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Ulloa's ring. See BOUGUER'S HALO.

ultra high frequency. Radio frequency of 300 to 3,000 megahertz.

ultra quick light. A navigation light flashing at a rate of not less than 160 flashes per minute. See also CONTINUOUS ULTRA QUICK LIGHT, INTERRUPTED ULTRA QUICK LIGHT.

ultrashort wave. A radio wave shorter than 10 meters. A wave shorter than 1 meter is called a MICROWAVE. See also WAVE.

ultrasonic, adj. Having a frequency above the audible range. Frequencies below the audible range are called INFRASONIC. See also SUPERSONIC.

ultrasonic depth finder. A direct-reading instrument which determines the depth of water by measuring the time interval between the emission of an ultrasonic signal and the return of its echo from the bottom. A similar instrument utilizing signals within the audible range is called a SONIC DEPTH FINDER. Both instruments are also called ECHO SOUNDERS.

umbra, n. 1. The darkest part of a shadow in which light is completely cut off by an intervening object. A lighter part surrounding the umbra, in which the light is only partly cut off, is called the PENUMBRA. 2. The darker central portion of a sun spot, surrounded by the lighter PENUMBRA.

uncorrecting, n. The process of converting true to magnetic, compass, or gyro direction, or magnetic to compass direction. The opposite is CORRECTING.

uncovered, adj. & adv. Above water. The opposite is SUBMERGED. See also AFLOAT; AWASH.

undercurrent, n. A current below the surface, particularly one flowing in a direction or at a speed differing from the surface current. See UNDERTOW, SUBSURFACE CURRENT, SURFACE CURRENT.

under the lee. To leeward.

undertow, n. Receding water below the surface of breakers on a beach. See also UNDERCURRENT, SUBSURFACE CURRENT, SURFACE CURRENT, BACKRUSH, RIP CURRENT.

underway, under way, adv. Not moored or anchored. See also ADRIFT. See also MAKING WAY.

undevelopable, adj. A surface not capable of being flattened without distortion. The opposite is DEVELOPABLE.

undisturbed orbit. See NORMAL ORBIT.

undulating, adj. Having the form of more or less regular waves.

undulating light. See under FIXED AND FLASHING LIGHT.

undulation of the geoid. See GEOIDAL HEIGHT.

undulatus, adj. Having undulations, referring to a cloud composed of elongated and parallel elements resembling ocean waves.

unfavorable current. A current flowing in such a direction as to decrease the speed of a vessel over the ground. The opposite is FAVORABLE CURRENT.

unfavorable wind. A wind which delays the progress of a craft in a desired direction. Usually used in plural and chiefly in connection with sailing vessels. A wind which aids the progress of a craft is called a FAIR or FAVORABLE WIND. See also FOLLOWING WIND, HEAD WIND.

Uniform State Waterway Marking System. An aids to navigation system developed jointly by the U.S. Coast Guard and state boating administrators to assist the small craft operator in inland state waters marked by states. It consists of two categories of aids to navigation. One is a system of aids to navigation, generally compatible with the Federal lateral system of buoyage, to supplement the federal system in state waters. The other is a system of regulatory markers to warn the small craft operator of dangers or to provide general information and directions.

unipole antenna, n. See ISOTROPIC ANTENNA.

unique sanctuary. A marine sanctuary established to protect a unique geologic, oceanographic, or living feature. See also MARINE SANCTUARY.

unit, n. A value, quantity, or magnitude in terms of which other values, quantities, or magnitudes are expressed. In general, a unit is fixed by definition and is independent of such physical conditions as temperature. See also STANDARD, definition 2; INTERNATIONAL SYSTEM OF UNITS.

United States Coast Pilot. One of a series of SAILING DIRECTIONS published by the National Ocean Service, that cover a wide variety of information important to navigators of U.S. coastal and intracoastal waters, and waters of the Great Lakes. Most of this information cannot be shown graphically on the standard nautical charts and is not readily available elsewhere. This information includes navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, currents, and port facilities. Each *Coast Pilot* is corrected through the dates of *Notices to Mariners* shown on the title page and should not be used without reference to the *Notices to Mariners* issued subsequent to those dates.

United States National Map Accuracy Standards. A set of standards which define the accuracy with which features of U.S. maps are to be portrayed. 1. Horizontal accuracy: For maps at publication scales larger than 1:20,000, 90 percent of all well-defined features, with the exception of those unavoidably displaced by exaggerated symbolization, will be located within 0.85 mm of their geographic positions as referred to the map projection; for maps at publication scales of 1:20,000 or smaller, 0.50 mm. 2. Vertical accuracy: 90 percent of all contours will be accurate within one-half of the basic contour interval. Discrepancies in the accuracy of contours and elevations beyond this tolerance may be decreased by assuming a horizontal displacement within 0.50 mm. Also called MAP ACCURACY STANDARDS.

universal plotting sheet. See under SMALL AREA PLOTTING SHEET.

Universal Polar Stereographic grid. A military grid system based on the polar stereographic map projection, applied to maps of the earth's polar regions north of 84° N and south of 80° S.

Universal Time. Conceptually, time as determined from the apparent diurnal motion of a fictitious mean sun which moves uniformly along the celestial equator at the average rate of the apparent sun. Actually, Universal Time (UT) is related to the rotation of the earth through its definition in terms of sidereal time. Universal Time at any instant is derived from observations of the diurnal motions of the stars. The time scale determined directly from such observations is slightly dependent on the place of observation; this scale is designated UT0. By removing from UT0 the effect of the variation of the observer's meridian due to the observed motion of the geographic pole, the scale UT1 is established. A scale designated UT2 results from applying to UT1 an adopted formula for the seasonal variation in the rate of the earth's rotation. UT1 and UT2 are independent of the location of the observer. UT1 is the same as Greenwich mean time used in navigation. See also TIME SCALE.

