Santa Barbara Channel

Examples

Try out these examples to learn the basics of modeling oil spills in Santa Barbara Channel. Explore how the changing circulation modes alter an oil spill's trajectory, how wind can move an oil spill in a direction different from the currents, and how model and observation limitations can be overcome by considering both the "Best Guess" and the "Minimum Regret" (Uncertainty) solutions. This knowledge will help you in designing your own GNOME model runs.

The following conditions hold for each of the examples:
Model Start Time: User's choice.
Run duration: 24 hours, unless otherwise specified in a particular example.
Uncertainty: Not included.
Wind: Constant at 0 knot, unless specified.
Pollutant type: Non-weathering.
Spill size: 1000 barrels.

Use GNOME's Standard Mode and the Santa Barbara Channel Location File to answer the following questions:

1. Make two linear spills extending across the Santa Barbara Channel (SBC) and Santa Maria Basin (SMB). Make one in the east/west direction, along 34° 52.06'N, and one in the north/south direction, along 119° 48.17'N.

How does your choice of current pattern affect the spill trajectories in the first 24 hours?

> **Hints:** To easily set a line spill, click and drag the spill tool from the *any* starting point on the water area of the map to the *any* endpoint. In the Spill Information window that opens, you can then enter the exact latitude and longitude of the starting point and endpoint. (This method is much easier than moving your mouse around the map and watching its location in the lower left corner of the window!)

> To change the current pattern, but keep all other Location File settings the same, double-click the name of your Location File, "Santa Barbara Channel," in the left section of the Map Window (the Summary List). The Location File Welcome window will appear with all the settings you had previously chosen. You only have to enter information that you are changing. You can then rerun the model with the same spills, under the same conditions, but with a new current pattern.

> **Answer:** These three circulation patterns show the range of variability within the SBC and SMB. The SBC shows a general cyclonic (counterclockwise) circulation, but the direction of flow through the eastern

entrance can reverse. The SMB shows either an anticyclonic (clockwise) circulation or a general northward trend.

2. To investigate the effects of wind on oil spill movement, choose the Relaxation pattern and set a spill at 34° 25.54'N, 120° 05.01'W. Gradually increase the wind from the south (by 10 knots each time) and examine where the oil impacts the beach.

How does changing the wind speed change the distance the spill travels before beaching?

