F

fabric. The orientation in space of the elements composing a rock substance.

facet. See scallop.

facies. The lithologic appearance of a rock[16].

facies change. The change in appearance that occurs when one lithologic unit ends and a new one is encountered.

failure. In rocks, failure means exceeding of the maximum strength of a rock or exceeding the stress or strain requirement of a specific design.

fall. The gross slope of a river[16].

false floor. A remnant of a sheet of flowstone, originally deposited on clastic sediments that were subsequently washed out from beneath. False floors may survive as a complete bridge between passage walls or just as projecting ledges. They may be thin and easily broken or thick and very strong[9].

farangothes ipoyios thiavasis. See aisle.

fathometer. A water depth measuring device[16].

fault. 1. A fracture in the earth's crust, across which relative rock movement has taken place, or continues to take place. Fault planes commonly guide vertical or sub-vertical shafts in caves, as well as guiding sub-horizontal or oblique passages within the confines of the fault plane[9]. 2. A fracture or fracture zone along which there has been displacement of the two sides relative to one another parallel to the fracture[6]. This displacement may be of a few centimeters or many kilometers. See also joint fault set; joint fault system.

fault breccia. The assemblage of broken rock fragments frequently found along faults. The fragments may vary in size from inches to feet.

fault cave. A cave developed along a fault or fault zone[10].

fault gouge. A clay-like material occurring between the walls of a fault as a result of the movement along the fault surfaces.

fault line. The intersection of a fault with the surface of the earth or any other plane of reference[16].

fault plane. A plane on which dislocation and relative movement has taken place[16].

fault scarp. An elevation formed by movement of blocks along a fault plane[16].

fault zone. A zone with numerous small parallel faults[16].

feeding tube. In karst terrane, a more or less straight and waterbearing underground gallery of regular cross-section. Synonyms: (French.) *tunnel*; (German.) *Strŏmungsrohr, Karstgerinne;* (Greek.) *karstikos ypoyios agogos*; (Spanish.) *tubo;* (Turkish.) *akarsu mecrasɪ*; (Yugoslavian.) *vodonosni rov*. See also stream tube.

feldspars. A very common group of rock forming minerals[16].

fengcong; fengcong karst. (Chinese.) 1. A karst, conspicuous in China, that is identified by its clustered limestone hills. Fengcong (pronounced 'fungston'), which translates as 'peak cluster', is a mature karst normally developed during long uninterrupted periods of rapid dissolution in wet tropical environments with high levels of biogenic soil carbon dioxide. The Chinese classify karst by the hill or peak density, in contrast to the Western classification by hill shape. Fencong is almost the equivalent of cone karst; its closely packed hills are conical rather than hemispherical, with intervening dolines and disjointed valleys. The major occurrences are in Guizhou and Guangxi, in southern China. Some cones in Guangxi are so steep that they have been termed fengcong tower karst, but this concept is best avoided[9]. 2. Tower karst characterized as peak cluster because the individual karst towers appear to be grouped together in clusters. Closed depression among the peaks are common[4]. See also fenglin; fungling; mogote; tower karst.

fenglin; fenglin karst. (Chinese.) 1. A karst, conspicuous in China, that is identified by its isolated limestone hills. Fenglin (pronounced 'funglin') translates from Chinese as 'peak forest', and is distinguished from fengcong. Both fenglin and fengcong are mature karst normally only developed by long uninterrupted periods of rapid dissolution in wet tropical environments with high levels of biogenic soil carbon dioxide. The Chinese classify karst by the hill or peak density, in contrast to the Western classification by hill shape. Fenglin is therefore almost the equivalent of tower karst; its hills have very steep or vertical walls, and may have a height/width ratio greater than four. The limestone hills rise above level, alluviated plains, and the finest fenglin karst around Yangshuo, Guangxi, in southern China, is one of the world's most dramatic landscapes. The classification by hill density means that low residual cones scattered across a plain are also referred to as fenglin by the Chinese[9]. 2. Tower karst characterized as peak forest because the individual towers appear as isolated groups on a plain. Dry valley networks separate individual towers[4]. See also fengcong; fungling; mogote; tower karst.

ferghanite. A cave mineral — $U_3(VO_4)_2 \cdot 6H_2O$[11].

ferric oxide. Rust; hematite (Fe_2O_3)[16].

ferrito zone. Zone of iron oxide accumulation in soil under humid climate conditions[16].