Universal Transverse Mercator (UTM) grid. A military grid system based on the transverse Mercator map projection, applied to maps of the earth's surface extending to 84°N and 80°S.

unlighted buoy. A buoy not fitted with a light, whose shape and color are the defining features; may have a sound signal.

unlighted sound buoy. See under SOUND BUOY.

unmanned light. A light which is operated automatically and may be maintained in service automatically for extended periods of time, but with routine visits for maintenance purposes. Also called UNWATCHED LIGHT.

unperturbed orbit. See NORMAL ORBIT.

unsettled, adj. Pertaining to fair weather which may at any time become rainy, cloudy, or stormy. See also SETTLED.

unstabilized display. A radarscope display in which the orientation of the relative motion presentation is set to the ship's heading and changes with it.

unstabilized in azimuth. See under STABILIZATION OF RADARSCOPE DISPLAY.

unwatched light. See UNMANNED LIGHT.

upper branch. That half of a meridian or celestial meridian from pole to pole which passes through a place or its zenith.

upper culmination. See UPPER TRANSIT.

upper limb. The upper edge of a celestial body, in contrast with the LOWER LIMB, the lower edge.

upper transit. Transit of the upper branch of the celestial meridian. Transit of the lower branch is called LOWER TRANSIT. Also called SUPERIOR TRANSIT, UPPER CULMINATION.

uprush, *n.* 1. The rush of the water onto the foreshore following the breaking of a wave. 2. See RUN-UP.

upstream, *adj. & adv.* Toward the source of a stream. The opposite is DOWNSTREAM.

up-the-scope echo. See CLASSIFICATION OF RADAR ECHOES.

upwelling, *n.* The process by which water rises from a lower to a higher depth, usually as a result of divergence and offshore currents. Upwelling is most prominent where persistent wind blows parallel to a coastline so that the resultant wind-driven current sets away from the coast. Over the open ocean, upwelling occurs whenever the wind circulation is cyclonic, but is appreciable only in areas where that circulation is relatively permanent. It is also observable when the southern trade winds cross the equator.

upwind, *adj. & adv.* In the direction from which the wind is blowing. The opposite is DOWNWIND.

U.S. Survey foot. The foot used by the National Ocean Service in which 1 inch is equal to 2.540005 centimeters. The foot equal to 0.3048 meter, exactly, adopted by Australia, Canada, New Zealand, South Africa, the United Kingdom, and the United States in 1959 was not adopted by the National Ocean Service because of the extensive revisions which would be necessary to their charts and measurement records.

UTC, *n.* See under COORDINATED UNIVERSAL TIME.

UT0, *n.* See under UNIVERSAL TIME.

UT1, *n.* See under UNIVERSAL TIME.

UT2, *n.* See under UNIVERSAL TIME.

V

vacuum, *n.* A space containing no matter.

valley, *n.* On the sea floor, a relatively shallow, wide depression, the bottom of which usually has a continuous gradient. This term is generally not used for features that have canyon-like characteristics for a significant portion of their extent.

valley breeze. A gentle wind blowing up a valley or mountain slope in the absence of cyclonic or anticyclonic winds, caused by the warming of the mountainside and valley floor before the sun. See also KATABATIC WIND, MOUNTAIN BREEZE.

Van Allen Radiation Belts. Popular term for regions of high energy charged particles trapped in the earth's magnetic field. Definition of size and shape of these belts depends on selection of an arbitrary standard of radiation intensity and the predominant particle component. Belts known to exist are: a proton region centered at about 2,000 miles altitude at the geomagnetic equator; an electron region centered at about 12,000 miles altitude at the geomagnetic equator; overlapping electron and proton regions centered at about 20,000 miles altitude at the geomagnetic equator. Trapped radiation regions from artificial sources also exist. These belts were first reported by Dr. James A. Van Allen of Iowa State University.

vane, *n.* 1. A device to sense or indicate the direction from which the wind blows. Also called WEATHER VANE, WIND VANE. See also ANEMOMETER. 2. A sight on an instrument used for observing bearings, as on a pelorus, azimuth circle, etc. That vane nearest the observer's eye is called near vane and that on the opposite side is called far vane. Also called SIGHTING VANE. 3. In current measurements, a device to indicate the direction toward which the current flows.

vanishing tide. In a mixed tide with very large diurnal inequality, the lower high water (or higher low water) frequently becomes indistinct (or vanishes) at time of extreme declinations. During these periods the diurnal tide has such overriding dominance that the semidiurnal tide, although still present, cannot be readily seen on the tide curve.

vapor pressure. 1. The pressure exerted by the vapor of a volatile liquid. Each component of a mixed-gas vapor has its own pressure, called partial pressure.

vardar, *n.* A cold fall wind blowing from the northwest down the Vardar valley in Greece to the Gulf of Salonica. It occurs when atmospheric pressure over eastern Europe is higher than over the Aegean Sea, as is often the case in winter. Also called VARDARAC.

vardarac, *n.* See VARDAR.

variable, *n.* A quantity to which a number of values can be assigned.

variable parameters of satellite orbit. See under FIXED AND VARIABLE PARAMETERS OF SATELLITE ORBIT.

variable range marker. An adjustable range ring on the radar display.

variable star. A star which is not of constant magnitude.

variance, *n.* The square of the standard deviation.

variation, *n.* 1. The angle between the magnetic and geographic meridians at any place, expressed in degrees and minutes east or west to indicate the direction of magnetic north from true north. The angle between magnetic and grid meridians is called GRID MAGNETIC ANGLE, GRID VARIATION, or GRIVATION. Called MAGNETIC VARIATION when a distinction is needed to prevent possible ambiguity. Also called MAGNETIC DECLINATION. 2. Change or difference from a given value.

variation of latitude. A small change in the astronomical latitude of points on the earth due to polar motion.

variation of the poles. See POLAR MOTION.

variometer, *n.* An instrument for comparing magnetic forces, especially of the earth's magnetic field.

vast floe. See under FLOE.

