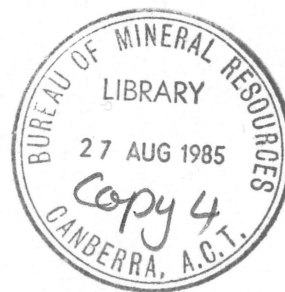


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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

Record 1985/30

GLOSSARY OF MORPHOTECTONICS

2nd EDITION

Compiled by

C.D. Ollier

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SUMMARY

This is the second edition, revised and enlarged, of the Glossary of Morphotectonics. Morphotectonic terms are listed for use by BMR personnel and to help in the establishment of an international glossary planned by the Working Group on Morphotectonics of the International Geographical Union.

PREFACE

The regolith program of the Bureau of Mineral Resources is concerned with the origin and distribution of surficial materials in Australia. Some parts of Australia have been land areas throughout the Phanerozoic, so it is clear that the time scale of regolith development and tectonic activity are the same, and an understanding of morphotectonics is essential for a full understanding of the regolith. Morphotectonics also has many other applications in the work of the BMR, as in basin studies, structural geology, remote sensing, and geophysics.

A Working Group in Morphotectonics was set up in 1983 as a part of the International Geographical Union to further the development of this discipline. At the meeting of this Working Group in Sofia, Bulgaria, it was decided that one of the first tasks of the group was to produce a Glossary of Morphotectonics, so that eventually a fairly standard use of terms can be achieved, and with it improved communication and increasing clarity of concepts. The Committee elected to produce this glossary comprised Ollier (Australia), Demek (Czechoslovakia) Ouma (Uganda, now Kenya) and Ufimtsev (USSR), with Ollier as the Chairman and compiler.

The first edition of the Glossary of Morphotectonics has been improved and enlarged to produce this new BMR Record.

INTRODUCTION

Morphotectonics is a branch of earth science which is actively developing and in a state of flux. There is still plenty of scope for debate on what is or is not included in Morphotectonics, as well as the definition of individual terms. Most of the definitions in this Glossary are my own, as is the selection of which terms to include. I should therefore explain the basis of my selection.

It became clear fairly early in the compilation that some terms were straightforward, easy to define because everybody had the same concept of what the word meant. Although there are many different definitions of 'fault' or 'continent' or 'plateau', everybody agrees about what the terms mean. Definitions become more difficult with the more abstract concepts, and one of the most difficult of all was the term 'morphotectonics!'

THE DEFINITION OF MORPHOTECTONICS

Since the definition of this term determines the contents of the glossary as a whole, I should explain how I came to my chosen definition.

Here is a list of some earlier definitions of morphotectonics, mostly taken from the glossary of Ufimtsev et al. (1979):

L. Kober, 1928. The gross and major features of the earth. Genesis of tectonic structures in which an important part is played by geomorphic processes.

E.S. Hills, 1961. A study of the external form and outlines of major topographic units - mountain massifs, plateaux and river basins - as well as their internal structure.

Y.A. Mescherikov, 1960. Branch of geomorphology studying the tectonic influences of large elements of relief, elucidating the connection between surficial features and underlying structures.

Y.A. Mescherikov, 1965. Morphotectonics uses data of the relief of the earth's surface as primary criteria, together with data from geology and geophysics, to interpret underlying, internal structure.

M.V. Piotrovsky, 1968. Tectonics of the earth's crust and its roots in the upper mantle expressed in major relief.

D.A. Timofeev, 1968. Main types of tectonic movements which are the basis of present day relief.

J. Tricart, 1968. Combination of tectogenesis and morphogenesis in faulting and folding.

L. Moldeau, 1969. Morphogenesis controlled by tectonic movements.

B.B. Ermolov, 1969. A term that has nowadays replaced neotectonics.

J.P. De Waart, 1971. In the narrow sense, phenomena reflecting the influence of geomorphic development on tectonic development.

G.I. Khudyakov, 1975. Wide regional study of the character of the primary surficial topography. Includes the outlines of the main topographic units as well as their internal structure. Apart from geological structure, morphotectonics looks at the most important divergences of the earth's surface from the geoid, and areas of dominant erosion rather than sedimentation.

M.V. Piotrovsky, 1983. Morphotectonics is the most adequate term for all the phenomena of the relations between tectonics and relief, including processes and history. A parallel meaning is the study of these features and relationships.

C.D. Ollier, 1984. The interaction of tectonics and geomorphology, and the study of this part of earth science.

From these definitions several ideas emerge:

1. First there is the influence of tectonics on landforms. This can be obvious, as with a fault scarp, or somewhat inferential, as with supposed tectonic uplift to form a plateau.

2. Second there is the influence of morphology on tectonics. The cutting of a valley may lead to erosional tectonics on the valley side, or a large, high landmass may cause tectonic spreading or gravity sliding.

3. Some writers restrict morphotectonics to large scale features. It is difficult to define a lower limit to morphotectonic phenomena, so I have chosen to leave scale out of my definition.

4. There is some confusion between tectonics and structure. I have chosen to leave out purely structural considerations. If geomorphic processes are picking out old structures, like strike valleys on Precambrian strata, I would not regard the valleys as morphotectonic phenomena, but merely morphostructural. Differential erosion of old structures by rivers is not regarded as a morphotectonic phenomena; the diversion of rivers by tectonic movements, or the extension of rivers onto newly uplifted coastal plains certainly is. Several authors use the term 'morphostructure' as virtually synonymous with 'morphotectonics.' I have not followed this line, preferring to distinguish between 'structure' as the static internal features of a rock mass, and 'tectonic' as an active process.

SELECTION OF DEFINITIONS

The first edition of this Glossary was somewhat idiosyncratic. The definitions were written in a rather idiomatic way rather than to a consistent formula. Brevity was valued more highly than scholarly precision. I mixed nouns and adjectives according to what I thought was general usage rather than going for consistency. In this second

edition of the Glossary, with the cooperation of Dr. G. Speight of CSIRO, Canberra, the definitions have been made in such a way that internal consistency is achieved as often as possible, and terms are not defined relative to other terms which are missing. We are conscious that we still have far to go to make a truly consistent glossary.

There are few cross references, so if a noun is missing, try to find it under a suitable adjectival phrase. Thus, under 'fault' I have not listed every possible variety, but 'transform fault' and 'listric fault' will be found in the appropriate section. Sources and references are not given. In taking definitions from other languages I have often used fairly free translation. With some terms, such as 'morphotectonics', I have taken the plunge and presented my own selection of possible definitions: with others, such as 'neotectonics', I have given two or three alternative definitions.

RULES USED IN COMPILING THE GLOSSARY

The following general rules have been used in compiling the Glossary.

1. Avoid coining terms by the mere addition of common adjectives, e.g. Volcanic..., Young..., Strike... Phrases coined in this way are usually self-explanatory. Such terms have been included only when the combined words have a distinct meaning, e.g. Young valley, Seamount.
2. Avoid specialised terms in related sciences such as volcanology or seismology that do not have a real morphotectonic significance. Otherwise we would compile a Glossary of Geology. Some such terms are included as they are needed in the definition of other terms.
3. Avoid terms of very restricted local use, e.g. 'Amba', the Ethiopian name for Mesa.
4. Avoid making sets of definitions based on the same word, e.g. strike stream, strike river, strike ridge, etc. Usually one or two examples suffice.
5. Avoid terms that can be readily coined, but which have not yet earned a recognised place in accepted vocabulary. Examples might be geoseismology, lithomorphostructure, palaeotectonomorphology, etc. Such terms are easy to coin, and it is easy to understand approximately what is meant, but they do not have standard definitions, and they may well prove to be redundant.
6. Where concepts differ between workers in different countries, I have given the English version. An example is 'Geosyncline' and its variants: the Russian concepts seem to be so very different from those of English speakers that translation is more likely to confuse than to clarify.

Dr Ufimtzev kindly provided a large number of terms that are not in the first edition of the Glossary. Other

suggestions came from Prof Gellert (Germany), Prof Mukang Han (China) and Dr Speight (Australia). Some of their suggestions have been included in the second edition, but others have been omitted because:

- a. They did not fit the Rules listed above.
- b. They have no equivalent in English.
- c. They reflect concepts different from those used by English-speaking workers.

This last point, which also relates to Rule 6 above, raises a major issue:

A technical glossary such as the Glossary of Morphotectonics cannot simply be converted from one language to another by word-for-word translation and grammatical adjustment, because underlying concepts are sometimes different. A whole range of terms may depend on how one views a particular concept, such as geosynclinal evolution, the cause of mountain building, or the cycle of erosion.

There are two main ways of tackling this problem:

1. The glossary might attempt to include translations of all terms from other languages. and perhaps finish with many competing definitions of the same term. This gives completeness, but it lacks internal consistency and the logical relationship of terms is obscured.
2. In any given language, use only those terms from other languages that can be translated accurately, or which are conceptually easy to translate. This lacks completeness, but the glossary has internal consistency and reflects the concepts and logic of the workers using that language.

The second approach has been adopted for this edition of the Glossary of Morphotectonics.

Perhaps another glossary is required, to include those morphotectonic terms used in other languages which do not have simple equivalents in English. This could be useful in translating foreign literature, without implying that the English definitions were necessarily accurate or authoritative.

I welcome any suggestions for improvements to the Glossary, both on general matters such as the nature of the contents or the lay-out, and on specific terms which may be badly defined or possibly not included in this version.

