

Slack water (slack tide): The state of a tidal current when its velocity is near zero, especially the moment when a reversing current changes its direction and its velocity is zero. The term is also applied to the entire period of low velocity near the time of turning of the current when it is too weak to be of any practical importance in navigation. The relation of the time of slack water to the tidal phases varies in different localities. In some places slack water occurs near the times of high and low water, while in other localities the slack water may occur midway between high and LOW WATER.

Ebb: Period when tide level is falling; often taken to mean the EBB CURRENT which occurs during this period.

Ebb current: The movement of a tidal current away from shore or down a tidal stream. In the semidiurnal type of reversing current, the terms GREATER EBB and LESSER EBB are applied respectively to the ebb currents of greater and lesser velocity of each day. The terms of MAXIMUM EBB and MINIMUM EBB are applied to the maximum and minimum velocities of a continuously running *ebb current*, the velocity alternately increasing and decreasing without coming to a slack or reversing. The expression MAXIMUM EBB is also applicable to any EBB CURRENT at the time of greatest velocity.

Ebb interval: The interval between the transit of the moon over the meridian of a place and the time of the following strength of EBB.

Ebb strength: The EBB CURRENT at the time of maximum velocity.

Ebb tidal delta: The bulge of sand formed at the SEAWARD mouth of TIDAL INLETS as a result of interaction between tidal currents and waves. Also called inlet-associated bars and estuary entrance shoals.

Ebb tide: A nontechnical term used for falling tide or EBB CURRENT. The portion of the tidal cycle between high water and the following low water. See Figure 11.

Flood: (1) Period when tide level is rising; often taken to mean the flood current which occurs during this period. (2) A flow above the CARRYING CAPACITY of a CHANNEL.

Flood current: The movement of a tidal current toward the shore or up a tidal stream. In the semidiurnal type of reversing current, the terms *greater flood* and *lesser flood* are applied respectively to the flood currents of greater and lesser velocity each day. The terms *maximum flood* and *minimum flood* are applied to the maximum and minimum velocities of a flood current the velocity of which alternately increases and decreases without coming to slack or reversing. The expression *maximum flood* is also applicable to any flood current at the time of greatest velocity.

Flood interval: The interval between the transit of the moon over the meridian of a place and the time of the following flood.

Flood mark: Proof of any kind on the shoreline used to determine the highest level attained by the water surface during the flood (note: the height of the flood mark usually includes the WAVE RUN-UP).

Spring range: The average SEMIDIURNAL RANGE occurring at the time of SPRING TIDES and most conveniently computed from the harmonic constants. It is larger than the MEAN RANGE where the type of tide is either SEMIDIURNAL or MIXED, and is of no practical significance where the type of tide is DIURNAL.

Spring tidal currents: Tidal currents of increased velocity occurring semi-monthly as the result of the moon being new or full.

Spring tide: A tide that occurs at or near the time of new or full moon, and which rises highest and falls lowest from the MEAN SEA LEVEL (MSL).

Stand of tide: An interval at high or LOW WATER when there is no discernable change in the height of the tide. The water level is stationary at high and LOW

WATER for only an instant, but the change in level near these times is so slow that it is not usually perceptible. See SLACK TIDE.

Neap high water: See NEAP TIDE.

Neap low water: See NEAP TIDE.

Neap range: See NEAP TIDE.

Neap tidal current: Tidal current of decreased velocity occurring semimonthly as the result of the moon being in quadrature.

Neap tide: Tide of decreased range occurring semimonthly as the result of the moon being in quadrature. The NEAP RANGE of the tide is the average semidiurnal range occurring at the time of neap tides and is most conveniently computed from the harmonic constants. The NEAP RANGE is typically 10 to 30 percent smaller than the mean range where the type of tide is either semidiurnal or mixed and is of no practical significance where the type of tide is DIURNAL. The average height of the high waters of the neap tide is called NEAP HIGH WATER or HIGH WATER NEAPS (MHWN), and the average height of the corresponding LOW WATER is called NEAP LOW WATER or LOW WATER NEAPS (MLWN).

Semidiurnal: Having a period or cycle of approximately one-half of a tidal day (12.4 hours). The predominating type of tide throughout the world is *semidiurnal*, with two high waters and two low waters each tidal day. The tidal current is said to be *semidiurnal* when there are two flood and two EBB periods each day. See Figure 11.

Semidiurnal tide: Tides occurring twice daily. There are two high and two lows per tidal day. See Figure 12.

