Regional Environments

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It was important for the team to learn about oceanic currents that depict the environments of the two regions of concern: the Caribbean and New York City metropolitan. By gaining an understanding of the big picture environment, the group was able to better interpret the GNOME output simulation and apply it to the emergency response spill model.

Caribbean Region:

The Caribbean is composed of the Greater Antilles, which are the larger northern islands, and the Lesser Antilles, which is the grouping of the smaller islands to the east (Fig.1). The subtropical recirculation from the Gulf Stream in the Atlantic Ocean flows west through the Lesser Antilles to drive the Caribbean currents. The sill of the semi-volcanic island arc restricts the flow of deep water ocean currents, so surface currents are the primary focus in the Caribbean.

The westward flowing Caribbean Current is a fairly complex current due to its variability caused by Caribbean eddies. Tides in the Caribbean Seas are not of any concern, because they have some of the lowest tidal ranges in the world. The various flows of current in the Caribbean combine to drive the Yucatan Current into the Gulf of Mexico. This current is joined by the Loop Current to provide power to the Gulf Stream.

Historically, there also exists the Antilles Current, which flows north of the Greater Antilles islands. However, there has been speculation of the currents’ existence since it is so weak. It is also important to point out that salinity levels are greater in the first five months of the year.
New York City Metropolitan:

The New York City Harbor is an estuary in which multiple rivers, primarily the Hudson and East Rivers, meet with the New York Bight as part of the Atlantic Ocean. The New York Bight environment is comprised of Gulf Stream eddy currents, longshore drift currents, South Atlantic waves, and diurnal tidal flow from the New York Harbor (Fig.2).

The influence of the tidal flow in and out of the New York Harbor is crucial, because “residual circulation in [the harbor] is one of the important factors responsible for the transport and distribution of pollutants from various sources located along the Hudson river, East River, and Long island Sound” (Blumberg, Prichard 1997)
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