Baylor Fox-Kemper, Brown University
Assistant professor; earth, environmental and planetary sciences

Baylor Fox-Kemper arrived at Brown University three years ago with his research focus on ocean turbulence, or, more simply, how things get mixed and transported in the upper part of the ocean.

Winds, waves and currents — turbulence as small as the wake behind a buoy to a massive eddy the size of 10 Rhode Islands — Fox-Kemper seeks to understand how they work and the impact of climate change on these natural systems.

Rhode Island NSF EPSCoR offered the chance to jump aboard and collaborate with colleagues at partner institutions and learn from their local expertise. Today, Fox-Kemper is the lead principal investigator on a Rhode Island Science and Technology Advisory Council (STAC) grant that brings together scientists at Brown, University of Rhode Island and Rogers Williams University, and relies on the research capacity of RI EPSCoR-supported facilities throughout the state.

Fox-Kemper brings his high resolution ocean modeling to the project; URI researchers Lewis Rothstein, Christopher Kincaid, and David Ullman add their expertise on modeling the region. RWU’s Dale Leavitt and David Taylor contribute their fisheries expertise.

“It spans the whole spectrum, from the fundamental physics through the local physical experience, and up to the biological expertise,” Fox-Kemper says. “The goal here is to predict what will happen in the future so we can be ready for what comes.”

What the EPSCoR grant has allowed, he adds, is for the Rhode Island scientists to build a fully functioning model that will have application in other regions (Chesapeake Bay, Puget Sound, Gulf of Mexico), attract additional funding, and give rise to the pursuit of bigger and more complex questions.

Lewis Rothstein, URI Graduate School of Oceanography
Professor; physical oceanography

The ocean, with the ebb and flow of tides, currents swirling at and beneath the surface, and winds blowing overhead, never stills, even at its calmest moments.

This constant state of circulation, says Lewis Rothstein, determines the health of our coastal system, which, in turn, supports the food web, drives the economy, and sustains quality of life.

The balance that is the earth’s heat budget — whether purely natural or influenced by human actions — determines how and where the water moves, and affects such characteristics as the light penetration and food availability organisms depend on for survival.

“The overall focus of my research is trying to understand the flow of energy through the world’s oceans,” Rothstein explains. “How is the coastal regime responding to natural climate variability and the trend that is climate change?”

Awarded a series of three, interrelated RI Science and Technology Advisory Council (STAC) grants, Rothstein and his peers in the Rhode Island NSF EPSCoR community are creating numerical models guided by observed scientific data to forecast the impact of climate change on water movement and the implications for marine life and ecosystems.

Says Rothstein: “We have to understand how the ocean circulates. The foundation of our coastal ecosystem — from the tiniest of organisms to fish — lies in how the water responds within a world that is experiencing profound climate change.”