Tidal current: The alternating horizontal movement of water associated with the rise and fall of the tide caused by ASTRONOMICAL TIDE-producing forces.

Tidal datum: See REFERENCE PLANE.

Tidal day: See LUNAR DAY.

Tidal delta: See DELTA.

Tidal flats: (1) Marshy or muddy areas covered and uncovered by the rise and fall of the tide. A TIDAL MARSH. (2) (SMP) Marshy or muddy areas of the seabed which are covered and uncovered by the rise and fall of tidal water.

Tidally driven circulation: The movement of fresh water and seawater that are mixed by the sloshing back and forth of the ESTUARY in response to ocean tides.

Tidal marsh: Same as TIDAL FLATS.

Tidal period: The interval of time between two consecutive like phases of the tide or tidal current. See Figure 11.

Tidal pool: A pool of water remaining on a BEACH or REEF after recession of the tide.

Tidal prism: (1) The total amount of water that flows into a HARBOR or out again with movement of the tide, excluding any fresh water flow. (2) (SMP) The volume of water present between MEAN LOW and MEAN HIGH TIDE.

Tidal range: See RANGE OF TIDE.

Tidal rise: The height of tide as referred to the DATUM of a chart. See Figure 11.

Tidal stand: An interval at high or LOW WATER when there is no observable change in the height of the tide. The water level is stationary at high and LOW WATER for only an instant, but the change in level near these times is so slow that it is not usually perceptible.

Tidal wave: (1) A wave, in the oceans and seas, produced by tides and tidal currents. (2) Non-technical term in popular usage for an unusually high and destructive water level along a shore. It usually refers to STORM SURGE or TSUNAMI.

Tide: The periodic rising and falling of the water that results from gravitational attraction of the moon and sun acting upon the rotating earth. Although the accompanying horizontal movement of the water resulting from the same cause is also sometimes called the *tide*, it is preferable to designate the latter as TIDAL CURRENT, reserving the name TIDE for the vertical movement. See Figure 11.

Tide, astronomic: The periodic change in magnitude and direction of gravity as caused by attraction of the Sun, Moon, and other members of the Solar system.

Tide, diurnal: See DIURNAL.

Tide, Ebb: See EBB TIDE.

Tide, flood: See FLOOD TIDE.

Tide gage: A device for measuring the rise and fall, and the current height of the tide.

Tide level: The height of the tide above a specified level.

Tide, mixed: See MIXED TIDES.

Tide, neap: See NEAP TIDES.

Tides, rip: See RIP.

Tide, semidiurnal: See SEMIDIURNAL, SEMIDIURNAL TIDE.

Tide, slack: See SLACK WATER.

Tide, spring: See SPRING TIDES.

Tide staff: A tide gage consisting of a vertical graduated staff from which the height of the tide can be read directly. It is called a *fixed* staff when it is secured in place so that it cannot be easily removed. A *portable* staff is one that is designed for removal from the water when not in use.

Tide station: The geographic location at which tidal observations are made. It is called a *primary tide station* when continuous observations are to be taken over a number of years to obtain basic tidal data for the locality. A *secondary tide station* is one operated over a short period of time to obtain data for a specific purpose.

Tide tables: Tables which give daily predictions of the times and heights of the tide. These predictions are usually supplemented by tidal differences and constants by means of which additional predictions can be obtained for numerous other places.

Tides, types of: The characteristic form of the tide with special reference to the relation of the DIURNAL and semidiurnal waves. Tides are sometimes classified as DIURNAL, SEMIDIURNAL and MIXED, but there are no sharply defined limits separating the groups. The tide is said to be DIURNAL when the diurnal wave predominated and only a single high and single LOW WATER occur each day during the greater part of the month. The tide is SEMIDIURNAL when the semidiurnal wave predominates and two high and two low waters occur each tidal day with a relatively small inequality in the high and LOW WATER heights. In the MIXED type of tide the DIURNAL and semidiurnal waves are both important factors and the tide is characterized by large inequality in the high or

LOW WATER heights or in both. There will usually be two high and two low waters each day, but occasionally the tide will become DIURNAL. See Figure 11.

Tide, wind: See WIND TIDE.

Wave: (1) An oscillatory movement in a body of water manifested by an alternate rise and fall of the surface. (2) A disturbance of the surface of a liquid body, as the ocean, in the form of a ridge, swell or hump. (3) The term *wave* by itself usually refers to the term SURFACE GRAVITY WAVE (PROGRESSIVE). See also CAPILLARY WAVE, GRAVITY WAVE, PROGRESSIVE WAVE, STANDING WAVE, TIDE WAVE, TSUNAMI. See Figure 10.