ACKNOWLEDGEMENTS

In the preparation of this second edition of the Glossary I have consulted various other glossaries and dictionaries, especially:-

Bates, R.C. and Jackson, J.A., 1980. 'Glossary of Geology.' 2nd.ed., American Geol.Inst., Falls Church, Virginia.

Dennis, J.G., 1967. 'International Tectonic Dictionary - English Terminology.' Amer.Assoc.Petroleum Geologists, Memoir 7, Tulsa.

Ufimtsev, G.F., Onukhov, F.S. and Timofiyev, D.A., 1979. 'Terminology of Structural Geomorphology and Neotectonics.' Geomorphological Commission, Institute of Geography, USSR Academy of Science, Nauka, Moscow.

I wish to thank those people who wrote in with further suggestions for improving the glossary, especially Dr Ufimtsev, Prof Gellert and Prof Mukang Han. I am especially grateful to Dr Garry Speight who helped enormously in compiling this edition, and added a degree of rigour that was previously lacking.

I think the Working Group on Morphotectonics elected me to compile the Glossary largely because I have access to word processing. It has been produced by my own typing on my personal word processor, so I must take full responsibility for the contents and the presentation.

Cliff Ollier

A

Abyssal plains: Sea-floor plains at depths of 3-6km with a cover of sediment.

Abyssal hills: Basaltic hills protruding through the sediment cover of abyssal plains.

Accreting plate boundary: 1. A boundary between two plates that are moving apart, with the accretion of new oceanic-type material being created at the seam. 2. A continental margin modified by accretion of one or more tectonostratigraphic terranes.

Accretion hypothesis: A hypothesis that continents grow by the accretion of new land (microcontinents or sedimentary piles) at their margins.

Active continental margin: A continental margin at a convergent plate boundary.

Active fault: A fault likely to move at the present day.

Active gneiss mantled domes: Gneiss mantled domes thought to be actively emerging at the earth's surface.

Active volcano: A volcano in eruption, or one considered likely to erupt again in the future.

Adaptation: Conformity between relief and geological structure.

Airy theory of isostasy: Explanation of major topography by varying thicknesses of material of uniform density over an irregular base.

Allochthon: A mass of rock that has been moved from its place of origin by tectonic processes.

Allochthonous: Formed or produced elsewhere than in its present place.

Alpine folding: Folding characterised by nappes, with old rocks thrust over younger ones.

Anatexis: Melting of formerly solid crustal rocks to form a new magma.

Andes-type geosyncline: Geosyncline where the trench is adjacent to a continent.

Andesite line: The boundary between the circum-Pacific rock province (mainly andesites) and the intra-Pacific rock province (mainly basalts).

Anorogenic: Unrelated to orogenic disturbance.

Antecedent drainage: A drainage system which was established before tectonic movement.

Anteclise: Broad updoming of large size, such as a shield or cratonic arch.

Anticlinal mountain: A mountain formed by an anticlinal fold.

Anticlinal valley: Valley running along the axis of an anticline.

Anticline: A fold that is convex upwards.

Anticlinorium: A series of anticlines and synclines so arranged that they form a large arch or anticline.

Anti-dip slope: Scarp slope.

Anti-dip stream: A stream flowing in a direction roughly opposite to that of the dip of underlying strata.

Antipodal: Relationship between a point and the point on the opposite side of the earth.

Antithetic faults: Faults that dip in the opposite direction to associated sediments.

Arc-arc collision: Plate tectonic term for the collision of two island arcs.

Arc-trench gap: The stretch of shallow sea between the steep continental side of a deep sea trench and its backing arc of islands.

Areal volcanism: Regional volcanism with many points of eruption, none of which are active for very long. Individual volcanic structures tend to be small.

Aseismic ridge: Submarine ridge with no associated seismic activity, possibly associated with hot spot activity and volcanoes.

Asthenosphere: A plastic layer beneath the lithosphere and above the mesosphere that transmits seismic waves at low velocity and provides the layer on which tectonic plates can move.

Astrobleme: Structure on earth, usually circular, caused by collision of a meteor or other astral body.

Asymmetric fold: A fold in which one limb dips more steeply than the other.

Atlantic coastline: A coast that is transverse to the trend of fold belts.

Atlantic-type continental margin: Continental margin with Atlantic-type coast. Passive continental margin.

Atlantic-type geosyncline: Geosyncline with accumulation of sediment at the trailing edge of a continent.

Atlantic-type continental margin: Passive continental margin.

Atoll: A ring-shaped "coral" island encircling a lagoon.

Aulacogen: The failed arm of a triple junction which did not develop into a spreading site.

Aureole (metamorphic): Altered rocks around a pluton, often resistant to erosion.

Autochthon: A group of rocks that have been moved little from their place of origin, although they may be intensely deformed.

Available relief: The difference between the highest parts of a landscape and base level.

Axes, tectonic: The fabric coordinates, a, b and c, used by structural geologists.

Axis: 1. A line where a folded bed shows maximum curvature.
2. The line of dominant uplift in a mountain chain.

B

Back arc basin: A marine basin behind (on the concave side of) an island arc.

Back arc thrust: Thrust fault in back arc basin.

Backdeep: Oceanic depression on the concave side of an island arc.

Back-folding: Folding in which the folds are overturned towards the interior of an orogenic belt.

Back-slope: The more gently sloping side of an asymmetrical structural ridge.

Back-thrusting: Thrusting towards the interior of an orogenic belt.

Barbed drainage: Drainage pattern in which tributaries join main streams at acute angles but are then reversed; usually an indicator of reversed drainage.

Basal facets: Small facets along the base of a fault scarp, commonly triangular.

Base level: The level below which land cannot be eroded by running water. Sea level is the ultimate base level.

Basement: The undifferentiated complex of rocks that underlies the rocks of interest in an area.

Basin: 1. An area of internal drainage. 2. A syncline that is circular or elliptical in plan. 3. A round shaped deep sea depression. 4. A pile of sedimentary rocks in a basin.

Basin and range structure: A regional structure of fault-block mountains and sediment-filled basins.

Basin and swell: Second order landscape features; a continent can be conceived as consisting of a number of basins separated by swells.

Basin folds: Folds in structural basins, possibly due to differential compaction.

Batholith: A large mass of plutonic rock.

Bedding: The arrangement of sedimentary rocks in beds, layers or strata.

Behead: To cut off by river capture the upper part of a river.

Beheaded stream: The stream from which water has been diverted by river capture.

Belt: A band of a particular kind of rocks or rock structures exposed at the surface.

Bench: A terrace or small platform.

Benioff zone: A steeply-dipping zone behind island arcs and some continental margins marked by earthquake epicentres and thought to mark subduction sites.

Block: 1. A craton. 2. A fault-bounded area of lithosphere.

Block mountains: An upland resulting from elevation of blocks of lithosphere along steep faults.

Blueschist facies: Metamorphic rocks indicating high pressure and low temperature, and possible indicators of plate collision. Glaucophane schist.

Bouguer anomaly: A gravity anomaly calculated after correction for latitude, elevation, and terrain.

Breakers at the nappe front: Excessive crumpling at the front or distal part of a nappe, often characterised by cascade folds. Branden der Deckenstirne.

Brittle zone: The upper zone of the earth's crust where rocks respond to stress by fracture rather than plastic flow.

Bubnoff unit: A conventional measure of process rates such as uplift, erosion, coastal retreat, expressed as millimetres per thousand years or metres per million years.

Buckle: To bend, warp or crumple, usually on a small scale.

Buoyancy mechanism: Suggested mechanism permitting nappe movement when lithostatic pressure and hydrostatic pressure become about equal.

Butte: A steep-sided, flat-topped hill, often capped by a horizontally-disposed hard rock.

C

Caldera: A large (1-20km) volcanic depression, roughly circular.

Camber: An apparent anticline along an interfluvium formed by flow of plastic strata beneath a caprock into a valley, with sagging of caprock at the edges.

Capable fault: Legal term for a fault thought capable of future movement. Usually based on activity within a stated time, such as the past 35,000 years.

Capture: River piracy.

Cascade: Multiple folds in a competent rock on a topographic slope caused by gravity sliding.

Catastrophe: A sudden violent change in the physical condition of the earth's surface; a cataclismic change in landscape.

Catchment: The area of land surface contributing runoff water to any point, especially a point on a drainage line. In American usage a watershed.

Cauldron subsidence: Structure resulting from subsidence with a steep ring fracture (2-20 km diameter), often associated with ring dykes.

Central volcano: Large volcano in which activity persisted at the same centre for a long time.

Chasmic fault: A fault extending through the lithosphere, bounding lithospheric plates.

Chevauchement intercutanes. (internal nappes) A structure where a series of overthrusts are found within seemingly tranquil, apparently unmoved strata.

Collapse caldera: A caldera resulting from collapse, after removal of underlying magma.

Collapse structures: Structures resulting from downhill sliding under gravity.

Collision site: Convergent plate boundary.

Compensation, isostatic: Equilibrium attained on the assumption that columns of earth material have equal weights irrespective of the elevation of the ground surface.

Competent: Applied to strata that respond to folding without internal flowage.

Composite terrane: Two or more terranes that amalgamated prior to accretion to a continental margin.

Compression: A system of forces or stresses that tends to decrease the volume or shorten the length of a rock.

Conjugate set (of joints, faults): Two sets of structures, almost at right angles, thought to be generated together.

Consequent stream: A river flowing in the direction of the dip of rocks; a dip stream.

Conservative plate boundary: A boundary where lithospheric plates slide past each other so that lithosphere is neither created nor destroyed.