Fickian diffusion. The spreading of solutes from regions of highest to regions of lower concentrations caused by the concentration gradient. In slow moving ground water, this is the dominant mixing process[22].

fissure. Any discontinuity within the rock mass that is either initially open or capable of being opened by dissolution to provide a route for water movement. Fissures in this sense, applied generally in karst, therefore include the primary sedimentary bedding planes as well as

tectonic faults and joints. More specifically, the term has been used to describe voids with average dimensions from 10 to 100mm[9]. See also conduit; fracture.

field capacity; field moisture capacity. See specific retention.

field survey. Measurements taken in the field[16].

field test. A test run in the field under normal field conditions[16].

field velocity of ground water. Actual interstitial velocity of ground water[16].

fill terrace. An elevated valley surface formed by aggregation[16].

fine gravel. Rock aggregates of 1–2 mm diameter[16].

fine sand. A silicon dioxide material with a grain diameter of 0.1– 0.25 mm[16].

finite difference method. A numerical method used to approximate the solution of partial differential equations[16].

finite element method. A numerical method used to approximate the solution of partial differential equations.

firn. Compacted granular snow[16].

firstkarren. (Austrian.) See Rillenkarren.

fissure. An open joint or crack in rocks[16].

fissure cave. A narrow vertical cave or cave passage along a fissure. Fissures widen out to become wells or vertical shafts[10]. See also vertical shaft.

Flachkarren. (German.) See clint.

flank. A limb of a fold[16].

flash flood. A relatively short but very intense flood[16].

flattener. A cave passage, which though wide, is so low that movement is only possible in a prone position[10]. See also crawl.

flexure. A bend in a stratum with one flank or limb only[16].

flint. A concretionary form of silica, similar to chert, that occurs in chalk as tabular sheets and layers of irregularly shaped nodules. Being very hard and relatively insoluble, flint tends to stand out from chalk cliffs. Flint-rich horizons may also influencer the inception of bedding-related dissoluational conduits in chalk[9].

float gage. A device that indicates or records water levels with a float[16].

floating pan. An evaporation pan floating in a water body with drum floats[16].

floe calcite. Very thin film of pure calcium carbonate floating on the surface of a subterranean pool of very calm water[10].

flood. A high river flow overtopping banks.

flood crest. The peak of a flood wave[16].

flooding method. A recharge method by flooding a recharge area[16].

floodmarks. The marks left on fixed objects by flood waters[16].

flood plain. The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river and covered with water when the river overflows its banks. It is built of alluvium carried by the river during floods and deposited in the sluggish water beyond the influence of the swiftest current[6].

flood profile. A continuous line representing the water surface for a given rate of flow[16].

flood water. Water that has overflowed its confines; the water of a flood[1].

flood-water zone. See epiphreas.

flood wave. A rise in the stage of a stream that culminates in a crest before receding[1].

floor pocket. See pocket.

flow, base. See base flow.

flow, creep. Flow with a creeping motion where inertial terms have been dropped[16].

flow, critical. See critical flow.

flow duration curve. A curve of cumulative streamflow versus the corresponding per cent of time[16].

flow gage. A gage used to measure flow rate[16]. See also gage.

flow-mass curve. 1. A mass curve with runoff discharge as a hydrologic quantity[16]. 2. The integral of the curve of a hydrograph[16].

flow line. The general path that a particle of water follows under laminar flow conditions[22]. Flow lines are usually drawn perpendicular to equipotential lines. See also equipotential lines.

flow net. 1. A graphical representation of flow lines and equipotential lines for two-dimensional, steady-state ground-water flow[22]. 2. A net of orthogonal streamlines and equipotential lines applied in the graphical solution of Laplace's equation[16].

flow path. The subsurface course a water molecule or solute would follow in a given ground-water velocity field.

flow rate. Volumetric rate of flow[16].

flow, steady. A characteristic of a flow system where the magnitude and direction of specific discharge are constant in time at any point[22]. See also flow, unsteady.

