MOORING LOAD CALCULATION FOR SCPI TRIPOD

WATER DEPTH = $D = 200\,m$

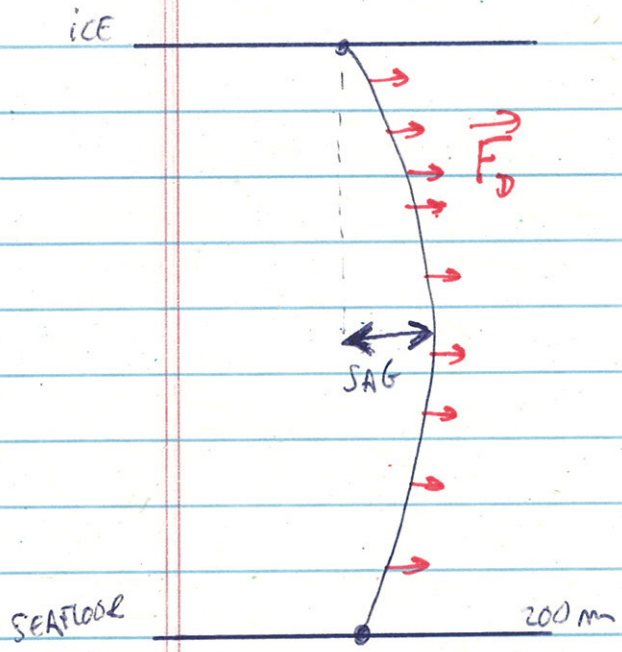
DENSITY OF WATER $\rho = 1025\ kg/m^3$

MAX CURRENT VELOCITY $V = 0.2\ m/s$

MOORING LINE ϕ $d = 1/8'' = 0.0038\ m$

COEF. OF DRAG $C_D = 1.2$

MOORING LINE SLACK $S = 20\ m$ (10%)



ASSUME UNIFORMLY DISTRIBUTED LOAD F_D

ASSUME THAT LINE IS NEUTRALLY BUOYANT

ASSUME THAT LINE HAS CATENARY SHAPE

CONSIDER DRAG ON A VERTICAL LINE ONLY.

$$F_D = \frac{1}{2} \times \rho \times V^2 \times C_D \times d$$

$$= \frac{1}{2} \times 1025 \times 0.2^2 \times 1.2 \times 0.0038 = 0.0935\ N/m$$

TOTAL LOAD $= F_D \times 200 = 18.7\ N$

USING CATENARY THEORY, CALCULATOR FINDS

SAG = 40 m

VERTICAL FORCE ON LINE (SEE CATENARY THEORY)

$$F_V = \frac{F_D}{8 \times SAG} \times \left(220^2 - 4 \times SAG^2\right)$$

↑ TOTAL LENGTH OF LINE

$$F_V = 12.2\ N$$

TENSION ON CABLE = $$T = \left(F_V^2 + \left(F_D \times \frac{D}{2}\right)^2\right)^{1/2}$$

$$T = 16\ N$$

USING 5% SLACK, WE FIND $T = 20\ N$

CONCLUSION: THE LOAD ON THE LINE WILL BE VERY SMALL, COMPARED TO THE WEIGHT OF THE TRIPOD

5% TO 10% SLACK IS APPROPRIATE. MORE SLACK MAY CAUSE LINE TO GET STUCK UNDER THE ICE. LESS SLACK INCREASES LOAD.