Continent: One of the five or six largest land masses, consisting mainly of sial and rising fairly abruptly above the deep ocean.

Continent-continent collision: Collision between two continental parts of plates, as between India and the Asia plate.

Continent-ocean collision: Collision between the oceanic part of one plate and the continental part of another, usually resulting in subduction or obduction.

Continental basin: A region in the interior of a continent comprising one or several closed basins.

Continental drift: The hypothesis that the continents can drift on the surface of the earth, and that they were once united in one or two supercontinents.

Continental island: An island, the crust of which is sial; a microcontinent.

Continental lithosphere: Region of lithosphere, the crust of which is sial.

Continental margin: The submarine edge of a continent, comprising continental shelf, continental slope and continental rise.

Continental plate: That part of a plate underlying a continent; thick siallic plate.

Continental platform: Platform-like mass of continent, including the continental shelf, that stands above the oceanic basins.

Continental rise: Submarine surface on the seaward side of the continental slope.

Continental shelf: Offshore zone extending from the shore to about 200m where there is usually a rather steep descent to greater depths.

Continental shield: Shield.

Continental slope: Submarine slope between the continental shelf and the top of the continental rise, ranging from about 200m to 2 - 3km.

Continuous deformation: Deformation by flowage rather than rupture.

Contraction hypothesis: Hypothesis that folds and faults result from a shrinking of the earth.

Convection: A process of fluid flow as a consequence of different temperatures within the medium.

Convection cell: A domain within which subcrustal material is moving by convective flow; often proposed as a driving force for continental drift and plate tectonics.

Convective flow: A postulated movement of material deep in the earth resulting from differences in temperature and density.

Convergent plate boundary: A boundary between lithospheric plates which are moving towards each other. Collision site.
Cordillera: A mountain chain.

Coral reef: Accumulation of coral and other carbonate organic remains to build a rock barrier up to sea level.

Coupled oroclines: Two oroclines that together form an S shape.

Crater: A closed depression of roughly circular shape.

Craton: A relatively large area of a continent, immobile since ancient times. A shield.

Cratonization: The process whereby sediments and volcanic rocks deposited at the edge of a craton become welded to the craton, becoming part of it.

Creep: The flow of material in a solid crystalline state.

Crest: The line of highest points in a topographic ridge, anticline, or stratum.

Cross fault: A fault that runs diagonally or perpendicularly to the strike of a strata.

Crushing strength: The compressive stress necessary to cause a solid to fail by fracture.

Crust: The outer layer of the earth, above the mantle, from which it is separated by the Mohorovicic Discontinuity.

Cuesta: An asymmetrical ridge on dipping strata, comprising a dip slope and a scarp slope.

Culmination: The highest point on a nappe, dome or other structure.

Curie point: The temperature above which rocks cannot be magnetised.

Cycle of denudation: The alternate tectonic uplift and wearing down of a landmass.

Cycle of erosion: The wearing down of a landmass to base level, which will be repeated after tectonic uplift.

Cymatogen: A vast, upwarped region several hundred kilometres across.

Cymatogeny: The broad upwarp of large areas, especially continental margins, by vertical tectonics.

D

Dalmatian coast: A drowned coast with rock structure parallel to the coast.

Decken structure: Nappe structure. A series of large recumbent folds and overthrust sheets.

Decollement: The independent folding and faulting of an upper series of sedimentary beds by sliding them over an unaffected underlying basement.

Deep: Seafloor area of exceptional depth, often thought to mark subduction sites.

Degradation: Denudation. The wearing down of land by erosion.

Delta: Alluvial landform at a river mouth.

Delta plains: Plains formed at the mouths of major rivers.

Dendritic drainage pattern: Drainage pattern in which tributaries join at acute angles which point downstream, the whole having a tree-like appearance.

Denudation: The processes of weathering and erosion considered together.

Depression: 1. A relatively low-lying landform. 2. An area made relatively low by tectonic movement.

Diapir: Dome or anticline in which light, mobile material, such as salt, has intruded overlying, more brittle materials. Piercement fold.

Diastrophism: The processes that deform the earth's crust, and the results of these processes.

Differential compaction: The relative change in thickness of layers of different grain size and composition under loading.

Differential erosion: The more rapid erosion of one part of the earth's surface compared with another.

Differential movement: The movement of neighbouring areas at different rates, or in opposite sense.

Digital terrain model: Computer-generated image of topography based on a grid of spot heights.

Dike: See dyke.

Dip: The inclination of strata or structural surfaces.

Dip slope: A land surface slope approximately parallel to the dip of underlying strata.

Dip stream: A stream flowing in a direction roughly the same as the dip of underlying strata.

Discontinuity: Sudden changes with depth in some physical property of earth material, as indicated by seismic data.

Discontinuous deformation: Deformation of stressed rocks by rupture rather than flowage.

Discordant coast: A coast transverse to the trend of fold belts; an Atlantic-type coastline.

Discordant valley: A valley which trends in a different direction from the strike of underlying rocks.

Disharmonic fold: A fold in which plastic and brittle beds have different geometric relationships.

Disjunctive folds: Folds in which brittle beds interbedded with plastic beds are pulled apart into blocks.

Dislocation: Displacement of rocks on opposite sides of a fracture.

Divergent plate boundary: A boundary between lithospheric plates that are moving apart, with material of the asthenosphere emerging between them, typically forming a mid-ocean ridge. Constructive plate boundary. Accreting plate boundary. A spreading site.

Diverted stream: 1. In stream piracy the stream that was diverted from the beheaded stream by river capture. 2. A stream which has been diverted by tectonic movement, volcanic eruption, landslide, etc.

Divide: Watershed. The line of separation between drainage systems. Interfluvium.

Dome: 1. A roughly symmetrical structure in which dips radiate from a centre. 2. Any convex hill, such as a granite dome.

Dormant volcano: A volcano not active at present but thought likely to erupt in the future.

Double island arc: Island arc with an outer line of non-volcanic islands, and an inner line of volcanic islands.

Doubly plunging fold: A fold that plunges in opposite directions from a central point.

Downwarp: The process of bending down: a low area produced by this process.

Drainage basin: Catchment.

Drainage divide: The rim of a drainage basin. Watershed.

Drainage pattern: The arrangement of drainage lines within an area: patterns are related to structure and geomorphic history.

Duplex surfaces: Thrust fault surfaces both above and below a block of allochthonous rock.

Duricrust: Weathering crust such as ferricrete or calcrete.

Dyke: A vertical or high angle sheet of intrusive igneous rock.

Dyke swarm: A set of numerous dykes, often parallel.

Dynamic equilibrium: The concept that a balance is attained between land surface erosion, stream downcutting and tectonic uplift so that the topography or landscape remains the same despite the operation of these processes.

E

Earth surface: The surface separating the lithosphere from the atmosphere or the hydrosphere, comprising the land surface, the seafloor, and the beds of streams and lakes.

Earthquake scarplet: A small fault scarp produced at the time of an earthquake.

Ecoulement: The downhill gliding of a large mass of rock under the influence of gravity.

Elbow of capture: Sharp bend in a river course marking the point where one river has been diverted into another by capture.

Endogenic: Relating to processes originating within the solid earth.

En echelon faults: Fault system in which faults die out to be replaced by parallel faults slightly offset.

Entrenched meander: A meander eroded below the surface on which it was formed, possibly indicating uplift.

Epeiric: Broad up or down movement of large areas without folding.

Epeirogenic movement: Broad uplift or depression of large areas without folding.

Epeirogeny: Broad movements of uplift and subsidence that affect the whole or large parts of continental areas or ocean basins.

Epicontinental seas: Small seas bordering continents and bounded by barriers other than island arcs.

Epigenic (epigenetic). Relating to processes at or near the surface of the earth.

Erosion: The group of processes which remove rock material from any part of the earth's surface.

Erosion caldera: A basin located in volcanic terrain, but produced by erosion rather than volcanic activity.

Erosion surface: A land surface shaped by erosion. Sometimes limited to rather flat erosion surfaces.

Erosion tectonics: Folding and faulting consequent upon erosion of valleys.

Erosion thrust: A thrust fault along which the hanging wall moved across an erosion surface.

Escarpment: A steep slope with considerable horizontal continuity bounding a plateau, bench, asymmetric cuesta, etc., or following a fault. Equivalent to, or larger than, a scarp.

Etching: Removal of weathering products following deep weathering.

Etchplain: A plain that is an erosion surface formed by deep weathering followed by removal of the weathered material (stripping).

Eugeosyncline: A geosyncline in which volcanic rocks and debris are abundant.

Eulerian pole: When points move apart on a sphere they move along 'latitudes' relative to poles of rotation known as Eulerian poles.

Eustasy: World-wide simultaneous change in sea level.

Eustatic: Related to world-wide changes in sea level.

Exhumed topography: Topography that has been buried under younger rocks and then exposed again by erosion.

Exogenic (exogenetic, exogenous): Relating to processes driven by outside energy and not resulting from the earth's internal processes.

Exotic terrane: A far-travelled terrane(hundreds or thousands of kilometres).

Explosion caldera: A roughly circular depression, several kilometres across, formed mainly by violent volcanic explosion.

Explosion crater: A crater resulting from a gaseous explosion, ejecting fragments of bedrock, with or without volcanic ejecta. A maar.

Extended streams: Old streams which become extended over an emerged coastal plain.

Extension (crustal): The widening of a block of the earth's crust, often associated with normal faulting.

