



Denudation activity  
of exogenic agents

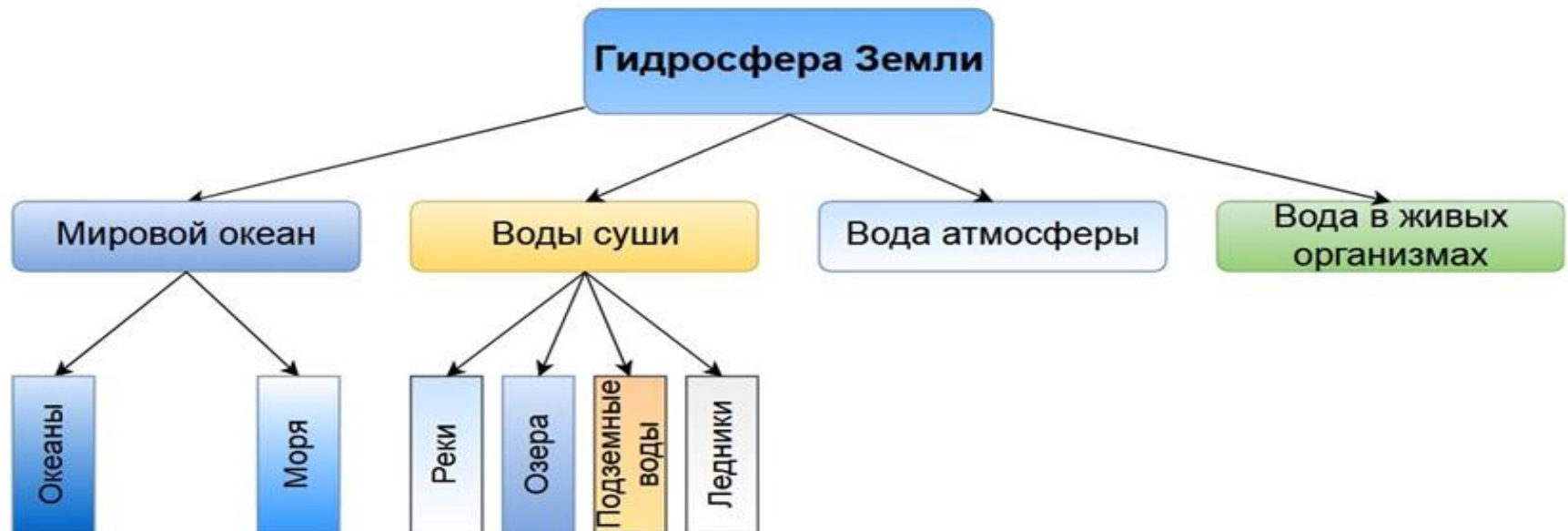
Denudation activity  
of rivers, seas



# THE HYDROSPHERE

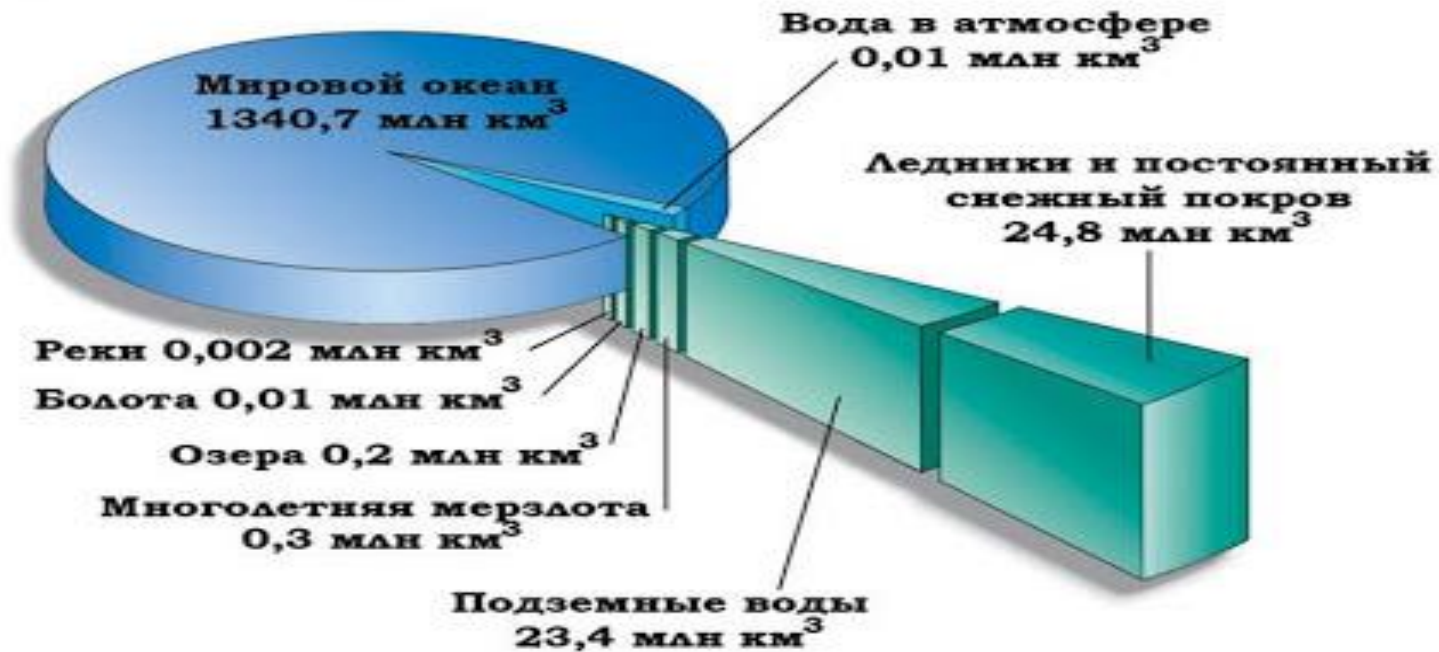
The hydrosphere is the discontinuous watery shell of the Earth. It is usually divided into the World Ocean, continental surface and underground waters.

The mass of the hydrosphere is 275 times the mass of the atmosphere, but it is only  $1 \ / \ 400$  of the mass of the Earth. It contains  $1.46 \times 10^{24}$  grams of liquid water and ice and covers more than  $2/3$  of the earth's surface.



# THE HYDROSPHERE

## Состав гидросферы



The bulk of the hydrosphere — about 94% — is concentrated in the World Ocean, approximately 4.5% of it falls on continental water bodies and groundwater, and about 1.5% is concentrated in continental glaciers.

