GEOGRAPHY AND GEOLOGY

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ABSTRACTS

Concerning Jet Stream Induced Vibrations in the Earth and Atmosphere. GERALD J. SHEA, Indiana State University, Terre Haute, Indiana.——Microbarometric and microseismic waves are minute fluctuations in the earth and atmosphere detectable by conventional and specially designed instruments of high sensitivity. Using magnifications of 50,000, a particular vibration restricted to local origin has been studied for a period of 30 years. Occurring repeatedly in the fall of the year and covering a brief span of three to four days, its amplitudes reach peak heights and decay to zero.

Records of these waves appear to be associated with the jet stream and thus are deeply involved with meteorological phenomenon. Since weather changes occur following their appearance, it is possible to use them for short range forecasting. It is also possible with more intense research to devise a system which could lead to the development of a key for long range weather forecasting.

Bedrock topographic map of Indiana. HENRY H. GRAY and PATRICIA G. DAVIS, Indiana Geological Survey, Bloomington, Indiana.——A concept of the configuration of the bedrock surface, whether that surface is drift-buried or exposed, is essential to the construction of a bedrock geologic map. We are compiling a bedrock topographic map as prerequisite to preparation of a new bedrock geologic map of Indiana at 1:500,000 scale.

In the deeply drift-covered northern half of the state there are few bedrock outcrops, and bedrock topography must be inferred from geophysical and well data. Addition of a few new data can radically alter an interpretation, but several hundred datum points per county ordinarily provide adequate basis for interpretation at the planned scale.

In south-central Indiana, surface topography approimates the bedrock topography except in deeply filled major valleys. In other parts of southern Indiana, however, present topography complexly intersects the buried bedrock surface, which produces a multicyclic surface that is difficult to interpret. One approach is to modify a preliminary "blind" interpretation of the bedrock surface by carving out of it the valleys called for by present topography. Ordinarily, bedrock exposures are abundant in these recently carved-out areas.

In places the buried bedrock surface itself appears multicyclic, and fascinating topographic features, such as escarpments, hanging valleys, entrenched meanders, entrenched braid cores, and valley-in-valley, become apparent where data are adequate.

Relationships between the Roger and Porter Cave Systems and Glacial Lake Quincy, Indiana, USA. KEVIN L. STRUNK, Department of Geology, Indiana University-Purdue University at Indianapolis, Indiana.——Glacial Lake Quincy existed in parts of Owen, Putnam, and Morgan counties, Indiana, during Illinoian and Sangamon times. In the eastern section of the lake, the Indian Creek and Butler Creek cols carried water south to the ancestral White River. Lying along the long axis of these cols are the Roger and Porter cave systems, respectively.

Drainage of Glacial Lake Quincy through the Roger and Porter cave systems has been discussed previously by Addington (1927) and Thornbury (1939, 1950). Addington favored such drainage, especially in the Porter System, while Thornbury argued for surface drainage entirely. Drainage through the cave systems would explain geomorphic relationships in the area.

To evaluate the relationships, surface features and the caves were mapped. Also, sediment sections associated with the cave systems were sampled and particle size, statistical, and heavy mineral analyses were conducted. A carbon-14 date of 97 yr. B.P. from the Roger System sediments established these not to be Illinoian age. The sediments have been correlated with the first clearcutting of the forests and the accompanying erosion of the top soil.

A model for the lake-cave systems relationship is here proposed. Following formation of the lake, surficial drainage was initiated through both cols. Gradually, the water was captured via subterranean stream piracy into primitive phreatic cave passages. Eventually, most drainage passed through the systems, significantly enlarging the cave systems.

Design and Application of an Automated Fluorescence Filter Spectrograph for Underground Water Tracing. STEPHEN D. MAEGERLEIN, WILLIAMS, Indiana.——An inexpensive fluorescent dye detector has been designed for recording both time and dye concentration as well as differentiating between dyes used for ground water tracing. The automated fluorescence filter spectograph (AFFS) is a waterproofed, battery-powered, automated time-lapse movie camera controlled by a series of timing circuits which also synchronize other unit components. The unit includes a water sediment precipitator and filter, centrifugal water pump, Pyrex flow cell, electronic flash with ultraviolet primary band pass filter, optically coupled light emitting diode time display mounted in the spectrograph slit, and secondary light filters in front of the film frame for distinguishing between dyes. A filtered water sample is analyzed every 10 minutes by recording the blue, green and orange fluorescences plus the time on high speed black and white movie film. The film is sensitive to the fluorescence of a few parts per billion of dye. Standard solutions of fluorescent dye are analyzed by the AFFS to calibrate the film before placing the unit in the water resurgence. The AFFS will operate underwater for 7 days on a fully charged battery pack and measure the fluorescence of over 1000 water samples.

A microphotometer is used to measure film percent transmission after the film is developed. Calibration curves are prepared for determination of fluorescent dye concentrations.

Fifty Years of Aerial Surveys of Flood Plains. ROBERT D. MILES, P.E. Professor, School of Civil Engineering, Purdue University, West Lafayette, Indiana.——The Corps of Engineers contracted in 1929 for aerial photographic mosaics and topographic maps (1/12,000) of the Wabash River from Terre Haute to Logansport and along East Fork of White River from Shoals to Sparksville. In 1930 and 1931 additional contracts were made for aerial surveys along West Fork White River and Eel River. A single-lens glass plate camera with a 7.07-in. focal length lens was used to obtain the aerial photography in a 7 x 9-inch format for a strip two miles wide along the river. The aerial mosaics and topographic maps were prepared at a scale of 1/12,000 from aerial photographs obtained in June and July. This was the first topographic survey for the United States Government that used photogrammetric methods to replace the plane-table method.

These historical aerial mosaics are located at Purdue University. They recently were examined and compared with more recent photography to determine landuse changes, evidence of stream bank erosion, channel change or information on the dynamic character of river systems. Slides will be used to illustrate the changes.

Air Temperature Fluctuation in North Dakota During the Eclipse of 26 February 1979. WILLIAM R. GOMMEL and DIANNE L. REUTER, Department of Earth Sciences, Indiana Central University, Indianapolis, Indiana. ——Using a sling psychrometer (U.S. Army Signal Corps ML-224) midway between Bowbells and Northgate, North Dakota, a reduction in air temperature of 1°C was observed in the 15-minute interval from 11 minutes before totality onset (–5.2°C at 10:28 CST or 16:28 GMT) to one minute after the end of totality (–6.2°C at 10:43 CST or 16:43 GMT). Wet-bulb temperature fell from –5.9°C to –6.8°C during the same time interval indicating a small increase in relative humidity from approximately 82% to 84%. By the end of the eclipse at fourth contact (11:54 CST), air temperature had increased to –3.8°C.

Duration of totality was 2 minutes and 46 seconds from 10h. 38m. 37s. CST to 10h. 41m. 23s. CST when the sun was 25° above the horizon. Clouds were 0.3 to 0.4 thin cirrus throughout the eclipse, and horizontal visibilities were more than 10 miles. Surface wind was calm to light and variable and did not seem to increase perceptibly as observed by the principal author during the Norwegian and African eclipses of 30 June 1954 and 1973, respectively. The ground was completely covered with snow, but shadow bands (apparently an interference of light phenomenon) were not as distinct as during the African eclipse of 30 June 1973.

Under similar total eclipse conditions but with higher sun angles (e.g., in central Indiana), air temperature fluctuations should be somewhat larger than those observed during this eclipse in North Dakota near the Canadian border.