Extinct volcano: A volcano considered (sometimes unwisely) to be safe from renewed eruption.

F

Facets: Triangular faces with their bases along a common line, which may be a strike line or a fault.

Failed arm (of triple junction): An arm of a triple junction which did not develop into a spreading site; an aulacogen.

False anticline: Anticline-like structure due to compaction of sediment over a resistant mass such as a hill.

Fault: A fracture along which there has been relative movement of the rocks on each side.

Fault basin: A depression bounded by faults.

Fault block: A mass of rock bounded on at least two opposite sides by faults.

Fault block mountain: A mountain originating by uplift of a large fault-bounded block of rocks.

Fault (chasmic): Fault extending through the lithosphere, bounding crustal fragments or plates.

Fault complex: A system of interconnecting faults.

Fault embayment: A fault-bounded depression invaded by the sea.

Faulting: the movement which causes relative displacement on opposite sides of a fault.

Fault line: The intersection of a fault with the earth's surface.

Fault-line scarp: A scarp that results from differential erosion on opposite sides of a fault, rather than resulting directly from fault movement.

Fault plane: A fault surface, even if curved.

Fault scarp: A scarp formed as a direct result of faulting at the earth's surface.

Fault set: Two or more parallel faults in an area.

Fault system: Two or more fault sets that were formed at the same time.

First order landforms: continents and oceans.

Fissure: An extensive crack.

Fissure eruption: A volcanic eruption from a fissure or from points along a fissure.

Flake tectonics: A variant in collision tectonics, in which one of the plates splits into two flakes, one of which is subducted, the other obducted.

Flap: An overturned limb lying on the ground surface as a result of gravity sliding.

Flat: A landform that is level or almost level.

Flatiron: A triangular landform with horizontal base and one elevated corner, formed by erosion of dipping strata.

Flexure: A bend in strata.

Flysch: A body of thin bedded dark shale, siltstone, cross-bedded greywacke and other sediments.

Fold: A bend in strata or any planar structure causing opposite limbs to dip in opposite directions.

Fold axis: Line following the highest part of an anticline or the lowest part of a syncline.

Fold belt: A large strip of folded rocks with the dimensions of a geosyncline or mountain chain.

Fold mountains: Mountains consisting of elevated, folded sedimentary rocks. It is commonly assumed (mistakenly?) that the folding and uplift occurred together in an 'orogeny,' sometimes associated with crustal shortening.

Fold nappe: Recumbent fold in which the middle limb has been completely sheared out.

Fold system: Group of folds showing common features and trends.

Foliation: The laminated structure resulting from segregation of different minerals parallel to schistosity.

Foredeep: Narrow oceanic depression bordering an island arc or continent.

Foreland: The relatively stable area bounding a fold belt and towards which apparent movement has occurred.

Foreland folding: The creation of a fold belt by apparent push of a sedimentary pile towards a foreland.

Fracture: Breaks in brittle rocks due to intense folding or faulting.

Framed basin: Polygonal sedimentary basin bounded by structural highs.

Fringing reef: Coral reef attached to a shore.

G

Gap: Well-defined notch or gorge in a ridge or mountain chain.

Gash fractures: Tension fractures diagonal to an associated fault.

Geanticline: A broad uplift, generally referring to an area of geosynclinal sediments. Originally synonymous with anticlinorium.

Geodepression: Long, narrow depression, not necessarily filled with sediment.

Geodesy: Investigation of the shape and dimensions of the earth.

Geofracture: Master fracture of great age, often separating very different rocks.

Geographical cycle: Cycle of erosion.

Geoid: The figure of the earth considered as a mean sea-level surface extended through the continents.

Geologic province: Large region with similar geologic history and development throughout.

Geology: Earth science in all its aspects.

Geomorphic cycle: cycle of erosion.

Geomorphic surface: One or more areas of the earth surface in which the landforms and their systematic arrangement indicate a common origin and history that is different from that of adjacent areas. Usually dissected remnants of an old surface.

Geomorphology: The study of landforms, landforming processes and associated materials.

Geophysics: Branch of physics dealing with the earth.

Geosphere: The solid portion of the earth.

Geostrophic: Pertaining to deflection resulting from rotation of the earth.

Geosynclinal prism: Mass of sediments accumulated in a geosyncline.

Geosynclinal sediment: Associated sediments or rocks presumed to be characteristic of geosynclinal deposition.

Geosyncline: Large linear trough that subsided over a long period and accumulated a thick succession of sediments and sometimes volcanic rocks.

Geotectonic: Pertaining to the form, arrangement and structure of the rocks in the earth's crust.

Geothermal gradient: The change of temperature of the earth with depth.

Geotumor: A large swell where the crust is bulged upwards from which strata may glide down under their own weight into adjoining depressions.

Gipfelflur: Plane through accordant summits in mountain region, possibly indicating a former land surface.

Gja: Gaping fissure or rift: a tension fracture in volcanic regions.

Glacio-isostasy: Isostatic balance in areas affected by the weight of glacial ice.

Glencoe type caldera: Cauldron subsidence, accompanied by quietly effusive volcanic activity.

Glide plane: Plane along which gravity sliding occurs.

Glide plane scar: The surface exposure of a glide plane as a slope or escarpment.

Gneiss: Coarse grained, banded metamorphic rock.

Gneiss mantled dome: Granite dome with a mantle of gneiss having foliation parallel to the dome surface.

Gondwana; Gondwanaland: Former supercontinent including India, Australia, Antarctica, and parts of southern Africa and South America.

Gorge: A deep, narrow, very steep-sided valley through high ground.

Graben: A relatively long and narrow down-faulted block.

Grade: Continuously descending, smooth curve of a stream channel long profile, supposedly adjusted to be just steep enough to carry its load of sediment.

Graded: Brought to some sort of equilibrium by erosional and depositional processes under the influence of some base level. Refers to both stream channels and hillsides.

Graded profile: A hillslope or stream channel at grade.

Graded slope: Unbroken slope in which equilibrium is attained between production of debris by weathering, and removal of debris by erosion.

Graded stream: A stream which has supposedly reached some sort of equilibrium and is at grade.

Granite: Plutonic rock consisting of alkali feldspar, quartz, mica and sometimes hornblende.

Granite gneiss: Banded metamorphic rock of granitic composition.

Granite tectonics: The structural features of plutons and their surroundings.

Gravitational sliding: Gravity sliding.

Gravity: The attractive force exerted by the earth.

Gravity compaction: Compaction of sediment resulting from overburden pressure.

Gravity sliding: Extensive sliding of strata under the influence of gravity, producing overthrust faults, folds and nappes.

Gravity spreading: The spreading of elevated land over surrounding lower country, with faulting and folding, that sets in whenever an elevation over 3km is produced.

Gravity tectonics: Tectonic features which were created in response to gravitational forces.

Great Divide: A major watershed of continental significance.

Great Escarpment: An escarpment of large size following a continental margin and related to major tectonic uplift.

Guyot: Flat-topped seamount, subaerially eroded in the past, since when it has sunk.

H

Hade: The angle of inclination of a fault from the vertical.

Harmonic folding: Folding in which there are no sudden changes in form with depth.

Headward erosion: Extension of a valley by erosion in an upstream direction.

Heat flow: Dissipation of heat from within the earth to the surface by conduction.

Heave: In faulting, a measure of the horizontal component of displacement.

High, structural: The higher part of a dome or anticline.

High-angle fault: A fault with a dip greater than 45°.

High plain: a landform comprising extensive relatively level land well above sea level; a plateau.

Highland: Elevated region of mountains or plateaus.

Hill: A landform standing up to 300m above the surroundings.

Hinge line: A line of abrupt flexure.

Hinterland: The undisturbed terrain behind a fold belt; the side away from which thrusting and recumbent folding appear to have taken place.

Historical geomorphology: The study of the development of landforms through time. Includes denudation chronology.

Hogback: A ridge produced by erosion on steeply dipping strata; a roughly symmetrical homoclinal ridge.

Holocene: The last 10 000 years.

Homoclinal ridge: A ridge developed on uniformly dipping strata of different resistance by differential erosion, tending to form dip slopes and scarp slopes. Includes cuestas and hogbacks.

Homoclinal shifting: The downdip movement of a strike river, brought about by relatively greater erosion on the downdip side.

Horizontal slip: The horizontal component of the net slip in faulting.

Horst: A block of rocks, relatively long and narrow, that has been uplifted along faults on either side.

Hydrodynamic: Relating to the force or pressure of water or other fluids.

Hydrostatic stress: State of stress in which all principal stresses are equal.

Hypsometric: Relating to elevation above a datum, usually sea level.

Hypsometric curve: Diagram showing the relative amount of land at different elevations.

I

Icecap: Regionally extensive glacier.

Imbricate structure: A series of overlapping thrust sheets dipping in the same direction.

Inactive fault: A fault considered unlikely to move at the present day.

Incised meander: Meander cut deeply below the surface on which it originated, possibly of tectonic significance.

Incompetent bed: A bed that deforms by flowage.

Injection folding: Deformation in a plastic layer between more competent layers resulting from differential changes in thickness.

Insequent stream: Streams with courses or stream patterns that are not due to any obvious factors.

Interfluve: 1. The land between adjacent streams: 2. The divide or watershed between catchments.

Intermontane area: Structural and topographic basin enclosed by mountain ranges.

Intermontane trough: Subsiding area between mountain chains.

Intracratonic: Situated within a stable continental region.

Intracratonic basin: Roughly oval depressed area of considerable size within a continent.