# THE HYDROSPHERE



The total volume of the Earth's hydrosphere is about 1.458 billion km<sup>3</sup>



# Geological activity of the hydrosphere



# Geological activity of rivers

**Rivers** are constant streams of water. Their geological activity consists of linear erosion of flowing waters, the transfer of erosion products and their deposition. Distinguish between deep (bottom) and lateral erosion.



- **Bottom erosion** is expressed in the deepening of the river bed (the destructive force is directed into the depths of the Earth);

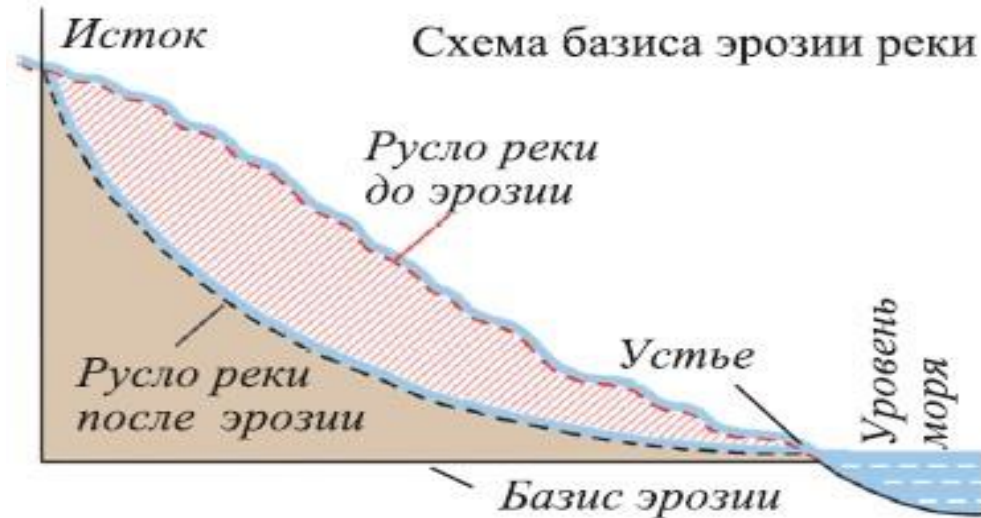
**Lateral erosion** is the destruction of the banks and the widening of the river valley.