V-band. A radio-frequency band of 46.0 to 56.0 kilomegahertz. See also FREQUENCY, FREQUENCY BAND.

vector, *n.* Any quantity, such as a force, velocity, or acceleration, which has both magnitude and direction, as opposed to a SCALAR which has magnitude only. Such a quantity may be represented geometrically by an arrow of length proportional to its magnitude, pointing in the given direction.

vector, *adj.* A type of computerized display which consists of layers of differentiated data, each with discreet features. Individual data files can be independently manipulated. See RASTER, BIT-MAP.

vector addition. The combining of two or more vectors in such manner as to determine the equivalent single vector. The opposite is RESOLUTION OF VECTORS. Also called COMPOSITION OF VECTORS.

vector diagram. A diagram of more than one vector drawn to the same scale and reference direction and in correct position relative to each other. A vector diagram composed of vectors representing the actual courses and speeds of two craft and the relative motion vector of either one in relation to the other may be called a SPEED TRIANGLE.

vector quantity. A quantity having both magnitude and direction and hence capable of being represented by a vector. A quantity having magnitude only is called a SCALAR.

veer, *v., i.* 1. For the wind to change direction in a clockwise direction in the Northern Hemisphere and a counterclockwise direction in the Southern Hemisphere. Change in the opposite direction is called BACK. 2. Of the wind, to shift aft. The opposite motion is to HAUL forward.

veer, *v., t.* To pay or let out, as to veer anchor chain.

vehicle location monitoring. A service provided to maintain the orderly and safe movement of platforms or vehicles. It encompasses the systematic observation of airspace, surface, or subsurface areas by electronic, visual, and other means to locate, identify, and control the movement of vehicles.

velocity, *n.* A vector quantity equal to speed in a given direction.

velocity meter. See INTEGRATING ACCELEROMETER.

velocity of current. Speed and set of the current.

velocity ratio. The ratio of two speeds, particularly the ratio of the speed of tidal current at a subordinate station to the speed of the corresponding current at the reference station.

Venus, *n.* The planet whose orbit is next nearer the sun than that of the earth.

verglas, *n.* See GLAZE.

vernal, *adj.* Pertaining to spring. The corresponding adjectives for summer, fall, and winter are aestival, autumnal, and hibernal.

vernal equinox. 1. The point of intersection of the ecliptic and the celestial equator, occupied by the sun as it changes from south to north declination, on or about March 21. Also called MARCH EQUI-

