

COP Annual Progress Report

Project Title: "Field Studies for Validation of Florida Bay Models"

Grantee: Harbor Branch Oceanographic Institution

Award Period: From August 1, 2001 to July 31, 2002

Period Covered by this Report: From August 1, 2001 to March 31, 2002

1. Work Accomplishments (as related to project objectives):

[Primary project objectives include collecting relative humidity data needed to make evaporation calculations for southern Florida Bay, and assembling current meter time series needed to validate hydrodynamic model simulations. Until model results are available, observations will be used to characterize regional flow patterns of Florida Bay]

a. Summary of Progress

1. The evaporation time series for the Long Key C-MAN station (starting April 1, 2000) has been extended to January 7, 2002, covering a total of just over 21 months. Interannual variability can now be quantified for the overlap time period. This work will continue through the end of the contract.
2. A 392-day (October 17, 2000 to November 13, 2001) current meter time series from an open-water study site in the interior of Florida Bay (between Rabbit Key and Sid Key) shows a net southward and southwestward flow coming out of the north-central part of the bay. This is consistent with the long-term net outflow that has been recorded in previous studies at locations west, south and east of this location.
3. A 405-day (November 29, 2000 to January 8, 2002) current meter time series from South Twin Key Channel shows a strong long-term net outflow, reinforcing the pattern that shows a net outflow through all the major tidal channels in the interior of the bay. This is one of the important general patterns of the circulation of Florida Bay that should be reproduced by a hydrodynamic circulation model.
4. A 215-day (February 7 to September 10, 2001) current meter time series from the main east-west channel just south of Flamingo in the northwest corner of the bay shows an irregular net (westward) outflow into the Gulf of Mexico. These results document another region of outflow, but they do not suggest an inflow pathway for the water needed to balance the outflow recorded, e.g., in South Twin Key Channel (see above).
5. A 405-day (November 29, 2000 to January 8, 2002) current meter time series from Rabbit Key Pass along the eastern side of Rabbit Key Basin shows a net westward flow. Combined with earlier results from Iron Pipe Channel and both Chlorox Channel and Y-Channel, this time series helps describe a pathway of water leaving the interior of the bay and entering shelf waters of the Gulf of Mexico. Strong tidal exchanges through Rabbit Key Pass contribute to interbasin mixing and shorten the residence time of water in the interior of the bay.

6. A 112-day (November 14, 2001 to March 6, 2002) current meter record from Steamboat Channel (a study site in the Intracoastal Waterway on the east side of Lignumvitae Basin) shows a quasi-steady westward transport into Lignumvitae Basin. A previous study of flow through Steamboat Channel showed that fluctuations about the mean are highly coherent with wind forcing. The net westward transport may be a component of the larger-scale flow patterns in eastern Florida bay, or it may be a result of differences in tidal exchanges to the east (through Snake Creek and Whale Harbor Channel) relative to tidal exchanges to the west (through the Teatable Channel, Indian Key Channel and Lignumvitae Channel group). A net transport occurring in response to channel geometry would provide a dependable exchange process that would be significant to the flushing in the eastern part of the bay .
 7. A 56-day (November 14, 2001 to January 9, 2002) current meter record from Bowlegs Cut (a study site in the Intracoastal Waterway on the west side of Lignumvitae Basin) shows a quasi-steady westward transport similar to that shown in the Steamboat Channel (see above) for the same time period. The quasi-steady inflow and outflow of water through Steamboat Channel and Bowlegs Cut, respectively, combined with active tidal exchanges through Teatable Key Channel, Indian Key Channel and Lignumvitae Channel, would contribute to a rapid flushing of Lignumvitae Basin.
 8. A 55-day (January 9 to March 5, 2002) current meter record from Cowpens Cut (a study site on the northwest side of Cotton Key Basin where the Intracoastal Waterway cuts through Cross Bank) shows an irregular south-southwestward flow. The pattern is consistent with that found in Steamboat Channel and Bowlegs Cut in the sense that all three time series show a generally southwestward flow along the Intracoastal Waterway on the Bay side of the Middle and Upper Keys.
- b. Work to be Performed (April through July)

The evaporation study will be continued through the end of the 2001-2002 contract. The current meter in Steamboat Channel will remain there through the end of July also. Another current meter will be installed in Lignumvitae Channel for a short study (April-July) to determine the role that channel plays along with Indian Key Channel and Teatable Key Channel in flushing Lignumvitae Basin.

A sub-study will be initiated to investigate the “overtopping” mechanism that appears to be a partial explanation for the observed net outflow from all the major channels in the interior of Florida Bay. This work is designed to determine if a hydrodynamic model that is geographically restricted to Ninemile Bank and Rabbit Key Basin can explain the net outflow that has been observed in Iron Pipe Channel.

Current problems include only a gap in the relative humidity time series from the Long Key C-MAN weather station that occurred when the logger’s memory filled to capacity and new data began overwriting old data.

2. Applications.
 - a. Two papers have been accepted for publication since the last progress report:
 1. Smith, N.P. (in press) Florida Bay Circulation Studies. In: Recent Research Developments in Geophysics (S.G. Pandalai, Ed.). Research Signpost, Trivandrum, India.
 2. Pitts, P.A. (in press) Near-shore Circulation in the Lower Florida Keys. Journal of Coastal Research.
 - b. Applications to management and research include the role the expanded data base will play in model validation. Specifically, observations have identified a net flow in the Intracoastal Waterway from the Upper Keys toward the Middle Keys, a net flow into Rabbit Key Basin in the interior of the bay and a strong net outflow through South Twin Keys Channel. All these have an important effect on flushing, and thus they constitute components of the regional flow patterns of Florida Bay that should be reproduced by model simulations.
 - c. Data products are included in Part 1.a. of this report.
 - d. No partnerships have been established in addition to those already described in the original proposal. Data continue to be sent to the National Oceanographic Data Center Office in Miami.

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