Intramontane: Situated within or amongst mountains.

Intrusion: A body of igneous rock that invades older rock.

Inversion of relief: 1. When lava fills old valleys new valleys may be cut on each side of the flow leaving the lava flow as a ridge. 2. Topography in which anticlinal folds are in lowlands and highlands are on synclines.

Island: A tract of land completely surrounded by water.

Island arc: Curved chain of islands, generally convex towards the ocean, margined by a deep sea trench on the ocean side and with a back-arc basin between the arc and the backing continent, if present.

Island arc type geosyncline: Geosyncline parallel to an arc but separated from it by an arc-trench gap.

Isoclinal: Dipping in the same direction.

Isoclinal fold: A fold with limbs that have parallel dips.

Isostasy: Theoretical balance of all large portions of the earth's crust, as if they were floating on a denser, underlying layer.

Isostatic anomaly: The difference between the observed value of gravity at a point and the normal value of gravity at the point.

Isostatic compensation: 1. Isostatic adjustment, an equilibrium condition in which elevated masses such as continents or mountains are compensated by a mass deficiency beneath them. 2. Lateral flow of sub-crustal material to compensate for changes at the ground surface brought about by erosion and deposition.

Isostatic recovery: Movement of land in response to a change in load to regain balance.

Isostatic uplift: Uplift of land in response to removal of load.

J

Joint: Fracture in rock along which no appreciable movement has occurred.

Joint set: A group of more or less parallel joints.

Joint system: Two or more joint sets, or any group of joints with a characteristic pattern, such as radial, concentric.

Jura-type folds: Folds in an upper series of strata over an unaffected basement.

K

Kilauean type caldera: Caldera formed by collapse on top of a lava shield or dome.

Kinetics: Study of relations between forces and resultant movements.

Klippe: An isolated block of rocks separated from the underlying rocks by a low angle fault plane. Generally the rocks above the fault are the older.

Knee fold: Knee-shaped bend in competent strata resulting from gravity sliding.

Knickpoint: Point of abrupt change of gradient in the long profile of a stream or valley floor.

Krakatauian type caldera: Caldera formed by collapse following a Krakatauian-type volcanic eruption.

L

Lake: A standing body of inland water.

Lake plain: A plain formed by alluvial fill of a former lake.

Lake terrace: Terrace formed around the shores of a former lake by alluvial fill and coastal erosion, terminated by lowering of the lake surface level.

Landform: Any one of the individual topographic features that together form the surface of the earth, both subaerial and submarine, ranging from broad features like plains and plateaus, to valley sides and gullies.

Landslide: The relatively rapid downward sliding of a mass of earth and rock, under the influence of gravity.

Landslip: A landslide, often one triggered by erosional undercutting, or earthquake shock.

Land surface: The surface separating the lithosphere from the atmosphere.

Left-lateral fault: A strike-slip fault with movement such that an observer approaching the fault would have to go left to find matching strata, etc. on the far side of the fault.

Lineament: Significant lines perceived in landscapes, maps, or remote-sensing images.

Linear: A straight or gently curving physiographic feature.

Lineation: A linear structure within a rock.

Listric fault: A curved fault, steep at the surface and flatter at depth.

Lithosphere: The uppermost, solid layer of the earth, including the crust and part of the upper mantle, overlying the asthenosphere.

Lithospheric plate: A part of the lithosphere that behaves as a single nearly rigid body, with most seismic and tectonic activity localised at its boundaries. Six major plates make up the surface of the earth, with smaller plates postulated in more detailed analyses.

Lithostatic pressure: The pressure in the crust of the earth due to the weight of the overlying rocks.

Littoral: Relating to a shore.

L-joints: Horizontal or nearly horizontal joints in igneous rocks.

Longitudinal fault: Fault with strike parallel to the general structure.

Longitudinal stream: A strike stream.

Longitudinal valley: A strike valley.

Low, structural: 1. Area in which the beds are structurally lower than in neighbouring areas. 2. Saddle between local highs along the crest of an anticline.

Low-angle fault: A fault dipping less than 45° .

M

Maar: Volcano consisting of a broad crater in bedrock, below the level of the general groundsurface (often holding a lake), and a surrounding rim of pyroclastics.

Macrostructure: Structural feature of rocks that can be seen by the naked eye.

Magma: Mobile rock material below the earth's surface, mostly a silicate melt. If it erupts at the surface it becomes lava.

Magma chamber: A large reservoir in the earth's crust full of magma.

Magnetic anomaly: A departure from the magnetic field of the earth as a whole.

Magnetic declination: The acute angle between the direction of the magnetic and geographic meridians.

Magnetic dip: Magnetic inclination. The acute angle between the vertical and the direction of the earth's total magnetic field in the magnetic meridian plane.

Mantle: A layer within the earth between crust and core.

Marginal basin: Submarine basin at the foot of the continental slope.

Marginal depression: A depression located around the base of a large volcano (usually submarine).

Marginal fissures: Joints along the margin of an intrusive body that dip inwards towards the intrusion.

Marginal platform: Submarine shelf adjacent to a continent, at a greater depth than the continental shelf.

Marginal thrusts: Thrust faults along the margin of an intrusive body that dip towards the intrusion.

Marginal trench: Submarine trench, adjacent and parallel to a continental margin.

Massif: A mountainous mass.

Mass movement: Downwards movement of surficial materials by creep, landslides, etc.

Mass wasting: The lowering of a groundsurface by mass movement processes.

Mature landscape: Anthropomorphic description of landscape with various connotations; often indicates slope-dominated landscape with limited development of plateaus and plains.

Mature river: Anthropomorphic description of river; generally indicates smooth long profile, but limited development of alluvial plains.

Mature valley: Anthropomorphic description of valley; generally means broad, V-shaped valley with little vertical erosion but limited valley widening.

Maturity: The middle and major phase in the anthropomorphic description of landforms and landscapes in terms of youth, maturity and old age.

M-discontinuity: Mohorovicic discontinuity.

Median mass: Plateau or massif between two out-facing mountain ranges or fold belts.

Mediterranean-type geosyncline: Geosyncline with intercontinental sedimentation.

Mega-: 1. Prefix meaning large. 2. Prefix meaning one million times.

Megalineament: A lineament that can be traced for hundreds of kilometres.

Megashear: A transcurrent fault with very large displacement (>100 km).

Mesa: Hill or mountain with a flat top.

Meso-: Prefix meaning middle.

Mesosphere: A layer within the earth at depths between 250km and 2900km: the part of the mantle below the asthenosphere, thought to be stronger and less involved in tectonics.

Meta-: Prefix to denote metamorphic equivalent.

Metamorphic rock: Rocks formed by altering earlier rocks in response to high temperature, pressure or both.

Metamorphism. Process of forming metamorphic rocks.

Meteor crater: Topographic depression formed by the impact of a meteor.

Meteoric: Relating to the atmosphere.

Meteoric water: Rainwater.

Micro-: 1. Prefix meaning very small, 2. Prefix meaning one-millionth.

Mid-oceanic islands: Isolated islands that rise from the deep sea floor. Chiefly volcanic.

Mid-ocean ridge: Topographic submarine ridge, often but not always in a mid-ocean position (see Sub-oceanic ridge). The centre of sea-floor spreading.

Miogeosyncline: A geosyncline in which volcanic rocks are rare or absent.

Misfit stream: A stream considered too small to have made the valley in which it now flows.

Mobile belt: A large, long part of the earth in which sediments accumulate and are folded.

Mobilization: Process that enables rocks to flow.

Mohorovicic discontinuity: Seismic discontinuity about 35 km below the continents and 10 km below the oceans, separating the earth's crust and mantle.

Molasse: Sediment derived from erosion of newly formed mountains and deposited in foredeep basins thought to be genetically related to the mountains.

Monadnock: A residual hill or mountain standing above an erosion surface.

Monocline: A local steepening of otherwise uniform gentle dip.

Monogenic volcano: A volcano resulting from a single and continuous eruption.

Morphogenesis: 1. The creation or modification of landforms.
2. The complex of processes that creates particular landforms.

Morphogenetic process: Any process that creates or modifies landforms.

Morphogenetic region: A region characterised by an assemblage of landforms determined by particular morphogenetic processes, especially those processes controlled by climate.

Morphological analysis: Study of landforms with the aim of determining their origin and evolution.

Morphology: Observation of the form of lands.

Morphometry: Measurement and mathematical characterisation of form (in geomorphology, of earth surface form).

Morphostructural analysis: Study of the relationships between topography and geological structure.

Morphotectonic analysis: Study of the relationships between topography and tectonic activity.

Morphotectonic pattern: Regular arrangement of landforms such as valleys, ridges, basins and plains in the form of linear, arcuate, en echelon, or other patterns.

Morphotectonics: The interaction of tectonics and geomorphology, and the study of this part of earth science.

Morphotecture: The set of very major landforms created by endogenetic processes that forms the framework of the earth's relief.

Mount: Mountain. Always used instead of 'mountain' before a proper name.

Mountain: Land considerably higher than the surrounding country.

Mountain building: Tectonic processes that produce mountains. Generally not the same as orogeny.

Mountain chain: A line of mountains.

Mountain range: A line of mountains.

Mud volcano: Conical mound built of mud erupted at the surface, often built around a spring.

Mylonite: Fine-grained rock formed by extreme micro-brecciation and milling of rock during movement on a fault surface.

N

Nappe: A large sheet of rock that has moved several kilometres by overthrusting or overfolding.

Negative area: Area that subsided conspicuously or repeatedly.