- NOX, FIRST POINT OF ARIES. 2. That instant the sun reaches the point of zero declination when crossing the celestial equator from south to north.
- vernier**, *n.* A short, auxiliary scale situated alongside the graduated scale of an instrument, by which fractional parts of the smallest division of the primary scale can be measured with greater accuracy by a factor of ten. If 10 graduations on a vernier equal 9 graduations on the micrometer drum of a sextant, when the zero on the vernier lies one-tenth of a graduation beyond zero on the micrometer drum, the first graduation beyond zero on the vernier coincides with a graduation on the micrometer drum. Likewise, when the zero on the vernier lies five-tenths of a graduation beyond zero on the micrometer drum, the fifth graduation beyond zero on the vernier coincides with a graduation on the micrometer drum.
- vernier error**. Inaccuracy in the graduations of the scale of a vernier.
- vernier sextant**. A marine sextant providing a precise reading by means of a vernier used directly with the arc, and having either a clamp screw or an endless tangent screw for controlling the position of the index arm. The micrometer drum on a micrometer drum sextant may include a vernier to enable a more precise reading.
- vertex** (*pl. vertices*), *n.* The highest point. See also APEX.
- vertical**, *adj.* In the direction of gravity, or perpendicular to the plane of the horizon.
- vertical**, *n.* A vertical line, plane, etc.
- vertical axis**. The line through the center of gravity of a craft, perpendicular to both the longitudinal and lateral axes, around which it yaws.
- vertical beam width**. The beam width measured in a vertical plane.
- vertical circle**. A great circle of the celestial sphere through the zenith and nadir. Vertical circles are perpendicular to the horizon. The prime vertical circle or prime vertical passes through the east and west points of the horizon. The principal vertical circle passes through the north and south points of the horizon and coincides with the celestial meridian.
- vertical control datum**. See VERTICAL GEODETIC DATUM.
- vertical danger angle**. The maximum or minimum angle between the top and bottom of an object of known height, as observed from a craft, indicating the limit of safe approach to an offlying danger. See also DANGER ANGLE.
- vertical datum**. 1. A base elevation used as a reference from which to reckon heights or depths. It is called TIDAL DATUM when defined by a certain phase of the tide. Tidal datums are local datums and should not be extended into areas which have differing topographic features without substantiating measurements. In order that they may be recovered when needed, such datums are referenced to fixed points known as bench marks. See also CHART SOUNDING DATUM. 2. See VERTICAL GEODETIC DATUM.
- vertical earth rate**. To compensate for the effect of earth rate, the rate at which a gyroscope must be turned about its vertical axis for the spin axis to remain in the meridian. Vertical earth rate is maximum at the poles, zero at the equator and varies as the sine of the latitude. See also EARTH RATE, HORIZONTAL EARTH RATE.
- vertical force instrument**. See HEELING ADJUSTER.
- vertical geodetic datum**. Any level surface taken as a surface of reference from which to reckon elevations. See also DATUM. Also called VERTICAL DATUM, VERTICAL CONTROL DATUM.
- vertical intensity of the earth's magnetic field**. The strength of the vertical component of the earth's magnetic field.
- vertical lights**. Two or more lights disposed vertically, or geometrically to form a triangle, square or other figure. If the individual lights serve different purposes, those of lesser importance are called AUXILIARY LIGHTS.
- vertically polarized wave**. A plane polarized electromagnetic wave in which the electric field vector is in a vertical plane.
- very close pack ice**. Pack ice in which the concentration is 9/10 to less than 10/10.
- very high frequency**. Radio frequency of 30 to 300 megahertz.
- very low frequency**. Radio frequency below 30 kilohertz.
- very open pack ice**. Pack ice in which the concentration is 1/10 to 3/10.
- very quick flashing light**. A navigation light flashing 80-160 flashes per minute. See also CONTINUOUS VERY QUICK LIGHT, GROUP VERY QUICK LIGHT, INTERRUPTED VERY QUICK LIGHT.
- very small fracture**. See under FRACTURE.
- very weathered ridge**. A ridge with tops very rounded, the slopes of the sides usually being about 20° to 30°.
- vessel**, *n.* Any type of craft which can be used for transportation on water.
- Vessel Traffic Services**. A system of regulations, communications, and monitoring facilities established to provide active position monitoring, collision avoidance services, and navigational advice for vessels in confined and busy waterways. There are two main types of VTS, surveilled and non-surveilled. Surveilled systems consist of one or more land-based radar sites which output their signals to a central location where operators monitor and to a certain extent control traffic flows. Non-surveilled systems consist of one or more calling-in points at which ships are required to report their identity, course, speed, and other data to the monitoring authority.
- viaduct**, *n.* A type of bridge which carries a roadway or railway across a ravine; distinct from an aqueduct, which carries water over a ravine. See also BRIDGE, definition 2; CAUSEWAY.
- vibrating needle**. A magnetic needle used in compass adjustment to find the relative intensity of the horizontal components of the earth's magnetic field and the magnetic field at the compass location. Also called HORIZONTAL FORCE INSTRUMENT.
- vibration**, *n.* 1. Periodic motion of an elastic body or medium in alternately opposite directions from equilibrium; oscillation. 2. The motion of a vibrating body during one complete cycle; two oscillations.
- video**, *n.* In the operation of a radar set, the demodulated receiver output that is applied to the indicator. Video contains the relevant radar information after removal of the carrier frequency.
- violet storm**. Wind of force 11 (56 to 63 knots or 64 to 72 miles per hour) on the Beaufort wind scale. See also STORM, definition 1.
- virga**, *n.* Wisps or streaks of water or ice particles falling out of a cloud but evaporating before reaching the earth's surface as precipitation. Virga is frequently seen trailing from altocumulus and altostratus clouds, but also is discernible below the bases of high-level cumuliform clouds from which precipitation is falling into a dry subcloud layer. It typically exhibits a hooked form in which the streaks descend nearly vertically just under the precipitation source but appear to be almost horizontal at their lower extremities. Such curvature of virga can be produced simply by effects of strong vertical windshear, but ordinarily it results from the fact that droplet or crystal evaporation decreases the particle terminal fall velocity near the ends of the streaks. Also called FALL STREAKS, PRECIPITATION TRAILS.
- virtual image**. An image that cannot be shown on a surface but is visible, as in a mirror.
- virtual meridian**. The meridian in which the spin axis of a gyrocompass will settle as a result of speed-course-latitude error.
- visibility**, *n.* A measure of the ability of an observer to see objects at a distance through the atmosphere. A measure of this property is expressed in units of distance. This term should not be confused with VISUAL RANGE. See also METEOROLOGICAL VISIBILITY.
- visible horizon**. The line where earth and sky appear to meet, and the projection of this line upon the celestial sphere. If there were no terrestrial refraction, VISIBLE and GEOMETRICAL HORIZONS would coincide. Also called APPARENT HORIZON.
- visual aid to navigation**. An aid to navigation which transmits information through its visible characteristics. It may be lighted or unlighted.
- visual bearing**. A bearing obtained by visual observation.
- visual range**. The maximum distance at which a given object can be seen, limited by the atmospheric transmission. The distance is such that the contrast of the object with its background is reduced by the atmosphere to the contrast threshold value for the observer. This term should not be confused with VISIBILITY. See also CONTRAST THRESHOLD, VISUAL RANGE OF A LIGHT.
- visual range of light**. The predicted range at which a light can be observed. The predicted range is the lesser of either the luminous range or the geographic range. If the luminous range is less than the geographic range, the luminous range must be taken as the limiting range. The luminous range is the maximum distance at which a light can be seen under existing visibility conditions. This luminous range takes no account of the elevation of the light, the observer's height of eye, the curvature of the earth, or interference from background lighting. The luminous range is determined from the nominal range and the existing visibility conditions, using the Luminous Range Diagram. The nominal range is the maximum distance at which a light can be seen in clear weather as defined by the International Visibility Code (meteorological visibility of 10 nautical miles). The geographic range is the maximum distance at which the curvature of the earth and terrestrial refraction permit a light to be

seen from a particular height of eye without regard to the luminous intensity of the light. The geographic range sometimes printed on charts or tabulated in light lists is the maximum distance at which the curvature of the earth and refraction permit a light to be seen from a height of eye of 15 feet above the water when the elevation of the light is taken above the height datum of the largest scale chart of the locality.) See also VISUAL RANGE, CONTRAST THRESHOLD.

- volcano, n.** An opening in the earth from which hot gases, smoke, and molten material issue, or a hill or mountain composed of volcanic material. A volcano is characteristically conical in shape with a crater in the top.
- volt, n.** A derived unit of electric potential in the International System of Units, it is the difference of electric potential between two points of a conducting wire carrying a constant current of 1 ampere, when the power dissipated between these points is equal to 1 watt.
- volt per meter.** The derived unit of electric field strength in the International System of Units.
- volume, n.** 1. A measure of the amount of space contained within a solid. 2. Loudness of a sound, usually measured in decibels.
- voyage, n.** 1. A trip by sea.
- vulgar establishment.** See under ESTABLISHMENT OF THE PORT.

