



AdOc 2013 GEOL4060/5060 Exercise 4
Surface currents, salinity, temperature

Name:
 Id:

Issued 18 Feb 2013; Due at beginning of 1 March 2013 session. Give short answers, but please show your thinking.

<p>1a. Draw the idealized case of an Ekman spiral, including the wind direction, and direction of Ekman transport for the northern hemisphere.</p> <p>1b. If the initial current is 1m/s, the latitude is 35°N, and the current is 10km wide, what is the Rossby Number of the structure ?</p>	
--	--

2. Eastern China has two contrasting wind seasons northwest wind in winter and southeast wind in summer.
 Q2a. Draw the water movement at surface in the following maps according to Ekman theory. Which is the monsoon season ?

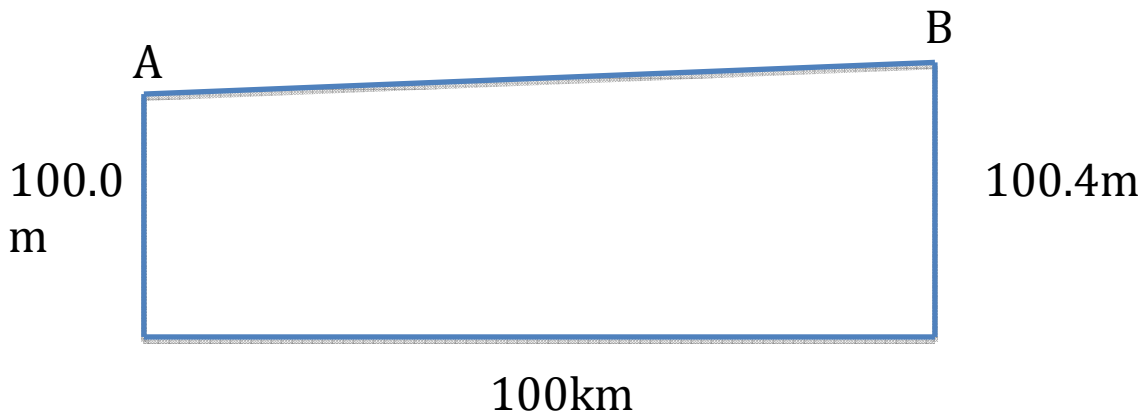
Winter	Summer
	

2b. The current induced by wind could carry sediment to or from the coast. According to the wind direction, in which season will the sea bed be eroded, or deposited? (Keep in mind that sediment concentration is higher close to the sea bed.)

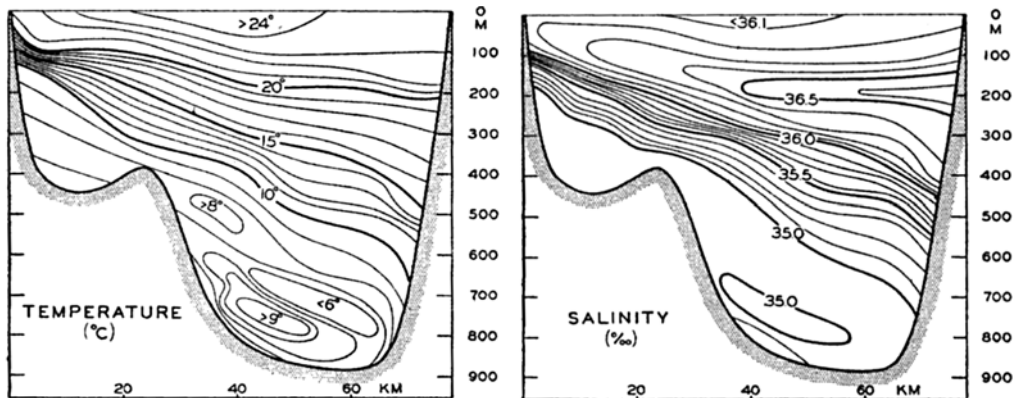
3. Geostrophic describes a current when pressure and Coriolis force balance each other, which could be described as the following gradient equation, where the pressure terms are due to raised sea-surface: $mg \tan\theta = mfu$ where the water parcel mass, g is the gravity acceleration (9.8 m/s²), θ is the sea surface tilted angle, u is current velocity, and f is the Coriolis parameter, which is calculated as $f=2\Omega \sin\varphi$ (Ω is the earth's rotation speed 7.29*10⁻⁵ s⁻¹, and φ is latitude).

Q3a: Hydrographic stations A and B are 100 km apart at 30°S latitude. Because of wind, there is water piled at station A, and the water depth for station A is 100.0 m, and B is 100.4m (as shown in the following figure). Calculate the current speed u with the gradient

equation and also indicate the direction of flow.



4. The oceanographic (W, left; E, right) sections shown below were taken off the Florida/Georgia. Florida current is a part of the Gulf Stream, which flows through the strait of Florida and Bimini.



a. In which direction should the sea-surface slope according to the temperature and salinity?

b. Using the salinity and temperature plots, identify where you think the core of the Florida Current flows.