Neogene: The later two epochs of the Tertiary.

Neotectonics: 1. Tectonic movements of the present and the recent past. 2. Tectonic movements of the Neogene. 3. Legal use relates to so-called 'capable faults', that is faults which display such recent movements that they seem capable of further movement. 'Recent' refers to some stated period, often 35,000 years.

Net slip: The total slip along a fault measured on the fault surface between two points that were originally adjacent.

New Zealand type fault-block landscape: Block-faulted landscape with through rivers and little debris accumulation.

Nickpoint: Point where a sudden change in gradient occurs in the long profile of a stream or valley.

Normal dip: Regional dip of strata, contrasted with local dip affected by local structures.

Normal fault: A usually high-angle fault at which the hanging wall has been depressed relative to the footwall.

O

Obduction: The thrusting of a slab of sea floor over a continental slab during continent-ocean collision.

Oblique fault: Fault with strike oblique to the strike of the strata.

Oblique joint: Joint with strike oblique to the strike of adjacent strata or cleavage.

Oblique-slip fault: A fault with net slip in a direction between the direction of the dip and that of the strike.

Obsequent fault-line scarp: A scarp along a fault line, where the upthrown block is on the side of the topographic low.

Obsequent stream: Antidip stream. A stream flowing in a direction opposite to that of the dip of the strata.

Ocean: The body of salt water that covers two thirds of the earth's surface.

Ocean-ocean collision: Collision between the oceanic part of two plates, usually to form an island arc.

Oceanic islands: Islands that rise from deep water far from continents, usually volcanic.

Oceanic lithosphere: Lithosphere, the crust of which is sima.

Oceanic rise: Large area above the deep ocean floor but not part of a mid-ocean ridge.

Offlap: Strata deposited along a receding shore, with successive layers further seaward.

Offset: Displacement of formerly contiguous bodies.

Old age landscape: Anthropomorphic term for a landscape consisting mainly of plains near base level.

Old age river: Anthropomorphic term for a river on broad alluvial plains near base level.

Oldland: The oldest topographic surface of which evidence still survives. A palaeoplain.

Olistostrome: Sedimentary melange. Sedimentary stratigraphic unit with many exotic blocks in fine-grained matrix.

Onlap: Extension of successive strata towards land resulting from deposition in a transgressive sea.

Ophiolites: Altered mafic igneous rocks, presumed to have been erupted on the sea floor.

Order: Expression of the magnitude of landforms, with first order of continents and oceans, second order of features such as mountain chains or regional plains, and third order including individual valleys, hillslopes, etc.

Original dip: The dip of strata immediately after deposition.

Orocline: Bend of a fold belt or mountain chain in a horizontal plane after the formation of the fold belt.

Orogen: Belt of deformed rocks, often metamorphosed and intruded by plutons.

Orogenesis: 1.Original meaning - the process of forming mountains, especially by folding. 2.Modern meaning - the process of forming fold belts.

Orogenic: Adjective derived from orogeny.

Orogenic facies: Classification of sediments according to their presumed relationship to periods of tectonic deformation.

Orogeny: A period of folding related to a specific time span. Also the process of folding.

Oregon-type fault-block landscape: Block fault landscape where original rocks were flat-lying.

Outlier: Portion of stratified group detached from the main body by erosion.

Overflow stream: The spillway from a lake.

Overfold: Fold in which the beds on one limb are overturned.

Overthrust: 1. A thrust fault with low dip. 2. Movement of one part of the crust over another.

Overturned: Folds or strata tilted past the vertical.

P

Pacific-type coastline: Coast parallel to the trend of folded rocks.

Pacific-type continental margin: Active continental margin.

Pacific-type geosyncline: A geosyncline formed at converging plate boundaries.

Paired metamorphic belts: An inner belt of low-pressure facies (andalusite) and an outer belt of high-pressure facies (glaucophane), of similar age, associated with island arcs.

Palaeogene: The early Tertiary, including the Paleocene, Eocene and Oligocene.

Palaeogeography: The geography of an area at some specified time in the past.

Palaeogeomorphology: The landforms and associated materials as they existed at some former time, and the processes that were then operating. The study of these things.

Palaeomagnetism: Magnetic signal preserved in rock from some former time.

Palaeoplain: The oldest erosion surface of which we have evidence in the landscape.

Palaeosurface: 1. A land surface that existed at some former time. 2. Part of the present land surface which has remained essentially unchanged for a long time.

Palaeotectonic: The crustal deformation at a given time in the past.

Palinspastic maps: Map showing restoration of folded and faulted rocks to their original relative position.

Pangaea, Pangea: Former supercontinent comprising all the continents: Gondwanaland and the northern continents.

Panplain: An erosion surface thought to result from lateral erosion by rivers.

Panthalassa: Hypothetical proto-Pacific Ocean.

Parallel drainage: Drainage pattern with parallel streams, often without structural control.

Parallel fold: Fold in which each bed maintains the same thickness throughout all parts of the fold.

Parasitic volcano: A volcano which was formed on the slope of a larger central volcano.

Pass: A gap in a ridge.

Passive continental margin: The side of a continent where there is no subduction or collision; a trailing edge; Atlantic type continental margin.

Pediment: Gently sloping planar surface eroded across hard rock.

Pediment pass: Pass formed by headward erosion of pediments from opposite sides of a ridge.

Pediplain: An extensive erosion surface of low relief formed by the coalescence of numerous pediments. Defined by some as an erosion surface resulting from parallel slope retreat.

Peneplain: An extensive erosion surface, almost a plain, inferred to be the result of long-continued erosion. Defined by some as an erosion surface resulting from slope decline.

Pericontinental island arc: An island arc partly attached to a continent, e.g. Alaska, Kamchatka.

Petrographic province: A region in which the igneous rocks are thought to be derived from a common parent magma.

Physiographic province: A region with similar structure, climate and geomorphic history throughout.

Physiography: The study of the genesis and evolution of landforms.

Piedmont: Lying or formed at the base of mountains.

Piedmont alluvial plain: Plain formed by coalescence of alluvial fans at the base of a mountain range.

Piercement dome: Dome in which the core (usually salt) has broken through the overlying strata.

Plain: An extensive area of nearly level land.

Planation surface: Extensive plain formed by any type of erosional process.

Planeze: A remnant of an original volcanic cone surface after radial erosion has removed much of the volcano; usually triangular.

Plastic deformation: A permanent change in the shape of a solid without rupture.

Plastic zone: Deep zone where rocks deform by plastic flow rather than by brittle fracture.

Plasticity: Property of material enabling permanent deformation without volume change, elastic rebound, or fracture.

Plate: A lithospheric plate; A first order unit of the earth's crust consisting of some continent, some ocean, or some of both.

Plate boundary: The line separating lithospheric plates.

Plate tectonics: Hypothesis that the lithosphere (comprising the earth's crust and upper mantle) consists of a number of rigid plates that move about over the asthenosphere. Many tectonic effects are thought to occur at plate boundaries

Plateau: An elevated area of comparatively flat land.

Platform: Area of thinner sediment adjoining a geosynclinal trough.

Plugs: Cylindrical bodies of igneous rock, solidified volcanic feeders. The topographic features formed by erosion of such feeders.

Plunge: The dip of a fold axis.

Pluton: A large body of igneous rock formed deep in the earth.

Pole-fleeing force: Force supposedly causing land masses to move towards the equator.

Polje (tectonic): A large depression in limestone (karst) country which is of tectonic rather than solutional origin.

Polygenic volcano: A volcano resulting from several eruptions which were interrupted by long periods of quiescence.

Ponding: The formation of a pond or lake by processes such as faulting, volcanic action, or landslide.

Positive area: Area that has been uplifted conspicuously or repeatedly.

Post-orogenic: An event that takes place after a period of folding:

Pratt isostasy: A hypothesis for hydrostatic balance based on changes in density.

Pressure, geostatic: The pressure exerted by a column of rock.

Pressure ridge: A ridge formed by lateral compression. Usually a ridge oblique to strike-slip movement.

Primarrumpf: An upwarped, progressively expanding dome, with a rise so slow that erosion keeps pace with uplift.

Principal axes of stress: The coordinate axes along which no shearing stress exists.

Principal stresses: Intensities of stress (maximum, minimum and intermediate) along each of three mutually perpendicular axes in terms of which any state of stress can be described.

Profile of equilibrium: 1. Profile of a river which is neither eroding nor depositing; a graded profile. 2. A shore profile on which the incoming and outgoing of beach materials is balanced.

Pull-apart basin: A topographic basin formed by lateral movement of crustal blocks, with exposure of simatic material in the basin.

Pyroclastic cone: Volcanic cone consisting of pyroclastics.

Pyroclastics: Fragmental volcanic material which has been blown into the atmosphere by explosive activity.

Q

Quaternary: The younger of the two systems or periods in the Cainozoic era. The past two million years.

R

Radial drainage pattern: Streams radiate from a centre, as on a volcanic cone.

Radial faults: Faults that radiate from a common centre.

Range: A chain of mountains or hills.

Reach: A straight portion of a river.

Recent: The past 10,000 years. The Holocene.

Rectangular drainage pattern: Drainage pattern resulting when streams have right-angle bends, usually joint controlled. Trellis drainage.

Recumbent fold: Fold in which the axial plane is more or less horizontal.

Reef: Ridge of rock just below the water surface, especially one of coral.

Reef atoll: A ring-shaped coral reef.

Reef complex: Reef core and all associated rocks and sediments.