> **Hints:** To remove the line source spills from Example 1, select each spill's description ("Non-Weathering: 1000 barrels") under **Spills** in the Summary List. Under the GNOME **Item** menu, select Delete.
>
> To quickly set a spill at a particular location, simply double-click the Spill Tool on the GNOME toolbar. You can then enter the *exact* latitude and longitude of the spill in the Spill Information window.
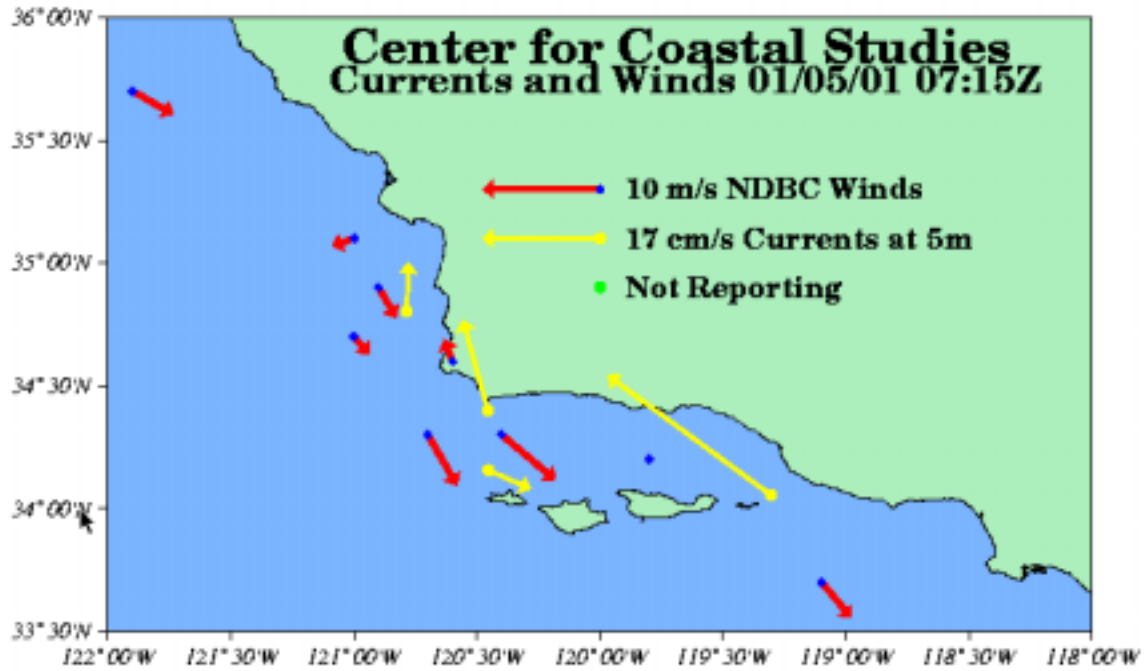>
> To increase the wind in your model, double-click **Wind** in the Summary List, and then enter the wind speed and direction in the Constant or Variable Wind window.
>
> **Answer:** With no wind, the spill follows the coast, but does not heavily impact the coastline. As the wind is increased, the impacts occur sooner after the spill occurs and closer to the spill site.
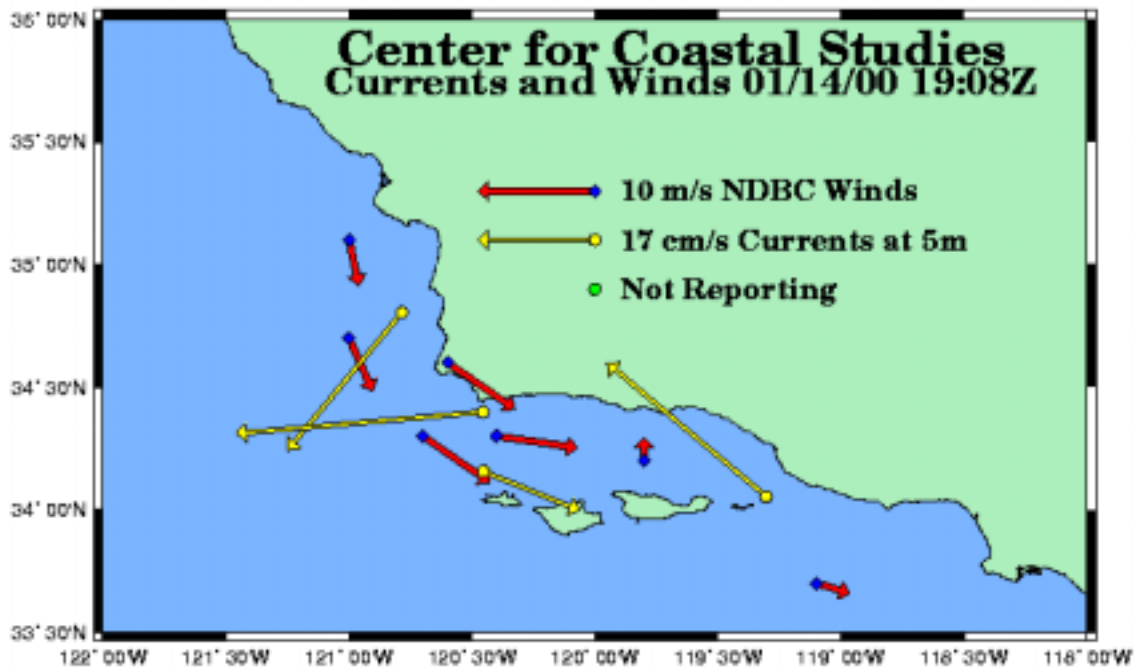
3. Below are some pictures of Santa Barbara Channel winds and currents (courtesy of the Center for Coastal Studies at the University of California at San Diego, and the Dept. of the Interior Minerals Management Service). **Use the pictures of the three current patterns in the Santa Barbara Channel Location File and the information in the "Selecting a Circulation Pattern" Help topic in the Location File to help you identify the current pattern in each picture.** You don't have to do all six examples in order to get an idea of how to do this task. As in real spill conditions, you may not have enough information to make an exact match, or the real conditions may vary from the classic definitions. In particular, the winds can change quickly, while the circulation and currents adjust to changes much more slowly.