Both types of river erosion manifest themselves simultaneously, however, depending on the place of the river and the period of its development, one or another type may prevail.



So, in the upper reaches of the river, deep erosion prevails, and in the lower reaches - lateral.<sup>6</sup>

# Геологическая деятельность рек. Базис эрозии



The ultimate goal of river erosion is to develop a longitudinal profile of the equilibrium of the river, which is a curve of changes in the heights of the river bottom along its entire length - from the source to the mouth.

The shape of the river's longitudinal profile is determined by the primary relief of the area, the height difference between the source and the mouth, the number of tributaries, the strength of the rocks of the river bed, etc. As the river erodes, its longitudinal profile continuously deepens, approaching the level of the basin into which the river flows. This level is called the **basis of erosion**.

# The transporting work of rivers

The transporting work of rivers is manifested in the transfer of matter by dragging and rolling it along the bottom, in suspended and dissolved states.



The transfer of large debris (boulders, boulders) along the bottom by dragging them is accessible only to mountainous, turbulent rivers.



Sandy or clayey material is usually transported in the bottom layer of the river.



# The transporting work of rivers

The **creative** work of rivers is expressed in the accumulation of new sedimentary rocks of the river type, which are called alluvial (Latin - alluvial, alluvial). Rivers carry a huge amount of materials in solid state and in solution.



Долина Миссисипи

Every year, rivers carry out almost 20 billion tons of substances to the seas and oceans, of which almost 18.5 billion tons are solid particles. Annual removal of matter by some rivers of the world (million m<sup>3</sup>): Amu Darya-45; Mississippi - over 200; Ganges - more than 450; Yellow River - about 1000. On average, across the globe, suspended sediment from rivers corresponds to the removal of 201 tons of material from each square kilometer of land.

# Geological activity of temporary streams



The geological activity of temporary streams is manifested to a much lesser extent than the work of rivers.

Nevertheless, in some cases, this activity is significant and leads to tangible results.

During the geological activity of temporary streams, ravines and mudflows are formed.

# Geological activity of temporary streams, ravines

A ravine is a steep-slope valley created by the activity of a temporary or small permanent watercourse on elevated-flat areas composed of loose rocks (loess, loam, sandy loam).



The length of the ravines is from meters to several kilometers, the width is up to several tens of meters, the depth is several meters. They are formed on hilly plains, hills, in the foothills. The development of ravines is facilitated by irrational nature management (deforestation, plowing of steep slopes, etc.).

## Geological activity of temporary streams, mudflows



Deposits of mudflows are typical for mountainous areas with significant elevation differences. Mudflows are understood as temporary mud - stone stream that forms during intense melting of snow or heavy rains on mountain slopes and in gorges.