Re-entrant: An indentation in a coast or in any other landform.

Regmatic: 1.Refering to strike slip faults. 2.Fault pattern.

Regolith: The generally unconsolidated material near the earth's surface, including saprolite, soil, and sometimes incidental sediments, that lies above fresh bedrock.

Regression: Retreat of a shoreline, with relative emergence of the land.

Rejuvenated fault: Fault which has moved after a long period of no movement.

Rejuvenation: Anthropomorphic expression of making streams young again. An increase in vertical erosion.

Relative relief: The difference in elevation between the high and low points in a specified area of the earth's surface.

Release fractures: Fractures that result from release of pressure.

Relief: 1. The difference in elevation between the high and low points of a specified area of the earth's surface. 2. The shape of a landform or a landscape.

Repose, angle of: The slope at which any given material will come to rest under specified conditions.

Resequent fault-line scarp: A fault line scarp in which the downfaulted side is also the topographically low side.

Resequent stream: Dip stream. Stream that flows in the direction of dip.

Resultant: A single force that produces the same results as two or more forces.

Resurgent tectonics: Renewed tectonic movement along ancient lines.

Reticulate: A network; in the form of a net.

Retrograding shore line: A shore line that is retreating under wave attack.

Reverse fault: A fault along which the hanging wall has been raised relative to the footwall.

Rheidity: Capacity of material to flow.

Rheology: Study of flowage of materials, especially the plastic flow of rocks.

Rhombochasm: A parallel-sided gap in the siallic crust occupied by simatic crust, interpreted as a dilation.

Ria: Drowned fluvial valley.

Ridge: Relatively narrow and steep-sided strip of high land.

Rift: 1.A narrow fissure. 2.A large strike-slip fault parallel to regional structures.

Rift trough: A graben.

Rift valley: Huge graben produced by subsidence between parallel faults.

Rift zone: A broad zone, generally arched, along which rift valleys, graben, etc. are concentrated.

Right-lateral fault: A strike-slip fault in which an observer on one side notes a matching feature on the far side to be displaced to his right.

Rim syncline: Synclines that develop around the periphery of domes (salt domes, granite domes), presumably in some sort of volume compensation.

Ring dyke, ring dike: A hypabyssal intrusion that is ring-shaped in plan, and dips outwards at a high angle.

Rise: A long, broad strip of the seafloor which is higher than neighbouring seafloor.

River: A stream of flowing water carrying sediment to lower ground.

River capture: The diversion of the headwaters of one river by the headward erosion of another valley, which then carries the captured headwaters.

River system: A main river and all its associated tributaries.

River terrace: A flat area bordering a river, at a higher elevation, that is a remnant of a former flood plain.

Roof and wall structure: Gravity collapse structure with a limb that bends abruptly from moderate dip to vertical.

Root zone: 1.Place where the axial plane of a recumbent fold becomes steeper and dips at a high angle into the earth.
2.Place where a low angle thrust fault becomes steeper and dips at a high angle into the earth.

S

Saddle: 1. A low point in a ridge or crest. 2. A sag in the crest of an anticline.

Sagponds: Ponds occupying depressions along active faults.

Salient: 1. A projection from any land feature. 2. A projection of a foreland into a fold belt.

Salt basins: Closed, subsiding basins filled with evaporites, often part of the rifting that precedes continental break-up.

Salt depression: A depression formed by downwarping of strata overlying salt following its solution or outflow.

Salt dome: Dome resulting from upward migration of a mass of salt.

Salt glacier: Mass of mobile salt at the earth's surface that flows slowly outward from an exposed salt plug.

Scarp: An escarpment. Steep slope bounding a plateau, bench, asymmetric cuesta, etc., or following a fault.

Scarp slope: A slope opposing a dip slope: an anti-dip slope.

Schist: Medium grained metamorphic rock with subparallel orientation of micas which dominate its composition.

Schistosity: The foliation in coarser metamorphic rocks.

Schuppen structure: Imbricate structure.

Scissors fault: Normal fault with displacement decreasing to a point of origin and then increasing again beyond that point.

Sea: A large body of water, usually part of the ocean.

Sea floor: The earth's surface beneath the sea.

Seafloor spreading: The enlargement of the seafloor by addition of new material at spreading sites associated with mid-ocean ridges.

Seamount: A submerged mountain rising from the deep sea floor.

Second order landforms: Sub-continental landforms such as major plateaus and mountain ranges, mid-continental plains.

Sector graben: Eccentric or lateral 'caldera' on the flank of a volcano, produced by down-faulting.

Sedimentary basin: Depressed area with thick sediments in the middle and thinner sediments at the edges.

Seismic: Related to earthquakes; hence seismicity.

Seismic centre: The point of origin of an earthquake.

Seismic discontinuity: Physical discontinuity within the earth separating materials in which seismic waves travel at different velocities.

Seismology: The science of earthquakes.

Separation: The distance between two originally adjacent points displaced by a fault.

Shear: 1. The effect produced by shearing stress. 2. A major fault along which shear has occurred, e.g. the Melanesian Shear.

Shearing stress: A stress causing two adjacent parts of a solid to slide past one another parallel to the plane of contact.

Sheeting: The production of joints roughly parallel to the ground surface, probably as a result of pressure release.

Shelf: Offshore zone extending from the shore to about 200 m where there is usually a rather steep descent to greater depths.

Shield: A part of a continent that has been relatively stable over a long period. A craton.

Shield volcano: A low, broad volcano many kilometres across, built mainly of lava and with slopes generally less than 10°.

Shift: The relative displacement of points on opposite sides of a fault.

Shore: The margin between land and water.

Shoreline of emergence: Shore produced when there is a relative fall in water level.

Shoreline of submergence: Shore produced when there is a relative rise of water level, generally drowning valleys and making the shore more irregular.

Shuttermidges: Ridges that have been moved laterally by strike-slip faulting and which come to block valleys.

Sial: The crustal layer that comprises the continents, of approximately granitic composition.

Sill: An intrusive body of igneous rock, sheet-like and parallel to bedding or other structure in the intruded rock.

Sima: A shell of the earth underlying the continents and directly underlying the oceans, of basaltic composition.

Similar folding: Type of folding in which each successive bed shows the same form as the bed above, implying thinning of the limbs of the fold.

Slaty cleavage: Foliation of slates and other rocks resulting from parallel arrangement of platy minerals.

Slickenside: Polished and striated surface features on a fault plane.

Slide: Landslide.

Slip-sheet: Gravity collapse structure; a bed that has slid down the side of an anticline, fractured, and slid on over the adjacent strata.

Slope: 1. Measured inclination from the horizontal. 2. An inclined landform.

Slump: The downward sliding of a mass of earth material, generally over a concave slip plane, with backward rotation of the slumped mass.

Somma type caldera: Caldera formed by collapse of the top of a volcanic cone, generally following Plinian eruption.

Sphenochasm: A triangular piece of oceanic crust separating two cratonic blocks with fault margins converging to a point, interpreted as caused by rotation.

Sphenopeizm: A wedge-shaped compressive area opposed to a sphenochasm.

Spreading site: A line away from which sea-floor spreading is taking place, by repeated intrusion of new basalt. A submarine divergent plate boundary.

Stable triple junction: A triple junction with no failed arms.

Stage names: The anthropomorphic names for stages in landscape evolution:- youth, maturity and old age.

Stillstand: A period when sea level does not change.

Stock: The solidified contents of a former magma chamber at fairly shallow depth, often roughly cylindrical.

Strato-volcano: Volcano built of both lava flows and pyroclastic deposits; often large, and built over a long period.

Stratum (plural Strata): A bed or layer of sedimentary rock.

Stream: A body of flowing water.

Stream capture: The abstraction of the headwaters of one stream by headward erosion of another stream.

Stream order: Topological scheme for labelling streams. First order streams are unbranched. Two first order streams unite to form a second order. Two second order streams unite to make a third order stream, and so on. There are several systems of stream ordering.

Strength: The limiting stress that a solid can withstand without failing by rupture or continuous plastic flow.

Stress: Force per unit area.

Stress difference: Algebraic difference between maximum and minimum principal stresses.

Strike: The bearing of the outcrop of strata or a structure on a level surface.

Strike ridge: A ridge running parallel to the strike of local strata.

Strike-slip fault: A fault along which movement is mainly horizontal in the direction of the fault.

Strike stream: A stream parallel to the strike.

Strike valley: A valley parallel to the strike.

Stripping: Removal of regolith by erosion, perhaps to create an etchplain.

Structural basin: A roughly circular structure in which the rocks dip towards the centre.

Structural bench: A terrace or similar flat area underlain by level strata.

Structural control: The apparent control of form and location of landforms by underlying geological structure.

Structural feature: An individual aspect of the spatial relationships and mutual arrangement of rocks, strata, dislocations, etc.

Structural geology: Study of the structural features of rocks.

Structural geomorphology: The study of landforms that are related to rock structure.

Structural high: The higher part of an anticline or dome.

Structural landform: Landform created by erosion which was largely guided by structures in the eroded rocks.

Structural low: The lowest part of a syncline or basin.

Structural plain: A plain on level strata, possibly owing its existence to some hard band.

Structural valley: A valley with an orientation that follows a geological structure.

Structure: 1. The mutual relationship of structural features. 2. The sum total of all the structural features of an area. 3. Sometimes used to refer to an individual structural feature.

Structure contour: A contour drawn through points of equal elevation on a stratum.