flow, uniform. A characteristic of a flow system where specific discharge has the same magnitude and direction at any point[22].

flow, unsteady. A characteristic of a flow system where the magnitude and/or direction of the specific discharge changes with time. Synonymous with nonsteady flow. See also flow, steady.

flow velocity. See specific discharge.

flower. A cave flower is a group of crystals, commonly of gypsum or mirabilite, that grow by accretion at their bases on a cave wall. As the crystals grow, curve and splay, their form mimics that of a flower[9].

flowing artesian well. A well with its potentiometric surface above the ground surface[16].

flowmeter. An instrument for measuring volumetric flowrate[16].

flowstone. Deposits of calcium carbonate, gypsum, and other mineral matter which have accumulated on the walls or floors of caves at places where water trickles or flows over the rock[10]. Layered deposits of calcium carbonate precipitated on rocks from water trickling over them[20]. (French.) *coulée stalagmitique;* (German.) *Sinterfall, Sinter*; (Greek.) *asvestolithikon epiphlioma;* (Italian.) *colata stalagmitica, deposito, concrezione, stalagmite*; (Russian.) *nateki;* (Spanish.) *colada estalagmítica*; (Turkish.) *akmataşı;* (Yugoslavian.) *kaskade*. See also dripstone.

fluid potential. The mechanical energy per unit mass of a fluid at any given point in space and time with regard to an arbitrary state and datum[22].

fluorapatite. A cave mineral — $Ca_5(PO_4)_3F$[11].

fluorite. A cave mineral — CaF_2[11].

flume. A channel supported on or above ground[16].

fluorescein. A reddish-yellow crystalline compound that imparts a brilliant green fluorescent color to water in very dilute solutions; used to label underground water for identification of an emergence[10]. Also commonly known as uranine. Dye type: *Xanthene*.

fluorescent dyes. Material used in environmental tracing studies that may be detected and measured in small concentrations ($\approx 10^{-12}$ mg/L), are inexpensive, relatively nontoxic, and are relatively miscible with the water being traced.

fluorometer, filter fluorometer. A highly sensitive instrument used for measuring the fluorescence of water. It is commonly used in water tracing and tracer gaging. Selected filters are used to control the excitation and emission ranges for specific fluorescent dyes of interest. See also scanning spectrofluorophotometer.

flushed zone. In geophysical well logging, the zone around the well bore completely invaded by the mud filtrate[16].

flute. See scallop.

fluviokarst. 1. A karst landscape where the dominant landforms are valleys cut by surface rivers. Such original surface flow may relate either to low initial permeability before caves (and hence underground drains) had developed, or to reduced permeability due to ground freezing in a periglacial environment. In both cases the valleys become dry as karst development improves underground drainage[9]. 2. Mixed terranes characterized by both shallow karst and

erosional landscape[20]. 3. A predominantly karst landscape in which there is much evidence of past or present fluvial activity[10]. Synonyms: (French.) *fluviokarst;* (German.) *Fluviokarst*; (Greek.) *fluviokarst;* (Italian.) *fluviocarsimo*; (Spanish.) *fluviokarst;* (Turkish.) akarsu karstı; (Yugoslavian.) *fluviokrš, fluviokras, fluviokarst.*

flux. See specific discharge.

foaming agent. See surfactant.

foiba. (Italian.) 1. A deep wide vertical cavity or the swallow point of a river at the beginning of its underground course. 2. A natural vertical shaft in soluble rock, tending toward cylindrical shape; it may or may not reach the surface. A dome pit[10].

fold. A bend in a geologic stratum with two flanks, often in anticlinal and synclinal sequence.

food chain. A series of plants and animals linked by their food relationships; the passage of energy and materials from producer through a succession of consumers. Green plants, plant- eating insects, and an insect-eating bat would form a simple food chain[23]. See also *food web*.

food pyramid. The normally diminishing number of individuals and amount of organic material produced at each successive level along a food chain. The declining productivity at each level results from the constant loss of energy in metabolism as the energy passes along the chain[23]. See also *trophic level*.

food web. An interlocking system of food chains. Since few animals rely on a single food source and since no food source is consumed exclusively by a single species of animal, the separate food chains in any natural community interlock and form a web[23].