Three conditions are necessary for the formation of a mudflow: the dissection of the relief, the presence of a large amount of clastic material on the slopes, and the stormy nature of precipitation. When entering the plains, mudflows spread out, forming a kind of cones at the foot of the mountains - fanning cones. Deposits of mudflows, ravines are called - proluviy

# Geological activity of temporary streams, landslides



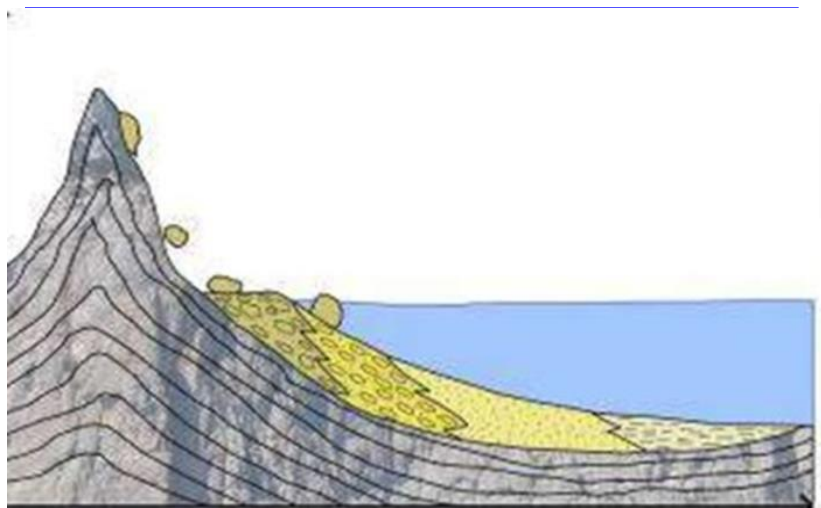
Landslides. Natural movement of rock mass under the influence of its own weight of groundwater and atmospheric precipitation. This process occurs on the slopes of hills, on the steep banks of ravines, rivers, lakes and seas. The sliding width reaches hundreds of meters, and the volume of the displaced masses is millions of cubic meters.

Landslide processes create a specific landslide type of relief, characterized by tuberosity, terrace-like ledges, cracks, separation walls, displacement surfaces, differently inclined tree trunks (drunk forest). There are several types of landslides: landslides-streams, squeeze-out landslides, mudslides, etc.

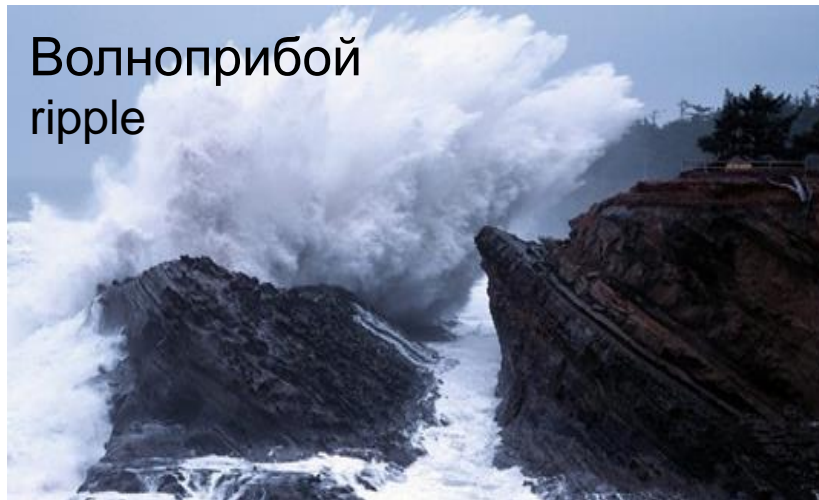




Destructive activity  
of the hydrosphere  
(activity of seas,  
lakes, reservoirs)

