Name_____ Period _____

INVESTIGATING OCEAN CURRENTS: PLOTTING BUOY DATA

(Modified from the original by Dr. Karen Grove, Department of Geosciences, San Francisco State University)

INTRODUCTION:

Ocean currents are like huge rivers in the sea. They carry drifting organisms, vital dissolved chemical nutrients and pollutants with them as they flow. Surface currents effect the biological productivity of the ocean and also help determine our climate by moving hot and cold water masses around. Currents are also important for ships traveling at sea that can move with or against the flow. In this investigation we will consider one important way that scientists gather information about the location and strength of ocean currents.

The data below are from drifter buoys in the North Pacific Ocean. Released into the ocean, the buoys float with the currents and take measurements of the water with built-in instruments. They are tracked by satellites in orbits far above Earth and transmit data several times a day.

The floater at the top of the buoy sits at the surface of the water and holds an antenna for sending data to a satellite above. Drogues well below the surface cause the ocean currents to take the buoy along instead of the surface wind (Figure 1 below). The buoy also holds electronic instruments for measuring sea surface temperatures (SST), submergence, irradiance (for sunlight) and barometric pressure. At the top is another device for measuring temperature and conductivity (used to calculate salinity).

PROCEDURES:

Longitudes 80-180 degrees on the left (west) side of the diagram are East Longitudes (positive numbers); longitudes 180 to 80 on the right (east) side of the diagram are West Longitudes (negative numbers). North Latitudes are in the upper half of the map and South Latitudes are in the lower half of the map. Label the numbers on the map as N and S latitudes and E and W longitudes.

Use the longitude and latitude data below to plot the position of each buoy location during the year. Next, connect the locations with different color lines for each buoy and draw an arrow to show the direction of motion.

DATA:

Buoy no	Position day	Latitude	Longitude
12410	27 Feb 95	30.1	-123.7
12410	28 Mar 95	27.5	-121.8
12410	22 Apr 95	25	-124.6
12410	22 May 95	23.6	-128
12410	24 June 95	22.5	-133.9
12410	24 July 95	23.1	-138.4
12410	26 Aug 95	20.5	-145.4
12410	25 Sept 95	20	-147.6
12410	20 Nov 95	17.9	-155.3
12410	18 Dec 95	21.4	-159.5
15022	25 Feb 95	10.7	162
15022	27 Mar 95	10.5	152.1
15022	23 Apr 95	11.6	145.5
15022	20 May 95	12.4	137.6
15022	25 June 95	17	131.1
15022	22 July 95	21.7	127.8
15022	27 Aug 95	33	141.6
15022	23 Sept 95	37	147.8
15022	23 Oct 95	39.3	152
15022	25 Nov 95	40.1	154.5
15022	31 Dec 95	37.6	160.4

22217	27 Feb 95	51.2	-162.7
22217	27 Mar 95	50.4	-165.3
22217	24 Apr 95	48.7	-159.5
22217	29 May 95	50.7	-155.1
22217	26 June 95	50.4	-151.7
22217	24 July 95	51.5	-149.3
22217	28 Aug 95	51	-145
22217	25 Sept 95	53.1	-143.8
22217	23 Oct 95	55.2	-139.1
22217	27 Nov 95	57.1	-141.4
22217	18 Dec 95	56.9	-141.7

ANALYSIS OF DATA:

1- Refer to a map of surface currents. What are the names of the surface currents that moved the buoys whose courses you plotted? (a) Buoy 12410 (b) Buoy 15022 (c) Buoy 22217

2- The currents plotted are all part of the North Pacific gyre, a clockwise-moving current that redistributes heat in the North Pacific. (a) What is the name of the current that moves water past the coast of California? (b) Do you think it carries warm or cold water past the coast of California?

3- Sometimes drifting buoys stop transmitting their data to orbiting satellites. (a) List several possibilities as to what might happen to a buoy drifting in the Pacific Ocean to interrupt its data stream. (b) How might these things be avoided?

GEOGRAPHIC AND MATH EXTENSIONS:

4- Using a more detailed map or an atlas showing the Pacific Ocean with a distance scale, calculate approximately how far each buoy travelled overall during the months studied.