forestry compass. A lightweight, compact instrument to be mounted on a tripod, which functions as a compass and a clinometer, and has a telescopic sight. Some types facilitate measurement of horizontal angles as well as bearings[25].

formation. The fundamental unit in rock-stratigraphic classification, consisting of a distinctive mappable body of rock[10]. See also cave formation; speleothem.

formation temperature. The prevailing temperature in a given subsurface formation[16].

formation stabilizer. A sand or gravel placed in the annulus of the well between the borehole wall and the well screen to provide temporary or long-term support for the borehole[6].

form factor. A factor indicating the shape and form of mineral aggregates influencing their hydrodynamic properties[16].

fossil. Any remains or traces of animals or plants that lived in the prehistoric past, whether bone, cast, track, imprint, pollen, or any other evidence of their existence[23].

fossil cave. A fossil cave is an underground cavity that formed when a carbonate succession was undegoing karstification but subsequently buried. Most fossil caves have been infilled by younger sediments. See neptunian deposits, palaeokarst, and relict cave.

fossil karst. See paleokarst.

fossile karst. (French.) See buried karst.

fouling. The process in which undesirable foreign matter accumulates in a bed of filter media or ion exchanger, clogging pores and coating surfaces and thus inhibiting or retarding the proper operation of the bed[6].

fountain. A free-flowing well or spring[16]. See also artesian well; spring, artesian.

fracture. 1. A break or secondary discontinuity in the rock mass, whether or not there has been relative movement across it. Faults, thrusts, and joints are all fractures, but bedding planes, which are primary features, are not. In a more strictly hydrogeological context the term has been used to classify voids in the size range 0.1 to 10mm[9]. 2. Breakage of rock strata[16]. 3. The general term for any mechanical discontinuity in the rock; it is, therefore, the collective term for joints, faults, cracks, etc. See also conduit; fissure.

fracture pattern. The spacial arrangement of a group of fracture surfaces.

fracture spring. See spring, fracture.

fracturing. A formation of breaks in a rock due to folding or faulting[16].

francoanellite. A cave mineral — $H_6K_3Al_5(PO_4)_8 \cdot 13H_2O$[11].

free pitch. Where a rope or ladder hangs vertically and free of the walls[25].

free-surface stream. In a cave, a stream that does not completely fill its passage[10].

free water. See gravitational water.

free-water elevation. See water table.

freezing point. The point at which a liquid solidifies[16].

fresco. A half-section of a stalactite on the wall of a cave.

fresh water. Water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids; generally more than 500 mg/L is undesirable for drinking and many industrial uses[22].

freshwater lens. 1. Body of fresh ground water found typically beneath permeable limestone islands or peninsular land masses in the tropics. The lens-shaped water body is bounded above by a water table and below by a mixing zone between fresh and saline ground water along the halocline. In the center of the lens freshwater extends below sea-level, and another set of springs exists where dissolutional conduits associated with the lower limit of the lens intersect the rock surface below sea-level[9]. 2. A lenticular

form of a freshwater body under oceanic coasts[16].

friction head. Head loss due to energy dissipation by friction[16].

friend. A mechanical camming device used for anchors[25].

Froude number. A dimensionless numerical quantity used as an index to characterize the type of flow in a hydraulic structure that has the force of gravity (as the only force producing motion) in conjunction with the resisting force of inertia. It is the ratio of inertia forces to gravity forces, and is equal to the square of a characteristic velocity (mean, surface, or maximum velocity) of the system divided by the product of a characteristic linear dimension (e.g. diameter or depth) and the gravity constant, acceleration due to gravity, all of which are expressed in consistent units in order that the combinations will be dimensionless. The number is used in open-channel flow studies or where the free surface plays an essential role in influencing motion[1] such as in karst conduits that are not necessarily flowing at pipe-full conditions. See also Chézy equation; Manning equation; Reynolds number.

fullflow spring. See spring, fullflow.

fungling; fungling karst. (Chinese.) Isolated limestone hill in alluvial plain, probably similar to mogote[10]. See also fencong; fenglin; mogote; tower karst.

funicular regime. The distribution of continuous liquid phase along pore walls with gaseous phase at the pore center[16].

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