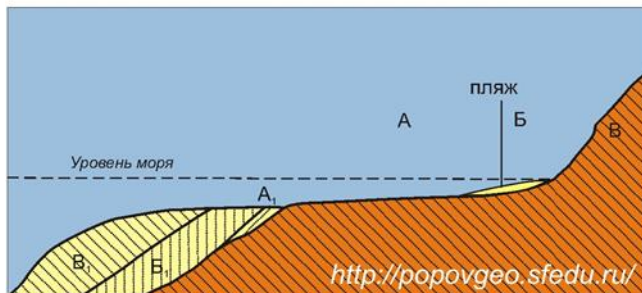
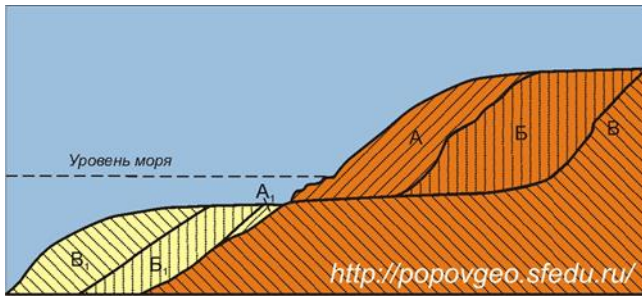
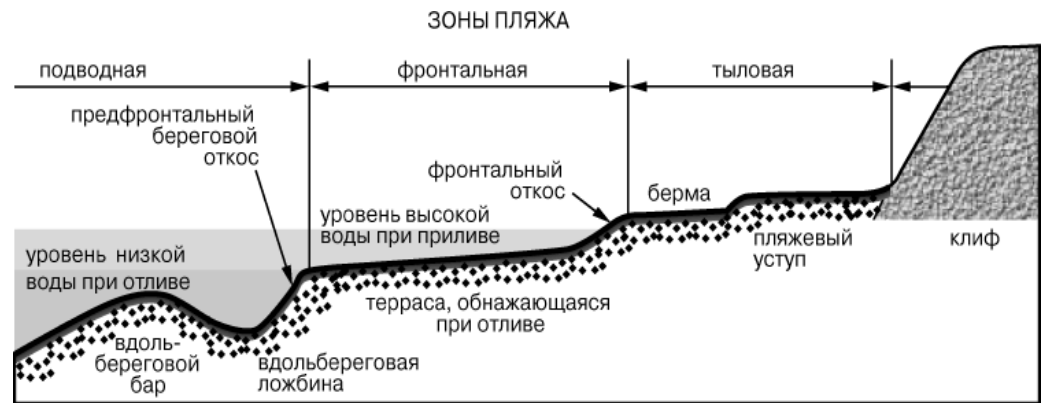


# The destructive activity of the sea



# Деятельность моря

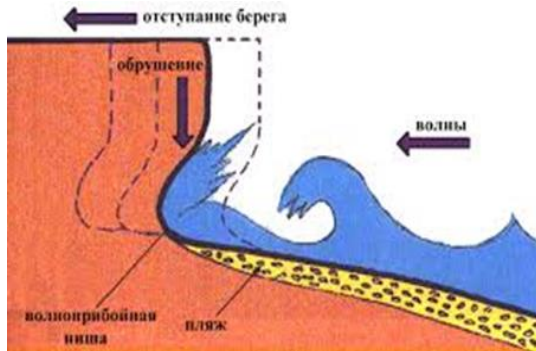
The sea is doing a great geological work: the destruction of the shores - **abrasion**, **transportation** of destroyed material and **sedimentation** of marine sediments.



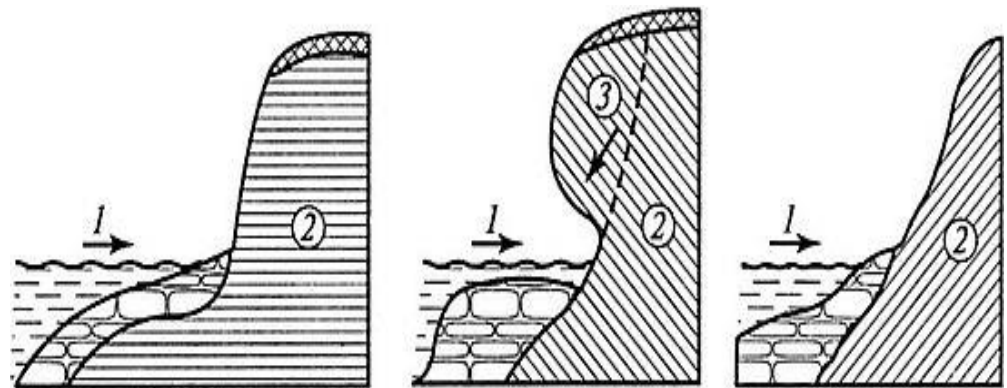
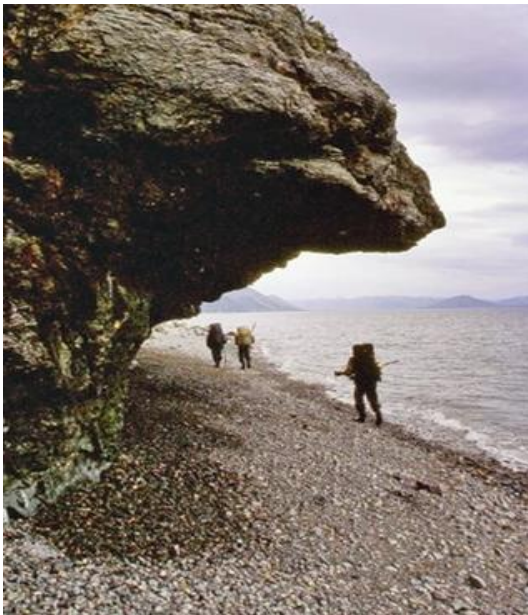


