imaginative manner. Studies have been carried out by laboratory simulations of erosion process, monitoring of losses of soil in the field and by prediction of wind erosion. Population explosion in several countries has resulted in overgrazing by cattle, over-cultivation to meet food needs, over-pumping of ground water and so on. Appreciable decrease in rainfall due to removal of vegetation has been identified in several areas.

Right through history flooding has been a widespread natural disaster. Flood plains and alluvial fans have been prone to inundation. In many cases, the dimensions of disasters had been known in advance and to the cause identified. The most common causes of flooding are heavy rainfall and melting of glaciers. The other causes include volcanic eruptions beneath glaciers, draining of englacial and subglacial lakes and breaching of dams. Infiltration capacity of soils and moistures conditions influence coversion of precipitation into discharge. Land use changes can also cause flooding urbanisation leads to the construction of impermeable surfaces and gutters leading to gushing of surface waters.

Slope instability leads to simple soil creep of little consequence and also disastrous landslides. Mudflows, volcanic mudflows (Lahars) and bog-bursts are known to lead to catastrophic consequences. Simply put, landslides are triggre when the forces responsible for movement exceed those resisting it. In essence, movement takes place from an unstable to a stable state. Man has contributed his share to slope instability by modifying natural slopes.

Subsidence of ground surface is a problem to reckon with in the present stage of industrial development withdrawal of fluids including water and oil form depth leads to slow but sure and extensive subsidence. Compaction of sediments after irrigation and land drainage as also mining of solid ores cause subsidence. In the Jharia Coalfield in Jharkhand, extensive subsidence of land due to removal of coal from depth has been known for long. Underground fires in coalfields is yet another problem. Management of environment to prevent and retard subsidence has received due attention in several countries.

Geomorphological process act with rapidly in the coastal environment. Flooding, erosion, coastal deposition and pollution are the factors involved. Long-term, retreat and erosion of the

The zone of weathering of the earth's crust is that portion of the lithosphere which has subjected to weathering processes under sub-aerial conditions. Since climate, especially temperature and moisture, have profound influence on chemical breakdown of minerals, the weathering styles as also depth of weathering vary from one climate zone to another.

Mass Wasting

The various types of mass wasting have been classified by Sharpe (1938) under four heads, including slow flowage type, rapid flowage type, landslides and subsidence. The causes which activate the processes may be passive or active. Passive causes may be due to weak and loose consolidated materials turning slippery when wet: presence of thinly bedded and alternating permeable and impermeable beds; presence of weak zones like faults, joints and so on; steep ground slopes; large changes in diurnal and annual temperature ranges; and poor or no vegetal cover. The causes which activate the processes may be due to steepening of slopes by running water, overloading by water saturation and excavation of material by natural or man-made agencies.

Crustal Erosion and Material Transportation

Each of the agents of erosion, including running water, ground water, waves currents, wind and glaciers has a distinct style of processes. However, erosion encompasses, acquisition of loose material, grinding and wearing down of the bed rock by the material that is in movement, mutual attrition of particles in movement and transportation of the basis. Solution may be an important aspect under some conditions.

Aggradation

When weathering of rocks occur, the resulting debris is deposited and agents like wind, running water, ground water, currents and waves play their part in depositional processes. No doubt, sculptured landforms produced by erosion are more attractive than depositional landforms, but then both are of equal importance in the study of features of the earth's surface.

continental shelf, approximately located 0.135 kilometres below the sea-level delimits the continental rocks. The continental slope from its outer edge descends at slopes up to 6° to depths of two kilometres. Continental sediments in the form of coalescing fans and aprons mark the base of the continental slope. In the seaward extension of large rivers submarine canyons mark the continental shelf and slope off the east coast of Australia, the shelf is characterised by thick coralline limestones.

OCEAN TRENCHES, DEEPS OR TROUGHS

The Western Pacific and the Caribbean Coastal area, the continental shelf plunges steeply into trenches, some of which define the deepest parts of the ocean floor. They are known to be variable in length (300–5000 kilometres) and 30–100 kilometres in width, with slopes of 10°–16° in their deeper parts. The trenches run parallel to island arcs or young volcanic zones on their seaward side. A characteristics feature of trenches is their negative gravity anomaly.

Island Arcs

Most ocean trenches on their landward side are marked by parallel accurate festoons of islands as in New Guinea and Hikkaido. In certain cases they are topographically and structurally continuous with continents belts of young folded mountains such as in Malaysia, Alaska and Kamchatka. They are tectonically active zones with profound seismicity. While they slow strong negative anomalies, positive anomalies are marked on their continental sides.

Marginal Sea Basins

Marginal sea basins occur between island arcs and continents as for example the sea of Japan and the sea of Okhotsk, some of them are 500 to 1,000 kilometres wide and have rugged bottoms with faults, undulations and small sea-mounts, characterising complex histories and different sediment sources. Both tectonically active and inactive basins and known.

Folded Mountains

Sediments under the impact of compression. Folding, thrusting and uplift are thrown up as curvilinear mountain chains which

attributable to the higher density of the lithosphere slab that is .er thrust.

There is difference in the types of volcanism in these island arcs. The arcs of Japan, Kamchatka and Indonesia are marked by landsite volcanism, the younger arcs show basaltic and basaltic andesitic volcanism. Some of the islands in these arcs have a long history of volcanic activity. The Honshu arc of Japan lates back to Ordovician. It is considered that the islands have grown by progressive addition of volcanic material from successive arc systems. In general, islands arcs are characterised by holistic, calc-alkalis and alkalis types of volcanic rocks. Islands arc disseminated copper deposits are reported from the the Philippines, South Pacific island arcs and New Guinea. Miyashiro recognised paired metamorphic belts of similar age but different types in the island arcs, particularly around the pacific ocean–an inner low pressure belt (with andalusite and granitic rocks) and an outer high pressure belt with aucophane, amphibolites and surpentinites.

8. DELTAS

Deltas are prominent areas near the margins of continents and sometimes extend far into the continental shelf, as in the case of the Ganga delta. A preliminary classification based on shape recognise five types of deltas which are as follow:

(i) *The Arcuate Delta*: The word delta is derived from the shape of the Greek letter Δ. An actuate delta has a three sided outline with the seaward margin convex or actuate. The Nile and the Niger deltas belong to the actuate delta.

(ii) *Estuarine Delta*: Estuarine delta is funnel shaped, has a length several times greater than its maximum width. For example, the Mackenzie river delta. NW Canada. The distributaries are braided or anastomosing and are separated by sand bars or island, which locally may be salty. Estuarine sediments may accumulate in certain river mouths, where the directions of stream flow is reversed by daily t dal incursions Estuarine deltas are formed when the opposing for s of stream and tidal energies are nearly equal and where the s eams transport sand and silt size sediments, in addition to day ize material.

(iii) *The Bir's-foot Delta*: Delta, which has the shape of a bird's-foot. The distributaries are relatively a few in number and the width