

Obligatory exercise no. 2, GEF2610, spring 2015

Deadline: Monday 27th April, either by e-mail to eyvind.aas@geo.uio.no, or in paper form to the mail box of E. Aas in the Geology building.

(It is neither necessary nor forbidden to repeat the questions in your answer; you should choose the presentation that makes the answers easy to understand.)

Exercise 1

a) We are lying on a bathing mattress and bobbing in swells in deep water outside Limasol on Cyprus. We observe that the swells have a period of about 5 seconds.

- *Derive by means of the equations in the Lecture Notes Chapter 8 a relationship between the phase velocity and the period for deep-water waves.*
- *What is the phase velocity of the observed swell?*
- *What is the wavelength of the swell?*

b) The bathing mattress seems to bob about 20 cm up and down, and we assume that the 20 cm correspond to the wave height. If the wave shape can be described by a sine function, the water particles will move in circles, where the particle speed in the circle orbit is a function of the circle radius and the wave period.

- *What is the speed of the water particles in the surface?*
- *What is the ratio between particle speed in the surface and the phase velocity of the swell in this case?*

c) The swell is refracted in towards the bathing beach of Limasol where the bottom slopes very gradually. The period of the swell will be the same, and therefore the wavelength has to change.

- *What is the wavelength when the depth has become 0.5 m?*
- *What is now the phase velocity of the swell?*

Exercise 2

a) - *Describe briefly how the positions of the earth, moon and sun are relative to each other when we have spring and neap tides, respectively. What do we call the phases of the moon that are related to the spring and neap tides?*

b) At the web page of the Norwegian Hydrographic Service NHS,

<http://www.sehavniva.no/>

write Oslo in the box "Skriv inn stedsnavn" and click on "Oslo, Vannstandsmåler". In the box "Tidsrom" choose the period "Fra: 15 Apr, 2015 Til: 17 Apr, 2015" Mark "Hver time". Click on "Vis".

- *What was the predicted ("beregnet") tidal difference on 16th April?*

- *What was the observed ("observed") tidal difference on 16th April?*

Mark (click) the button for "Værets virkning" (effect of weather). Click on "Vis".

- *What was the effect of weather on this date?*

c) - Follow the same procedure for the location of Vardø. Fill in Vardø in "Skriv inn stedsnavn" and click on "By, Vardø".

- *Answer the same questions as in b).*

d) On the web pages of the U.S. Naval Observatory, Astronomical Applications Department,

<http://aa.usno.navy.mil/data/docs/MoonPhase.html>

it is possible to find the dates for the phases of the moon in the same month. Click on "Get data".

- *Approximately when should the spring and neap tides appear in this month?*