> **Hint:** The arrows on the pictures point in the direction that the wind or current is flowing. **The longer the arrow, the faster the flow.** To determine upwelling or downwelling conditions, orient the paper so that you are looking down the wind arrow from tail to point. The water flow due to Ekman transport (caused by the wind and the earth's rotation) will be to your (and the arrow's) right. Water moving toward the coast will cause downwelling; water moving away from the coast will cause upwelling.
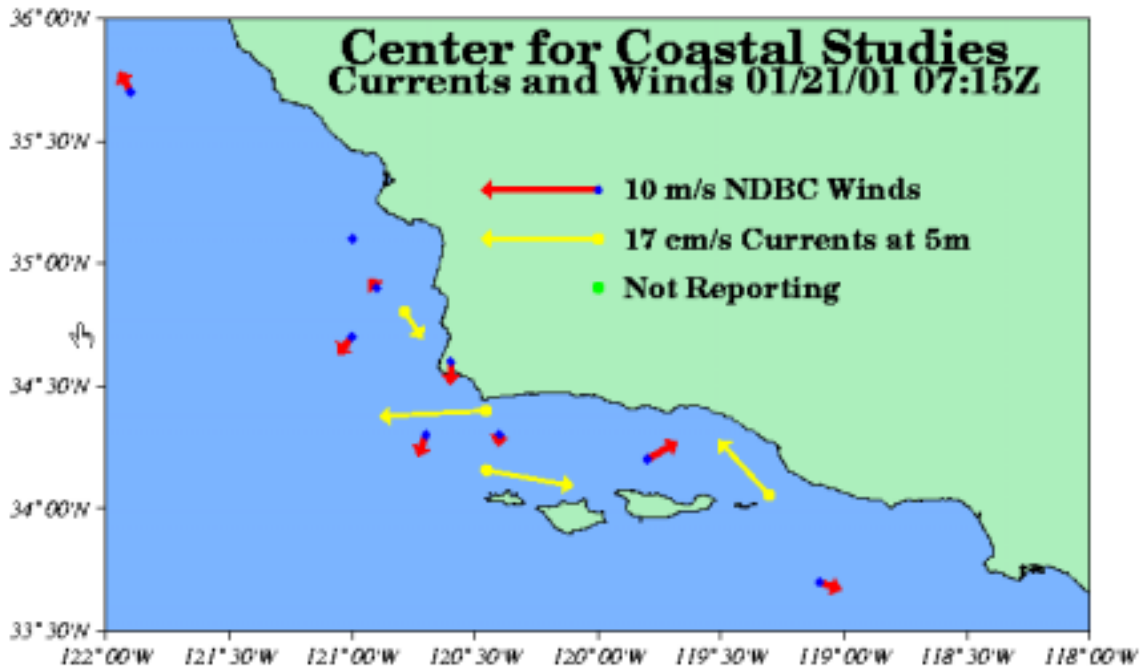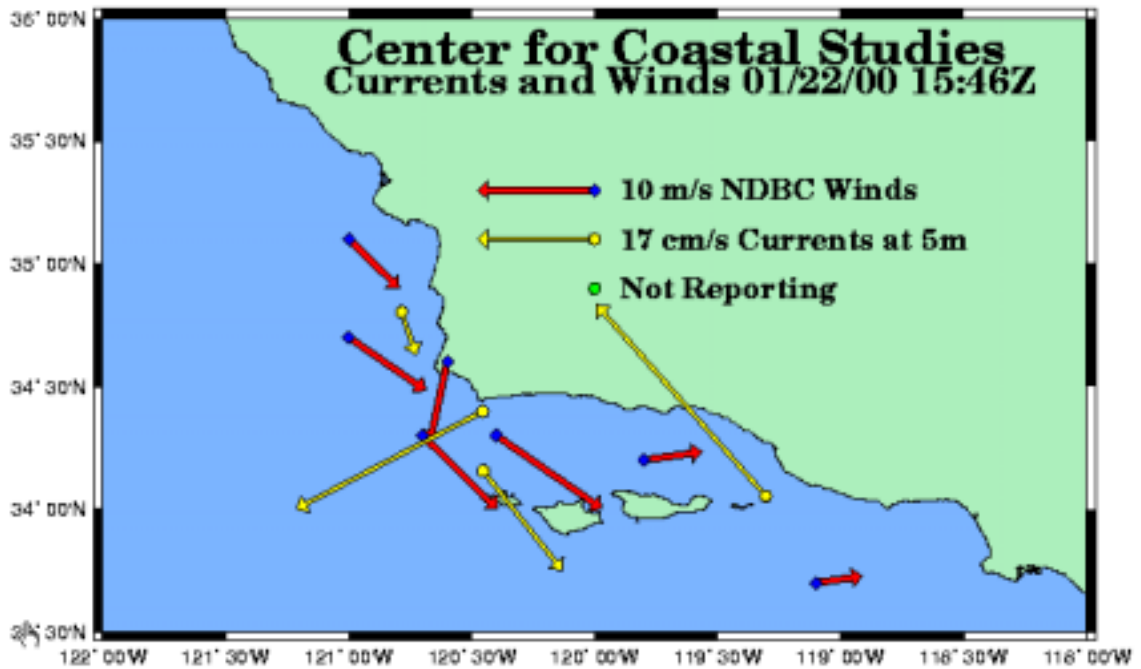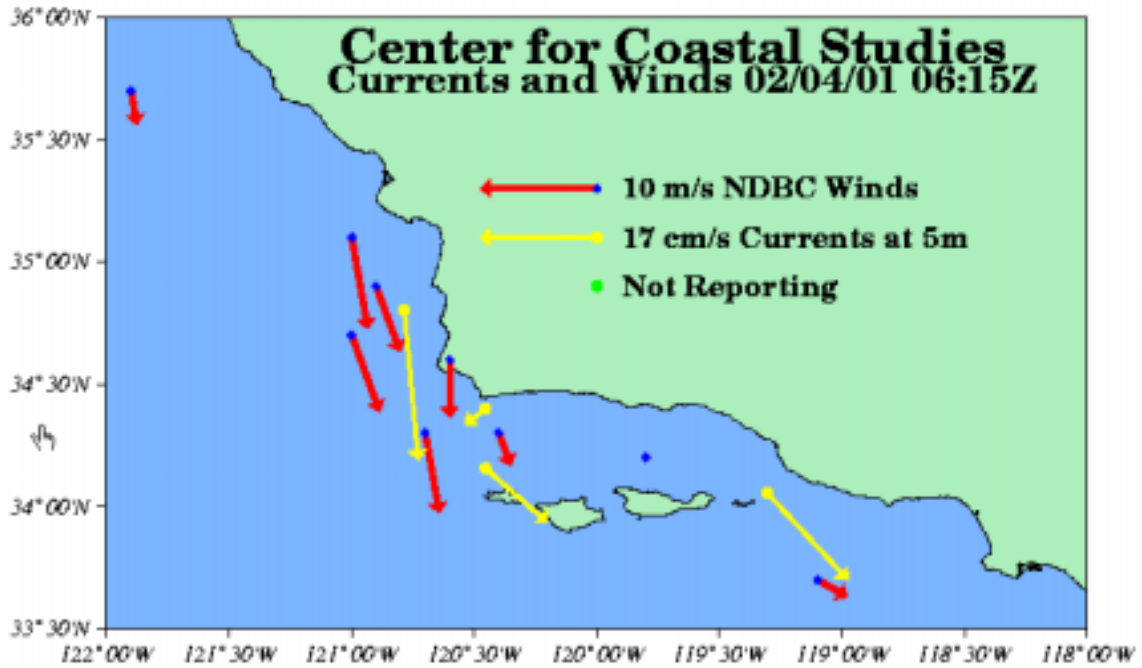
a. January 5, 2001