5- (a) How far did each buoy drift between February and March? (b) What was the speed of the current moving each buoy in kilometers per day? (c) miles per day? (d) kilometers per hour? (e) miles per hour?

6- Based on your calculations, rank the three surface currents according to their speed.

7- Based on your calculation for the California Current, how long would it take for plankton drifting off the coast of San Francisco to reach Santa Monica Bay?

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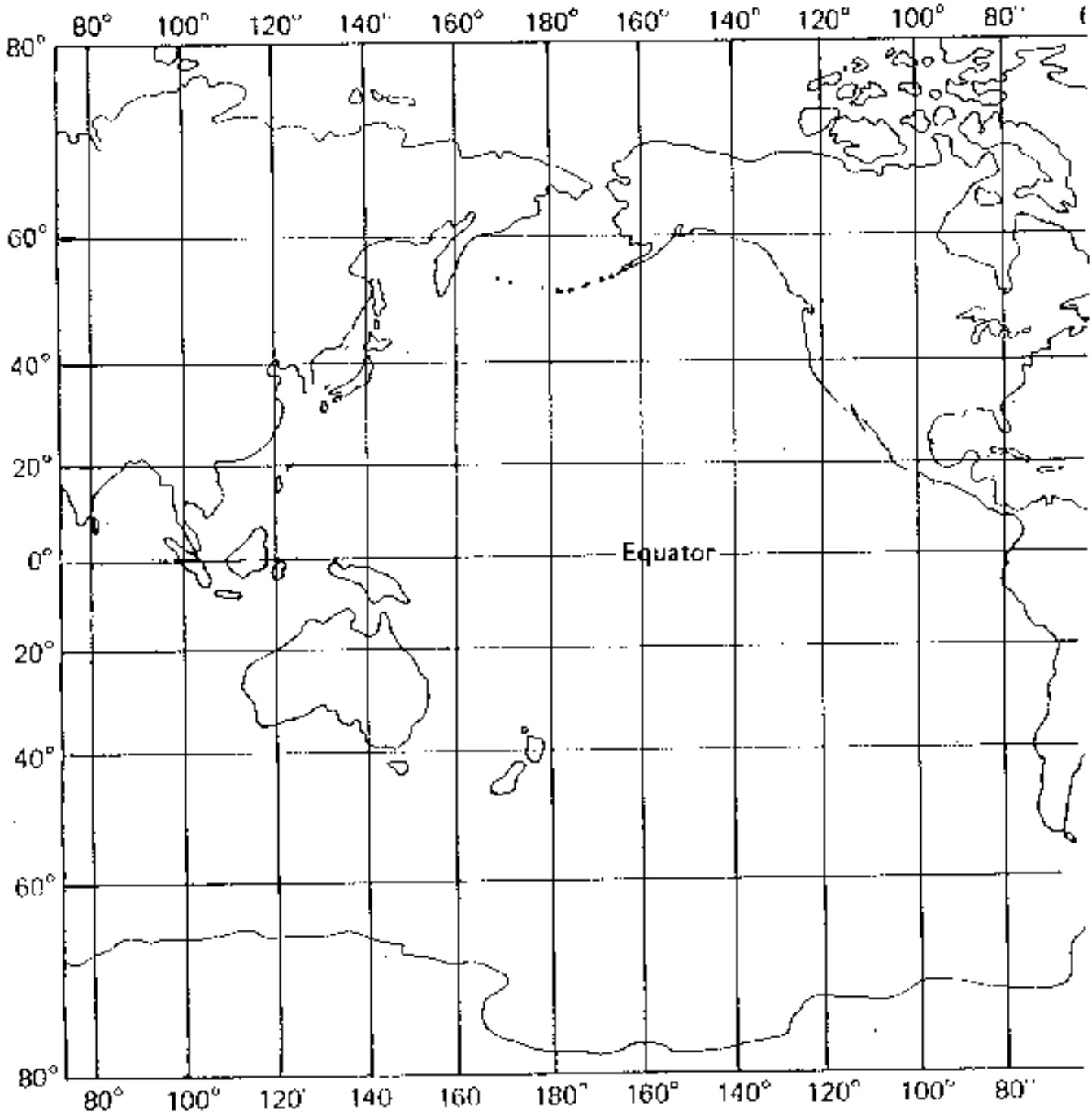
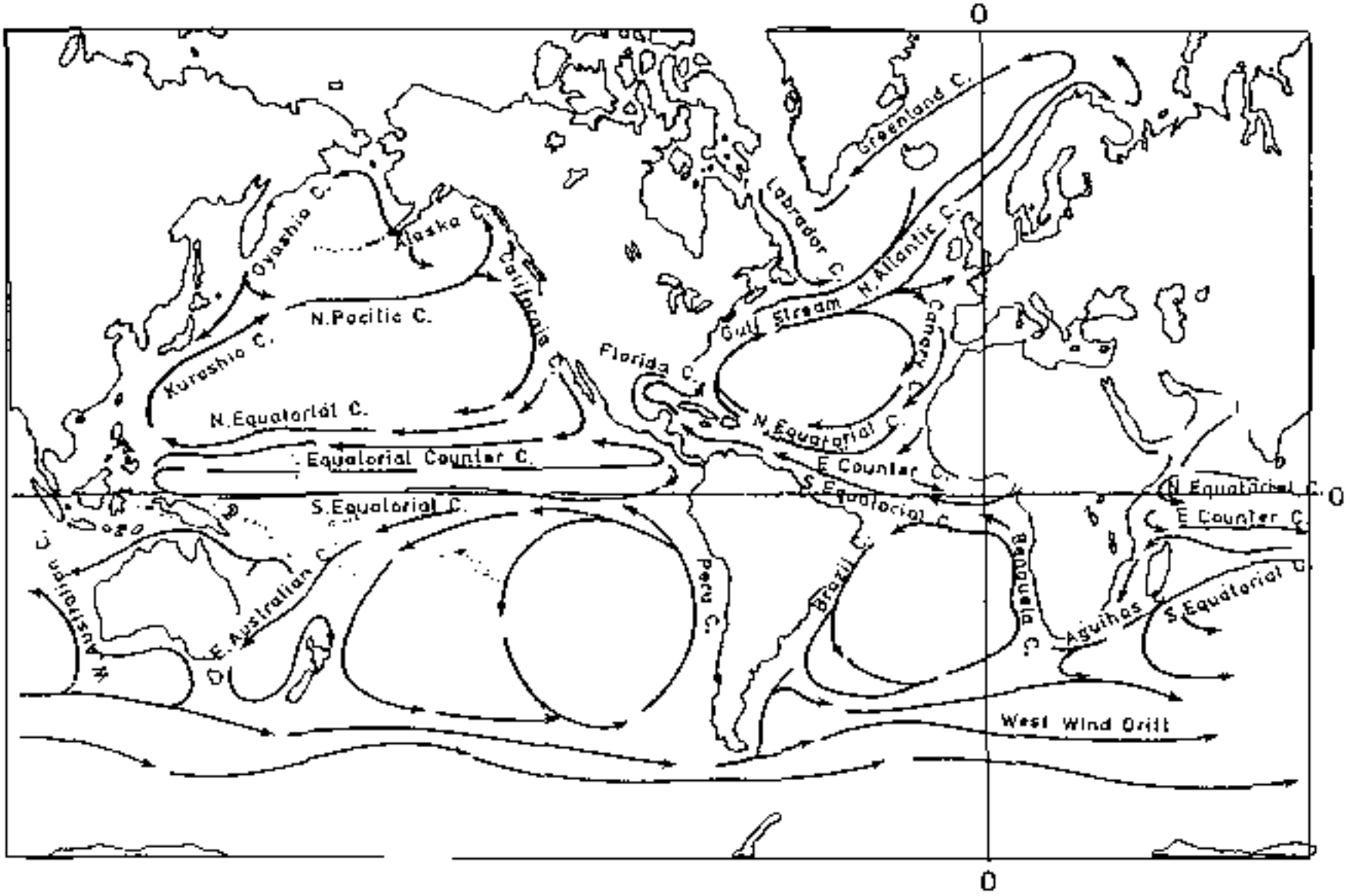
Map of the Pacific Ocean



Major World Surface Currents - Reference Map



T E A CH E R ‘ S G U I D E

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Map of the Pacific Ocean