Wave age: The ratio of wave velocity to wind velocity.

Wave base: The plane or DEPTH to which waves may erode the bottom in shallow water.

Wave climate: Average condition of the WAVES at a place, over a period of years, as shown by height, period, direction, etc.

Wave climate atlas: Series of maps showing the variability of wave conditions over a long COASTLINE.

Wave crest: (1) The highest part of the wave. (2) That part of the wave above still water level.

Wave crest length: See CREST LENGTH.

Wave-cut platform: A horizontal BENCH of rock formed beneath the surf zone as a COAST retreats because of wave EROSION.

Wave delta: See DELTA.

Wave direction: The direction *from which* the waves are coming.

Wave drift: The small net forward displacement of water in the direction of the wave travel, particularly in waves of large AMPLITUDE, so that the orbits are not quite closed, and the water, while in the crests, moves slightly further forward than it moves backward while in the troughs. See also MASS TRANSPORT, SHOREWARD.

Wave generation: Growth of wave energy by wind.

Wave group: A series of waves in which the distance between crests, and the AMPLITUDE, vary only slightly.

Wave height: The vertical distance between the crest (the high point of a wave) and the trough (the low point). See Figure 12.

Wave hindcast: The calculation from historic synoptic weather charts of the wave characteristics that probably occurred at some past time.

Wave hollow: See WAVE TROUGH.

Wave length: The distance, in meters, between equivalent points (CRESTS or TROUGHS) on waves. See Figure 12.

Wave period: (1) The time required for two successive wave crests to pass a fixed point. (2) The time, in seconds, required for a wave crest to traverse a distance equal to one wave length.

Wave propagation: The transmission of waves through water.

Wave recorder: A meter which records either the surface time history of GRAVITY WAVES, or the subsurface pressure time history due to these waves.

Wave refraction: See REFRACTION.

Wave rose: Diagram showing the long-term distribution of wave height and direction.

Wave set-up: ELEVATION of the still-water level due to breaking waves.

Wave staff: An instrument consisting of a graduated vertical pole for measuring wave heights, and, by introducing a timing device, wave periods. The staff may support a strip or series of electrical contacts for activating a recorder.

Wave steepness: The ratio of wave height to its length. Not the same thing as the slope between a wave crest and its adjacent trough. See Figure 12.

Wave train: A series of waves from the same direction.

Wave transformation: Change in wave energy due to the action of physical processes.

Wave trough: The lowest part of the wave form between crests. Also that part of a wave below STILL WATER LEVEL. See Figure 12.

Wave variability: (1) The variation of heights and periods between individual waves within a wave train. Wave trains are not composed of waves of equal heights and periods, but rather of heights and periods which vary in a statistical manner. (2) The variability in direction of wave travel when leaving the GENERATING AREA. (3) The variation in height along the crest.

Wave velocity: Speed at which the individual wave form advances, defined as the wave length divided by the wave period (in meters per second). See CELERITY. See Figure 14.

Wave wash: The erosive action on shores or embankments caused by the lapping or breaking of waves.

Wind current: A current created by the action of the wind. From theoretical considerations, currents produced by winds in the open sea will set to the right of the direction towards which the wind is blowing if in the Northern Hemisphere and to the left of this direction if in the Southern Hemisphere.

Wind ripple: Small, low ridge of sand produced by the saltation of windblown sand.

Wind rose: Diagram showing the long-term distribution of wind speed and direction.

Wind sea: wave conditions directly attributable to recent winds, as opposed to swell.

Wind setup: (1) The vertical rise in the stillwater level on the LEEWARD side of a body of water caused by wind stresses on the surface of the water. (2) The difference in stillwater levels on the windward and the LEEWARD sides of a body of water caused by wind stresses on the surface of the water. (3) synonymous with WIND TIDE and STORM SURGE. STORM SURGE is usually reserved for use on the OCEAN and large bodies of water. *Wind setup* is usually reserved for use on reservoirs and smaller bodies of water.

Wind stress: The way in which wind transfers energy to the sea surface.

Wind tide: The deviation from a still-water level surface ELEVATION caused by the transport of surface water by winds.

Windward: The direction *from which* the wind is blowing.

Wind waves: (1) waves formed and growing in height under the influence of wind. (2) Loosely, any wave generated by wind. See Figure 10.