W

- wandering of the poles.** See EULERIAN MOTION.
- waning moon.** The moon between full and new when its visible part is decreasing. See also PHASES OF THE MOON.
- warble tone.** A tone whose frequency varies periodically about a mean value.
- warm air mass.** An air mass that is warmer than surrounding air. The expression implies that the air mass is warmer than the surface over which it is moving.
- warm brow.** A foehn in the Schouten Islands north of New Guinea.
- warm front.** Any non-occluded front, or portion thereof, which moves in such a way that warmer air replaces colder air. While some occluded fronts exhibit this characteristic, they are more properly called WARM OCCLUSIONS.
- warm occlusion.** See under OCCLUDED FRONT.
- warm sector.** An area at the earth's surface bounded by the warm and cold fronts of a cyclone.
- warning beacon.** See WARNING RADIOBEACON.
- warning radiobeacon.** An auxiliary radiobeacon located at a lightship to warn vessels of their proximity to the lightship. It is of short range and sounds a warbling note for 1 minute immediately following the main radiobeacon on the same frequency. Also called WARNING BEACON.
- warp, v., t.** To move, as a vessel, from one place to another by means of lines fastened to an object, such as a buoy, wharf, etc., secured to the ground. See also KEDGE.
- warp, n.** A heavy line used in warping or mooring.
- warping buoy.** A buoy located so that lines to it can be used for the movement of ships.
- wash, n.** The dry channel of an intermittent stream.
- watch, n.** A small timepiece of a size convenient to be carried on the person. A hack or comparing watch is used for timing observations of celestial bodies. A stop watch can be started, stopped, and reset at will, to indicate elapsed time. A chronometer watch is a small chronometer, especially one with an enlarged watch-type movement.
- watch buoy.** See STATION BUOY.
- watch error.** The amount by which watch time differs from the correct time. It is usually expressed to an accuracy of 1 second and labeled fast (F) or slow (S) as the watch time is later or earlier, respectively, than the correct time. See also CHRONOMETER ERROR.
- watching properly.** The state of an aid to navigation on charted position and exhibiting its proper characteristics.
- watch rate.** The amount gained or lost by a watch or clock in a unit of time. It is usually expressed in seconds per 24 hours, to an accuracy of 0.1^s, and labeled gaining or losing, as appropriate, when it is sometimes called DAILY RATE.
- watch time.** The hour of the day as indicated by a watch or clock. Watches and clocks are generally set approximately to zone time. Unless a watch or clock has a 24-hour dial, watch time is usually expressed on a 12-hour cycle and labeled AM or PM.
- watch tower.** See LOOKOUT STATION.
- water-borne, adj.** Floating on water; afloat. See also SEA-BORNE.
- watercourse, n.** 1. A stream of water. 2. A natural channel through which water runs. See also GULLY, WASH.
- waterfall, n.** A perpendicular or nearly perpendicular descent of river or stream water.
- waterline, n.** The line marking the junction of water and land. See also HIGH WATER LINE, LOW WATER LINE, SHORELINE.
- water sky.** Dark streaks on the underside of low clouds, indicating the presence of water features in the vicinity of sea ice.
- water smoke.** See STEAM FOG.
- waterspout, n.** 1. A tornado occurring over water; most common over tropical and subtropical waters. 2. A whirlwind over water comparable in intensity to a dust devil over land.
- water tower.** A structure erected to store water at an elevation above the surrounding terrain; often charted with a position circle and label.
- water track.** 1. See under TRACK, definition 2. 2. See under TRUE TRACK OF TARGET.
- waterway, n.** A water area providing a means of transportation from one place to another, principally one providing a regular route for water traffic, such as a bay, channel, passage, or the regularly traveled parts of the open sea. The terms WATERWAY, FAIRWAY, and THOROUGHFARE have nearly the same meanings. WATERWAY refers particularly to the navigable part of a water area. FAIRWAY refers to the main traveled part of a waterway. A THOROUGHFARE is a public waterway. See also CANAL.
- watt, n.** A derived unit of power in the International System of Units; it is that power which in 1 second gives rise to energy of 1 joule.
- wave, n.** 1. An undulation or ridge on the surface of a fluid. See also STORM SURGE, TIDAL WAVE, TSUNAMI. 2. A disturbance propagated in such a manner that it may progress from point to point. See also ELECTROMAGNETIC WAVES, RADIO WAVES, SKYWAVE, GROUNDWAVE, DIRECT WAVE, INDIRECT WAVE, MODULATED WAVE, MICROWAVE, SPHERICAL WAVE, TRANSVERSE WAVE, LONGITUDINAL WAVE.
- wave basin.** A basin close to the inner entrance of a harbor in which the waves from the outer entrance are absorbed, thus reducing the size of the waves entering the inner harbor. See also WAVE TRAP.
- wave crest.** The highest part of a wave.
- wave cyclone.** A cyclone which forms and moves along a front. The circulation about the cyclone center tends to produce a wavelike deformation of the front. The wave cyclone is the most frequent form of extratropical cyclone (or low). Also called WAVE DEPRESSION. See also FRONTAL CYCLONE.
- wave depression.** See WAVE CYCLONE.
- wave direction.** The direction from which waves are coming.
- waveguide, n.** A transmission line for electromagnetic waves consisting of a hollow conducting tube within which electromagnetic waves may be propagated; or a solid dielectric or dielectric-filled conductor designed for the same purpose.
- wave height.** The distance from the trough to the crest of a wave, equal to double the amplitude, and measured perpendicular to the direction of advance.
- wave height correction.** A correction due to the elevation of parts of the sea surface by wave action, particularly such a correction to a sextant altitude because of altered dip.
- wave interference.** See INTERFERENCE, definition 2.
- wavelength, n.** The distance between corresponding points in consecutive cycles in a wave train, measured in the direction of propagation at any instant.

