

## Probabilistic Reanalysis of Florida Current Transport since 1982

Authors: Christopher G. Piecuch, Lisa M. Beal

The Florida Current is the headwater of the Gulf Stream and its volume transport is the best observed ocean transport in the world. Daily measurements date from 1982 and are derived from a submarine cable calibrated with quarterly ship-based in situ observations. Nevertheless, from these transports alone it remains unclear how the Florida Current is responding to climate change. It also remains unclear how conditions within the current relate to other important climatic variables, such as sea level and coastal flooding events. To fill this gap we conducted a Bayesian reanalysis to assimilate data from cable, ship, and satellite altimeter in a mathematically consistent and fully probabilistic way. Using the reanalysis we test whether transport has meaningfully changed during the past four decades and how sensitive the inference is to choice of dataset. We also identify the most extreme daily transports and when they probably happened. And we determine the accuracy of daily, monthly, and yearly transport estimates in the event the cable measurements fail. This latter investigation is prompted by fears that the submarine cable is falling into disrepair and transport estimates will need to be leveraged from alternative measurements in future. Our results place the Florida Current in the context of large-scale climate change, identify extremes that may be relevant to flooding in Florida, and inform future observing system design.