OF SANDSTONE CAVES.

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Caves formed in poorly soluble (non-carbonate) rocks such as sandstones are found in settings ranging from glacial to tropical. The origin of such features is problematic because the role of dissolution, which is of prime importance as a traditional karst mechanism, cannot be easily invoked. To evaluate the importance of genetic processes for non-carbonate caves, a comprehensive hydrogeochemical study of caves in the Berea Sandstone and Sharon Sandstone/Conglomerate in a 5-county region of the glaciated Allegheny Plateau of Ohio was undertaken.

Dissolutional features were observed on the surfaces of detrital quartz grains and in silica cement using polarizing microscope and SEM. Based on experimental work, observed textures are interpreted as a result of transport-controlled dissolution of silica cement. Analytical data show that the waters in a contact with sandstone bedrock are undersaturated with respect to feldspars and amorphous silica, and periodically undersaturated with respect to low-crystallinity silica polymorphs (cristobalite and chalcedony). Experimental data suggest the possibility of transport-controlled dissolution of quartz by flowing water, explaining the observed corrosion of quartz grains. Agreement between petrologic and geochemical data indicates that dissolution of silica is taking place and plays an important role in the formation of these caves. Removal of silica cement leads to increased porosity and a reduction of mechanical strength. Cave development is further aided by physical removal of fines, groundwater sapping, and near-surface freeze and thaw and evaporative mineral salt precipitation.

Chemical processes, primarily dissolution of silica, play a crucial role in cave development. This results in the development of true caves along preexisting fractures and joints within sandstone bedrock. A second type of 'cave', seepage recesses, are also found. These form at a sandstone-shale contact due to the above processes, as well as weathering of the underlying shale layer. Dissolution and dissolution-induced processes operating in the highly quartzose sandstones of northeastern Ohio should probably be considered as karst.

BTH 50 Neal, James T.

MCCAULEY SINKS: A COMPOUND BRECCIA PIPE IN EVAPORITE KARST, HOLBROOK BASIN, ARIZONA

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The McCauley Sinks, in the Holbrook Basin of northeastern Arizona, are comprised of some 50 individual sinkholes within a 3 km-wide depression. The sinks are grouped in a semi-concentric pattern of three nested rings. The outer ring is an apparent tension zone containing ring fractures. The two inner rings are semi-circular chains of large sinkholes, ranging up to 100 m across and 50 m deep. Several sub-basins within the larger depression show local downwarping and possible incipient sinkholes.

Kaibab Formation limestone is the principal surface lithology, here near its easternmost limit and with thickness less than 15 m. Although surface rillenkarren occur, the Kaibab is not involved in karst expression. Underlying the Kaibab is Coconino Sandstone, which overlies the Schnebly Hill Formation, the unit containing the evaporites -- principally halite in the Corduroy Member. The karst in this part of the Holbrook Basin is quite different from the eastern part, probably because of the disappearance of the Holbrook Anticline, and location near the western occurrence of evaporites.

The structure at McCauley Sinks suggests a compound breccia pipe, with multiple sinks contributing to the inward-dipping major depression. The Richards Lake depression, 5 km southeast of McCauley Sinks, is similar in form and size but contains only a single, central sinkhole. An apparent difference in hydrogeology at McCauley Sinks is the proximity to the adjacent Chevelon Canyon drainage, but the hydrologic connections are unknown.

The 3 km-wide McCauley Sinks karst depression, along with five adjacent depressions, provide substantial hydrologic catchment. Because of widespread piping into karst features and jointed bedrock at shallow depth, water does not pond easily for either agricultural or industrial purposes. Larger recharge efficiency than in alluvial areas is assumed; thus concern exists for groundwater users downgradient from the karst area. Accordingly, sinkholes and open fissures should not be used for waste disposal.