UNITS / EQUATIONS — OCEANOGRAPHY

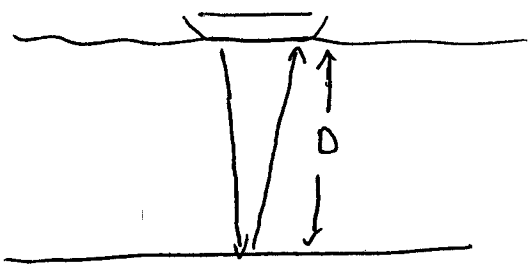
(1) DEPTH

1 FATHOM = 6 FEET

VELOCITY OF SOUND IN SEA WATER = $4800 \frac{ft}{sec} = 1450 \frac{m}{sec}$

SONAR DEPTH

$$V = \frac{D}{T}$$ VELOCITY = $\frac{DEPTH}{TIME}$



$$D = \frac{Vt}{2}$$

D = DEPTH
V = VELOCITY
t = 2-WAY TRAVEL TIME

---

(2) VERTICAL EXAGGERATION FOR PROFILES

$$V.E. = \frac{V}{H} = \frac{\text{VERTICAL SCALE}}{\text{HORIZONTAL SCALE}}$$

---

(3) DISTANCE 1 m = 3.281 ft

LAND DISTANCE = "STATUTE MILES" 1 STATUTE mi = 5280 ft

1 Km = 0.62 mi (STATUTE)

NAUTICAL MILE = 1′ OF LATITUDE (1° LAT = 60 N. MILES

1 NAUTICAL MILE = 1.15 STATUTE MILES = 6072 ft

---

(4) TRAVEL VELOCITY

1 KNOT = $\frac{\text{1 NAUTICAL MILE}}{HR}$ = 1.15 MILE/HR

(KNOTS) · (1.85) = Km

5) TIME ZONES

EARTH ROTATION = $\frac{360^\circ}{24\ hrs} = \frac{180^\circ}{12\ HRS} = \frac{15^\circ}{1\ HR}$

EARTH TIME ZONES:

NO. GLOBAL TIME ZONES = 24

LONGITUDE / 1 HR TIME ZONE = 15° LONG.

---

(6) SALT CONCENTRATION

1 PART SALT / 1000 PARTS WATER = 1 PPT = 1 ‰

1 ‰ = 1 g / LITER OF WATER = $\frac{1\ g\ SALT}{1\ kg\ H_2O}$ = 1 PPT

DENSITY OF PURE H_2O = $\frac{1\ gm}{cm^3} = \frac{1\ gm}{ml} = \frac{1\ Kg}{L}$

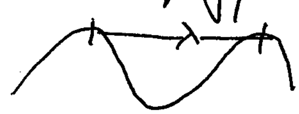
---

1 ppm = 1 part / million = 1 mg/L = 1 mg/kg

1 ppb = 1 part / billion = 1 μg/L = 1 μg/kg

---

(7) WAVES



WAVELENGTH (λ) = length unit cm)

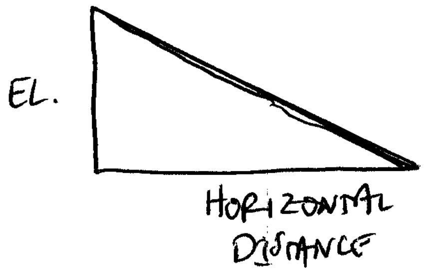
T = PERIOD = TIME FOR 1 WAVELENGTH TO PASS A PT.

WAVE VELOCITY = $\frac{\lambda}{T}$ (m/sec)

FREQUENCY = NO. OF CYCLES / SEC = $\frac{1}{T}$

VEL. = $f\lambda$

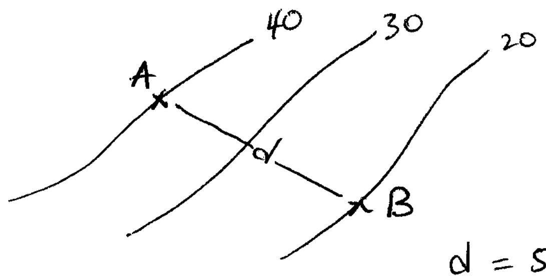
Slope Determination



A. From Cross-Section -

$$\text{SLOPE} = \frac{\text{RISE}}{\text{RUN}} = \frac{\Delta \text{ EL.}}{\Delta \text{ DIST}}$$

B. From map. (CI = 10 ft)



d = 50 ft

Sc

$$\text{SLOPE} = \frac{\Delta \text{ EL } A-B}{\Delta \text{ DIST } A-B} = \frac{40\text{ ft} - 20\text{ ft}}{50\text{ ft}}$$

$$\text{SEDIMENTATION RATE} = \frac{\text{THICKNESS OF SEDIMENT}}{\text{TIME OF ACCUMULATION}}$$

(UNITS: mm/yr, m/1000 yr)

Salinity Calculation

SALINITY (ppt) = 1.81 × (CHLORINE CONCENTRATION ppt)

$$\text{DENSITY} = \frac{\text{MASS}}{\text{VOLUME}}$$

1 cm³ = 1 ml for pure water

1 Kg = 1 L for pure water

Pure H₂O Density = 1 gm/cm³

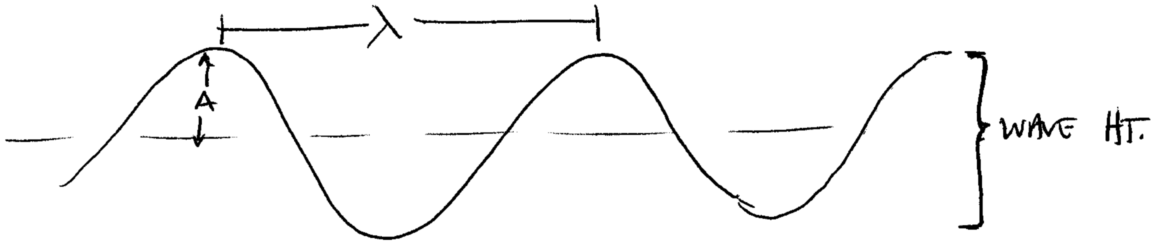
Density Factor for Sea Water

$$\sigma_t = (\text{density}_{(gm/cm^3)} - 1) \times 1000$$

E.G. D = 1.0281 gm/cm³

$\sigma_t = (1.0281 - 1) \times 1000 = 28.1$

WAVE EQUATIONS



λ = WAVELENGTH

A = WAVE AMPLITUDE

T = PERIOD (TIME FOR 1 WAVELENGTH TO PASS)

f = frequency $= \frac{1}{T}$ (cycles/sec = Hz)

WAVE BASE $= \frac{1}{2}\lambda$

WAVE HEIGHT $= 2 \cdot A$

GENERAL RULE FOR WAVE HT.

WAVE HEIGHT (ft) = 0.5 (WIND SPEED)
[knots N.mi/hr]

WAVE VELOCITY $= f\lambda = \frac{\lambda}{T}$

AS WAVELENGTH >, WAVE VELOCITY >