# Разрушительная деятельность моря

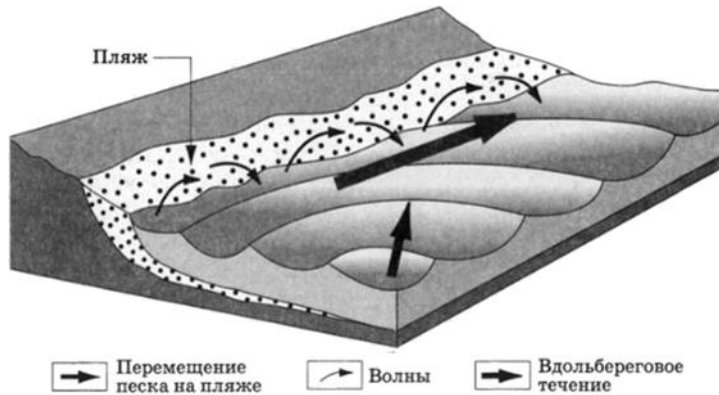
**Coastal destruction** occurs under the influence of waves, ebb and flow and coastal currents. Marine abrasion, acting constantly on the coast, first leads to the formation of a wave-breaker niche, or neck, which is located at the base of the steep coast.



When the wave-breaking niche grows inland, the water washes away the steep coast until it collapses under the influence of its own mass. The resulting debris form an accumulative terrace, and the steep coast (cliff) recedes towards the continent.



# Транспортирующая деятельность моря



Sea currents and waves redistribute debris that got into the sea from rivers or during the own destruction of the coast.

The eroded material is deposited under water, forming an accumulative terrace at the foot of the continental slope (**abrasive terrace**).

If the coast is shallow and the sea is shallow, **accumulative terraces** are formed at the water's edge.

Extensive sandy beaches are being formed.



# Geological activity of lakes and large reservoirs

Lakes are distinguished by **size**, **shape**, **salinity**, **temperature**, **nature of sediments**, etc.

The most common classification of lakes by origin (genesis). From these positions, lakes of exogenous and endogenous origin are distinguished.

**Exogenous** lakes arose due to the activity of external forces of nature. By the nature of the depression filled with water, exogenous lakes are divided into hollow (karst, glacial, eolian) and dam lakes.

**Endogenous** lakes are: Volcanic, tectonic.



## Разрушительная деятельность озер

The **geological activity** of the lakes consists in the destruction of the shores, transportation of debris and the formation of lacustrine sediments.

The destructive work of lakes (lake abrasion) is relatively small, since in most cases lakes are established water systems.

When the balance between land Coast and water is disturbed, the steep coast is washed away, as in the case of marine abrasion.

The destructive work is best seen at artificial lakes. This activity is usually seen as coastal recycling.



During storms on such lakes (for example, on Bukhtarma), the wave height can reach 1.5 m, which leads to the destruction of coastal slopes, the formation of landslides and landslides. As a result, the lake shores are retreating.