Subduction: The movement of one plate, possibly with overlying sediment, under another plate at a plate tectonics collision boundary.

Submarine canyon: Steep valleys that cross the continental margin.

Submergence: Relative fall of land relative to sea at a coast.

Sub-ocean ridge: Alternative name for so-called mid-ocean ridge, as such ridges are not always located in mid-ocean.

Subsequent stream: Strike stream.

Subsequent valley: Strike valley.

Subsidence: Downward movement of part of the earth's surface.

Subsidence caldera: A caldera produced by the collapse of a volcanic structure following removal of underlying support.

Summit accordance (concordance): The roughly equal elevation of ridge tops and mountain summits that might indicate the former existence of an ancient erosion surface which has been largely destroyed.

Superimposed stream: A stream with a course that was originally established on overlying strata, or on an erosion surface at a higher elevation. The course has been maintained at a lower level, even though the stream course may now be discordant to structure.

Surface thrust: Thrust fault in which the hanging wall is thrust over the ground surface.

Suspect terrane: A region suspected of being a terrane.

Suture: A line, fault, or zone along which continental blocks have collided.

Swell: A low dome.

Symmetrical fold: A fold with limbs dipping at similar angles.

Synclinal axis: The central line of a syncline towards which each limb dips.

Synclinal valley: A valley located along the axis of a syncline.

Syncline: A fold in rock in which the limbs dip inwards.

Synclinorium: A broad regional syncline including many minor folds.

Syneclise: Broad depression or basin of large size.

Synorogenic: Adjective to describe a geological event, usually granite intrusion, at the same time as the folding of a fold belt.

T

Tableland: Level elevated area, a plateau.

Tablemount: A seamount with a flat top, a guyot.

Tablemountain: 1. A flat-topped mountain, often structurally controlled. 2. A tuya.

Taphrogenesis: Broad vertical movements with high-angle faulting.

Taphrogeny: The formation of rift valleys.

Tear fault: Strike-slip fault that trends transverse to the strike of the deformed rocks.

Tectogene: Deeply downbuckled belt of sediments.

Tectogenesis: The process by which rocks are deformed, the formation of folds, faults, joints and cleavage.

Tectonic: Pertaining to rock structure formed by movement.

Tectonic basin: A surface basin created directly by deformation of the earth's crust.

Tectonic framework: The structural elements of a region, especially the rising, sinking and stable areas.

Tectonic landform: Landform created directly by tectonic movement (tectonism).

Tectonic map: Map showing major structural features related to a time element. Without a time element they are simply structural maps.

Tectonic melange: Body of rock composed of tectonically mixed blocks in a sheared shaly matrix.

Tectonic relief: Relief formed directly by tectonic activity.

Tectonic transport: Movement within a rock by flowage.

Tectonics: Study of the broader structural features of the earth, and their causes.

Tectonism: 1. Movement in the earth's crust. 2. Crustal instability. 3. Structural behaviour of an element of the earth's crust.

Tectonosphere: The crust of the earth where tectonic activity takes place.

Tectonostratigraphic terrane: A fault-bounded geological entity of regional extent that is characterised by a geological history different from that of neighbouring terranes. An allochthon.

Temporary base level: Lowest level to which a stream can erode under existing structural conditions.

Tensile stress: A stress tending to pull material apart.

Tension: A system of forces tending to pull material apart.

Tension fault. Fault produced by tension.

Tension fracture: Any fracture produced by tension.

Tension joint: A joint that is a tension fracture.

Terrace: Relatively flat area bounded by steeper slopes above and below, often long and narrow.

Terrain: An area of land considered as a group of natural features, especially landforms. An area characterised by a particular kind of topography.

Terrain analysis: Division of a region into terrain elements with similar natural features, especially landforms.

Terrane: see Tectonostratigraphic terrane.

Tertiary: The earlier of the two periods comprising the Cainozoic era (the other is the Quaternary). The system of strata deposited during that period.

Tethys: Pre-Tertiary seaway that separated Europe and Africa and extended across south east Asia.

Tetrahedron theory: Idea that the earth, in shrinking, tends to adopt the form of a tetrahedron rather than a sphere.

Thalassic: Pertaining to the sea.

Thalweg: 1. The long profile of a stream or valley. 2. Line joining the deepest points of a stream channel.

Third order landforms: Individual landforms such as hillsides or valleys.

Threshold: Physical point at which the behaviour of material changes in style, such as from laminar to turbulent flow, from plastic deformation to fracture.

Thrust: 1. Push forward. 2. Fault replacing the overturned limb of a fold.

Thrust fault: A reverse fault, with low angle of inclination.

Thrust plane: The plane of a thrust fault.

Thrust scarps: 1. Sinuous scarps marking the outcrop of a low-angle thrust sheet. 2. Fault scarp of high angle reverse fault.

Thrust sheet: The block above a thrust fault.

Tight fold: Fold in which the limbs diverge at a small angle.

Tilt: Movement which makes horizontal surfaces slope.

Tilt block: Fault block, the surface of which has been tilted.

Tilt slide: Gravity slide down the slope of a tilted surface.

Topography: The three-dimensional shape of the land surface of any area. Physical features of an area, especially the relief and landforms.

Trailing edge: Edge of a continent where no subduction is occurring; a passive continental margin.

Transcurrent fault: Strike-slip fault.

Transfer faults: Transverse strike-slip faults that allow accommodation of different rates and amounts of continental extension. They allow transfer of extension from one location in the crust to another.

Transform fault: Category of chasmic fault, usually on the sea floor, in which a strike-slip fault gives way to a fault trace along which there is no displacement.

Transgression: Movement of a coastline in a landward direction resulting from a relative rise in sea level.

Transpression: Oblique compression.

Transtension: Oblique extension.

Transverse fault: A fault whose strike cuts across the general structure.

Trellis drainage: Stream pattern in which tributaries join master streams almost at right angles, usually a combination of strike and dip streams.

Trench: Long, narrow depression in the deep sea, often bordering an island arc.

Triple junctions: Y-shaped junctions where three plates come together and where three spreading sites join.

Trough: A relatively long and narrow depression.

Turtleback: A large, curved topographic surface underlain by metamorphic rocks with foliation parallel to the topographic feature. Variant of gneiss mantled dome. Mainly in Death Valley region, USA.

Turtleback fault: Fault above the metamorphic rock in a turtleback, variously interpreted as a thrust fault, normal fault, or gravity slide.

Tuya: A mountain formed by volcanic eruption beneath an ice cap, with a caprock of lava flows over pillow-lava and pyroclastics.

U

Ultimate strength: The greatest stress that a substance can stand under normal short-time experiments.

Unconformity: A surface in a stratigraphic section with features indicating a period of erosion or non-deposition separating younger strata from older rocks.

Undation: Large-scale wave-like fold in the earth's crust.

Undation theory: Theory of mountain building based on broad wave-like uplift with associated gravity sliding and folding, with an outward migration of the wave of uplift.

Underfit stream: A stream considered too small to have made the valley in which it now flows.

Uniclinal shifting: The down-dip lateral movement of a river through time across the top of a resistant bed.

Uplift: Upward movement of part of the earth's surface.

Upthrust: Upward movement of a block, usually on a high-angle thrust fault.

Upwarp: Broad uplift of an area with slight bending.

V

Valley: A long depression, usually followed by a stream.

Valley bulge: Apparent anticline following the line of a valley, formed where incompetent material is forced up into the river bed (and eroded away) by the weight of the hill masses on either side. Competent beds become turned up at the valley sides.

Vertical slip: The vertical component of net slip in faulting.

Vertical tectonics: Tectonics resulting from vertical (radial) movement, as opposed to horizontal (tangential) movement as in compressive folding.

Volcanics: General term for all rocks and pyroclastics erupted from volcanoes.

Volcano: 1. A vent in the earth's crust from which lava, pyroclastics and gas are erupted. 2. A mountain or hill built up by accumulation of material erupted from a volcanic vent.

Volcano-tectonic depression: Surface depression caused by the collapse of the roof of a magma chamber brought about by rapid emptying of the magma.

W

Warping: Gentle bending of the earth's crust, usually over a broad area, without forming pronounced folds or dislocations.

Water gap: A gap in a ridge through which a stream flows.

Watershed: 1. Divide or interfluve; a line separating different catchments. 2. In American usage: a catchment, a drainage basin.

Weathering: The chemical and physical alteration of rocks and minerals under conditions at or near the earth's surface; commonly a response to low pressure and abundant air and water.

Weathering crust: 1. (mainly Russian usage) The entire zone below the earth's surface which is affected by weathering; Regolith. 2. A zone of induration related to weathering; duricrust, e.g. ferricrete, calcrete.

Weathering front: The often abrupt junction between weathered and unweathered rock.

Wildflysch: Highly contorted flysch, containing clay, shale, sandstone and exotic blocks.

Wind gap: Notch through a ridge, no longer followed by the stream which made it.

Window: Area in an overthrust sheet where rocks beneath the thrust plane are exposed by erosion.

Wrench fault: A nearly vertical strike-slip fault.

Y

Young valley: A narrow, very steep-sided valley; A V-shaped valley; A valley with irregular long profile. Anthropomorphic term for alleged early stage of valley evolution.

Youthful landscape: Anthropomorphic term for landscape considered to be in early stage of development. A landscape with many plateau remnants, and tendency for rivers to flow in gorges.

Z

Zigzag folds: Very sharp V-shaped folds with straight limbs.

Zwischengebirge: Median mass. A plateau between two outwardly-thrust fold belts or mountain ranges.