- wave of translation.** A wave in which the individual particles of the medium are shifted in the direction of wave travel, as ocean waves in shoal waters; in contrast with an OSCILLATORY WAVE, in which only the form advances, the individual particles moving in closed orbits, as ocean waves in deep water.
- wave period.** The time interval between passage of successive wave crests at a fixed point.
- wave train.** A series of waves moving in the same direction. See also SOLITARY WAVE.
- wave trap.** Breakwaters situated close within the entrance used to reduce the size of waves from sea or swell which enter a harbor before they penetrate into the harbor. See also WAVE BASIN.
- wave trough.** The lowest part of a wave form between successive wave crests.
- waxing moon.** The moon between new and full when its visible part is increasing. See also PHASES OF THE MOON.
- waypoint, n.** A reference point on the track.
- weak fix.** A fix determined from horizontal sextant angles between objects poorly located.
- weather, adj.** Pertaining to the windward side, or the side in the direction from which the wind is blowing. LEE pertains to the leeward or sheltered side.
- weather, n.** 1. The state of the atmosphere as defined by various meteorological elements, such as temperature, pressure, wind speed and direction, humidity, cloudiness, precipitation, etc. This is in contrast with CLIMATE, the prevalent or characteristic meteorological conditions of a place or region. 2. Bad weather. See also THICK WEATHER.
- weathered, adj.** Eroded by action of the weather.
- weathered berg.** An irregularly shaped iceberg. Also called GLACIER BERG.
- weathered ridge.** An ice ridge with peaks slightly rounded, the slopes of the sides usually being about 30° to 40°. Individual fragments are not discernible.
- weathering, n.** Processes of ablation and accumulation which gradually eliminate irregularities in an ice surface.
- weather map.** See under SYNOPTIC CHART.
- weather shore.** As observed from a vessel, the shore lying in the direction from which the wind is blowing. See also LEE SHORE.
- weather side.** The side of a ship exposed to the wind or weather.
- weather vane.** A device to indicate the direction from which the wind blows. Also called WIND DIRECTION INDICATOR, WIND VANE. See also ANEMOMETER.
- weber, n.** A derived unit of magnetic flux in the International System of Units; it is that magnetic flux which, linking a circuit of one turn, would produce in it an electromotive force of 1 volt if it were reduced to zero at a uniform rate in 1 second.
- wedge.** See RIDGE, definition 3.
- weight, n.** A quantity of the same nature as a force; the weight of a body is the product of its mass and the acceleration due to gravity; in particular, the standard weight of a body is the product of its mass and the standard acceleration due to gravity. The value adopted in the International Service of Weights and Measures for the standard acceleration due to gravity is 980.665 centimeters per second, per second.
- weighted mean.** A value obtained by multiplying each of a series of values by its assigned weight and dividing the sum of those products by the sum of the weights. See also WEIGHT OF OBSERVATION.
- weight of observation.** The relative value of an observation, source, or quantity when compared with other observations, sources, or quantities of the same or related quantities. The value determined by the most reliable method is assigned the greatest weight. See also WEIGHTED MEAN.
- wellhead, n.** A submarine structure projecting some distance above the seabed and capping a temporarily abandoned or suspended oil or gas well. See also SUBMERGED PRODUCTION WELL.
- west, n.** The direction 90° to the left or 270° to the right of north. See also CARDINAL POINT.
- West Australia Current.** An Indian Ocean current which generally first flows northward and then northwestward off the west coast of Australia. This current varies seasonally with the strength of the wind and is most stable during November, December, and January, and least stable during May, June, and July, when it may set in any direction. North of 20°S the main part of this current flows northwestward into the Indian South Equatorial Current.
- westerlies, n., pl.** Winds blowing from the west on the poleward sides of the subtropical high-pressure belts.
- West Greenland Current.** The ocean current flowing northward along the west coast of Greenland into Davis Strait. It is a continuation of the East Greenland Current. Part of the West Greenland Current turns around when approaching the Davis Strait and joins the Labrador Current; the rest rapidly loses its character as a warm current as it continues into Baffin Bay.
- westing, n.** The distance a craft makes good to the west. The opposite is EASTING.
- westward motion.** The motion in a westerly direction of the subtrack of a satellite, including the motion due to the earth's rotation and the nodical precession of the orbital plane.
- West Wind Drift.** An ocean current that flows eastward through all the oceans around the Antarctic Continent, under the influence of the prevailing west winds. On its northern edge it is continuous with the South Atlantic Current, the South Pacific Current, and the South Indian Current. Also called ANTARCTIC CIRCUMPOLAR CURRENT.
- wet-bulb temperature.** The lowest temperature to which air can be cooled at any given time by evaporating water into it at constant pressure, when the heat required for evaporation is supplied by the cooling of the air. This temperature is indicated by a well-ventilated wet-bulb thermometer. See also FREE-AIR TEMPERATURE.
- wet-bulb thermometer.** A thermometer having the bulb covered with a cloth, usually muslin or cambric, saturated with water. See also PSYCHROMETER.
- wet compass.** See LIQUID COMPASS.
- wet dock.** See NON-TIDAL BASIN.
- wharf, n.** A structure of open pilings covered with a deck along a shore or a bank which provides berthing for ships and which generally provides cargo-handling facilities. A similar facility of solid construction is called QUAY. See also PIER, definition 1; DOCK; LANDING; MOLE, definition 1.
- whirlpool, n.** Water in rapid rotary motion. See also EDDY.
- whirlwind, n.** A general term for a small-scale, rotating column of air. More specific terms include DUST WHIRL, DUST DEVIL, WATERSPOUT, and TORNADO.
- whirly, n.** A small violent storm, a few yards to 100 yards or more in diameter, frequent in Antarctica near the time of the equinoxes.
- whistle, n.** A sound signal emitter comprising a resonator having an orifice of suitable shape such that when a jet of air is passed through the orifice the turbulence produces a sound.
- whistle buoy.** A sound buoy equipped with a whistle operated by wave action. The whistle makes a loud moaning sound as the buoy rises and falls in the sea.
- whitecap, n.** A crest of a wave which becomes unstable in deep water, toppling over or "breaking." The instability is caused by the too rapid addition of energy from a strong wind. A wave which becomes unstable due shallow water is called a BREAKER.
- white ice.** See THIN FIRST-YEAR ICE.
- white squall.** A sudden, strong gust of wind coming up without warning, noted by whitecaps or white, broken water; usually seen in whirlwind form in clear weather in the tropics.
- white water.** 1. Frothy water as in whitecaps or breakers. 2. Light-colored water over a shoal.
- whole gale.** A term once used by seamen for what is now called STORM on the Beaufort wind scale.
- wide berth.** A generous amount of room given to a navigational danger.
- williwaw, n.** A sudden blast of wind descending from a mountainous coast to the sea, especially in the vicinity of either the Strait of Magellan or the Aleutian Islands.
- willy-willy, n.** See under TROPICAL CYCLONE.
- wind.** Air in horizontal motion over the earth.
- wind cone.** See WIND SOCK.
- wind direction.** The direction from which wind blows.