Center for Coastal Studies
Currents and Winds 01/05/01 07:15Z

10 m/s NDBC Winds
17 cm/s Currents at 5m
Not Reporting

b. January 14, 2000

Center for Coastal Studies
Currents and Winds 01/14/00 19:08Z

10 m/s NDBC Winds
17 cm/s Currents at 5m
Not Reporting

c. January 21, 2001

d. January 22, 2000

e. February 4, 2001

Center for Coastal Studies
Currents and Winds 02/04/01 06:15Z

10 m/s NDBC Winds
17 cm/s Currents at 5m
Not Reporting

f. February 24, 2000

Center for Coastal Studies
Currents and Winds 02/24/00 07:16Z

10 m/s NDBC Winds
17 cm/s Currents at 5m
Not Reporting
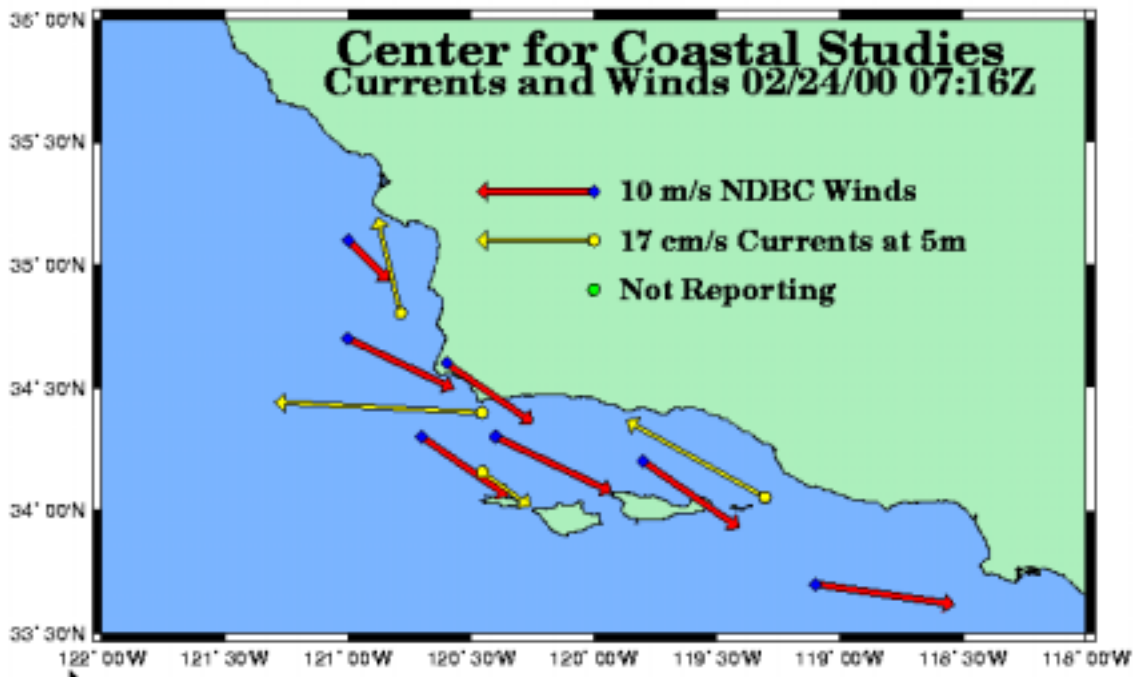
Answer:

a.   January 5, 2001 - RELAXATION STATE

b.   January 14, 2000 - CONVERGENT STATE

c.   January 21, 2001 - CONVERGENT STATE

d.   January 22, 2000 - UPWELLING STATE

e.   February 4, 2001 - UPWELLING STATE

f.   February 24, 2000 - RELAXATION STATE