wind direction indicator. See WEATHER VANE.

wind drift current. See DRIFT CURRENT.

wind driven current. A current created by the action of the wind.

wind indicator. A device to indicate the direction or speed of the wind. See also ANEMOMETER.

wind rode. A ship riding at anchor is said to be wind rode when it is heading into the wind. See also TIDE RODE.

wind rose. A diagram showing the relative frequency and sometimes the average speed of the winds blowing from different directions in a specified region.

winds aloft. Wind speeds and directions at various levels beyond the domain of surface weather observations.

wind shear. A change in wind direction or speed in a short distance, resulting in a shearing effect. It can act in a horizontal or vertical direction and, occasionally, in both. The degree of turbulence increases as the amount of wind shear increases.

wind-shift line. In meteorology, a line or narrow zone along which there is an abrupt change of wind direction.

wind sock. A tapered fabric sleeve mounted so as to catch and swing with the wind, thus indicating the wind direction. Also called WIND CONE.

wind speed. The rate of motion of air. See also ANEMOMETER.

wind storm. See under STORM, definition 2.

wind vane. See WEATHER VANE.

wind velocity. The speed and direction of wind.

windward, *adj.* & *adv.* In the general direction from which the wind blows; in the wind; on the weather side. The opposite is LEEWARD.

windward, *n.* The weather side. The opposite is LEEWARD.

windward tide. A tidal current setting to windward. One setting in the opposite direction is called a LEEWARD TIDE or LEE TIDE.

wind wave. A wave generated by friction between wind and a fluid surface. Ocean waves are produced principally in this way.

winged headland. A seacliff with two bays or spits, one on either side.

winter, *n.* The coldest season of the year. In the Northern Hemisphere, winter begins astronomically at the winter solstice and ends at the vernal equinox. In the Southern Hemisphere the limits are the summer solstice and the autumnal equinox. The meteorological limits vary with the locality and the year.

winter buoy. An unlighted buoy which is maintained in certain areas during winter months when other aids to navigation are temporarily removed or extinguished.

Winter Coastal Countercurrent. See DAVIDSON CURRENT.

winter light. A light which is in service during the winter months when the regular light is out of service. It has lower intensity than the regular light but usually has the same characteristic.

winter marker. An unlighted buoy or small lighted buoy which is established as a replacement during the winter months when other aids are out of service or withdrawn.

winter solstice. The point on the ecliptic occupied by the sun at maximum southerly declination. Sometimes called DECEMBER SOLSTICE, FIRST POINT OF CAPRICORNUS.

wiping, *n.* The process of reducing the amount of permanent magnetism in a vessel by placing a single coil horizontally around the vessel and moving it, while energized, up and down along the sides of the vessel. If the coil remains stationary, the process is called FLASHING. See also DEPERMING.

wire drag. An apparatus for surveying rock areas where the normal sounding methods are insufficient to insure the discovery of all existing obstructions above a given depth, or for determining the least depth of an area. It consists of a buoyed wire towed at the desired depth by two vessels. Often shortened to DRAG. See also DRAG, *v., t.*

withdrawn, *adj.* Removed from service during severe ice conditions or for the winter season. Compare with the term disestablished, which means permanently removed. See also CLOSED, COMMISSIONED.

WMO Sea-Ice Nomenclature (WMO/OMM/BMO No. 259. TP. 145). A publication of the World Meteorological Organization which is comprised of sea-ice terminology, ice reporting codes, and an illustrated glossary. This publication results from international cooperation in the standardization of ice terminology.

working, *n.* In sea ice navigation, making headway through an ice pack by boring, breaking, and slewing.

World Geographic Reference System. A worldwide position reference system that may be applied to any map or chart graduated in latitude and longitude (with Greenwich as prime meridian) regardless of projection. It is a method of expressing latitude and longitude in a form suitable for rapid reporting and plotting. Commonly referred to by use of the acronym GEOREF.

World Geodetic System. A consistent set of parameters describing the size and shape of the earth, the positions of a network of points with respect to the center of mass of the earth, transformations from major geodetic datums, and the potential of the earth (usually in terms of harmonic coefficients). It forms the common geodetic reference system for modern charts on which positions from electronic navigation systems can be plotted directly without correction.

Worldwide Marine Weather Broadcasts. A joint publication of the National Weather Service and the Naval Weather Service Command providing information on marine weather broadcasts in all areas of the world. In general, English language broadcasts (or foreign language broadcasts repeated in English) are included in the publication. For areas where English language broadcasts are not available foreign language transmissions are also included.

World Meteorological Organization. A specialized agency of the United Nations which seeks to facilitate world-wide cooperation in the establishment of stations for meteorological and related geophysical observations of centers providing meteorological services, of systems of rapid exchange of weather information; and to promote the standardization and publication of meteorological and hydrometeorological observations and statistics; to further the application of meteorology to aviation, shipping, agriculture, and other related activities; to encourage research and training in meteorology and their international coordination.

World Port Index. See PUB. 150.

World Wide Navigational Warning Service. Established through the joint efforts of the International Hydrographic Organization (IHO) and the Intergovernmental Maritime Consultative Organization (IMCO) now called the International Maritime Organization (IMO), the World Wide Navigational Warning Service (WWNWS) is a coordinated global service for the promulgation by radio of information on hazards to navigation which might endanger international shipping. The basic objective of the WWNWS is the timely promulgation by radio of information of concern to the ocean-going navigator. Such information includes failure and or changes to major navigational aids, newly discovered wrecks or natural hazards in or near main shipping lanes; areas where search and rescue, antipollution operations, cable-laying or other underway activities are taking place. For WWNWS purposes, the world is divided into 16 NAVAREAS. Within each NAVAREA one national authority, designated the Area Coordinator, has assumed responsibility for the coordination and promulgation of warnings. Designated "National Coordinators" of other coastal states in a NAVAREA are responsible for collecting and forwarding information to the Area Coordinator. In the Baltic, a Sub-Area Coordinator has been established to filter information prior to passing to the Area Coordinator. Coordinators are responsible for the exchange of information as appropriate with other coordinators, including that which should be further promulgated by charting authorities in *Notice to Mariners*. The language used is English, although warnings may also be transmitted in one or more of the official languages of the United Nations. Broadcast schedules appear in an Annex to the International Telecommunication Union *List of Radiodetermination and Special Service Stations Volume II*, and in the lists of radio signals published by various hydrographic authorities (for the U.S., *Pub 117, Radio Navigational Aids*.) Transmissions usually occur frequently enough during day to fall within at least one normal radio watch period, and the information is repeated with varying frequency as time passes until either the danger has passed or the information on it has appeared as a notice to mariners.

worldwide system. A term used to describe a navigation system providing positioning capability wherever the observer may be located. Also called GLOBAL SYSTEM.

wreck, *n.* The ruined remains of a vessel which has been rendered useless, usually by violent action by the sea and weather, on a stranded or sunken vessel. In hydrography the term is limited to a wrecked vessel, either submerged or visible, which is attached to or foul of the bottom or cast up on the shore. In nautical cartography wrecks are designated visible, dangerous, or non-dangerous according to whether they are above tidal datum, less than, or more than 20 meters (66 feet; 11 fathoms) below tidal datum, respectively.

wreck buoy. A buoy marking the position of a wreck. It is usually placed on the seaward or channel side of the wreck and as near to the wreck as conditions will permit. To avoid confusion in some situations, two buoys may be used to mark the wreck.

wreck mark. A navigation mark which marks the position of a wreck.

X-Y-Z

X-band. A radio-frequency band of 5,200 to 10,900 megahertz. See also FREQUENCY, FREQUENCY BAND.

yard, *n.* A unit of length equal to 3 feet, 36 inches, or 0.9144 meter.

yaw, *n.* The oscillation of a vessel in a seaway about a vertical axis approximately through the center of gravity.

yawing, *n.* See YAW.

year, *n.* A period of one revolution of a planet around the sun. The period of one revolution of the earth with respect to the vernal equinox, averaging 365 days, 5 hours, 48 minutes, 46 seconds in 1900, is called a tropical, astronomical, equinoctial, or solar year. The period with respect to the stars, averaging 365 days, 6 hours, 9 minutes, 9.5 seconds in 1900, is called a sidereal year. The period of revolution from perihelion to perihelion, averaging 365 days, 6 hours, 13 minutes, 53.0 seconds in 1900, is an anomalistic year. The period between successive returns of the sun to a sidereal hour angle of 80° is called a fictitious or Besselian year. A civil year is the calendar year of 365 days in common years, or 366 days in leap years. A light-year is a unit of length equal to the distance light travels in 1 year, about 5.88×10^{12} miles. The term year is occasionally applied to other intervals such as an eclipse year, the interval between two successive conjunctions of the sun with the same node of the moon's orbit, a period averaging 346 days, 14 hours, 52 minutes, 50.7 seconds in 1900, or a great or Platonic year, the period of one complete cycle of the equinoxes around the ecliptic, about 25,800 years.

young coastal ice. The initial stage of fast ice formation consisting of nilas or young ice, its width varying from a few meters up to 100 to 200 meters from the shoreline.

young ice. Ice in the transition stage between nilas and first-year ice, 10 to 30 centimeters in thickness. Young ice may be subdivided into GRAY ICE and GRAY-WHITE ICE.

zenith, *n.* The point on the celestial sphere vertically overhead. The point 180° from the zenith is called the NADIR.

zenithal, *adj.* Of or pertaining to the zenith.

zenithal chart. See AZIMUTHAL CHART.

zenithal map projection. See AZIMUTHAL MAP PROJECTION.

zenith distance. Angular distance from the zenith; the arc of a vertical circle between the zenith and a point on the celestial sphere, measured from the zenith through 90°, for bodies above the horizon. This is the same as COALTITUDE with reference to the celestial horizon.

zephyr, *n.* A warm, gentle breeze, especially one from the west.

zodiac, *n.* The band of the sky extending 9° either side of the ecliptic. The sun, moon, and navigational planets are always within this band, with the occasional exception of Venus. The zodiac is divided into 12 equal parts, called signs, each part being named for the principal constellation originally within it.

zodiacal light. A faint cone of light which extends upward from the horizon along the ecliptic after sunset or before sunrise, seen best in the tropics and believed to be the reflection of sunlight by extraterrestrial particles in the zodiac.

zone, *n.* 1. A defined area or region. The surface of the earth is divided into climatic zones by the polar circles and the tropics; the parts between the poles and polar circles are called the north and south frigid zones; the parts between the polar circles and the tropics are the north and south temperate zones; the part between the two tropics is the torrid zone. 2. A time zone, within which the same time is kept.

zone description. The number, with its sign, that must be added to or subtracted from the zone time to obtain the Greenwich mean time. The zone description is usually a whole number of hours.

zone meridian. The meridian used for reckoning zone time. This is generally the nearest meridian whose longitude is exactly divisible by 15°. The DAYLIGHT SAVING MERIDIAN is usually 15° east of the zone meridian.

zone noon. Twelve o'clock zone time, or the instant the mean sun is over the upper branch of the zone meridian. Standard noon is 12 o'clock standard time.

zone time. The local mean time of a reference or zone meridian whose time is kept throughout a designated zone. The zone meridian is usually the nearest meridian whose longitude is exactly divisible by 15°. Standard time is a variation of zone time with irregular but well-defined zone limits. Daylight saving or summer time is usually 1 hour later than zone or standard time. See ZONE DESCRIPTION.

zulu. See GREENWICH MEAN TIME.