Realtime modeling group Cruise Report: *Edwin Link* #9904

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Draft:

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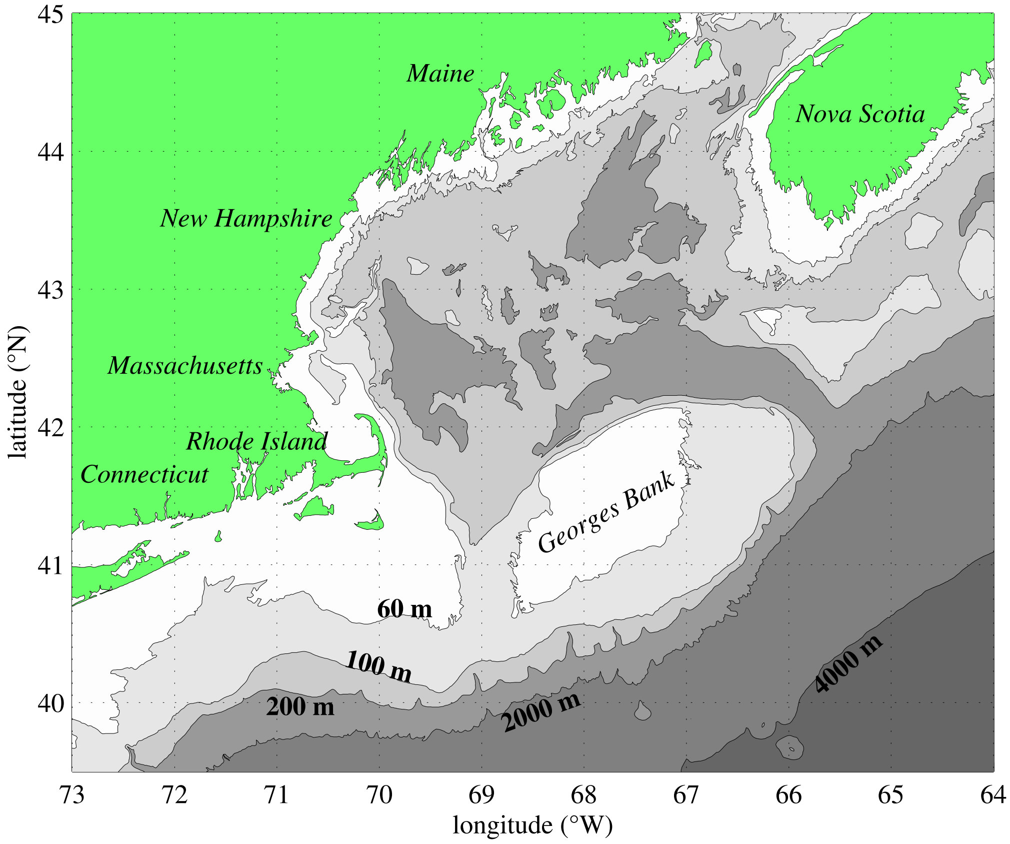

Figure 1: Map of Georges Bank and surroundings

1 Chronology

Thursday, 15 April 1999 (YD104.#)

1. Ship sailed: 1PM EDT
2. Secured equipment and took motion sickness drugs.
3. APR15_BPE01 run at 10PM EDT
4. Network computers to ship's net.
5. Establish ELWW pages.

Friday, 16 April 1999 (YD105.#)

1. Email came on line 10 PM. We received:
   - apr14h_fort.61
   - apr14h_fort.72
   - apr15h_fort.61
   - apr15h_fort.72
   - apr15-17f_fort.61
   - apr15-17f_fort.72
   - apr16-18f_fort.61
   - apr16-18f_fort.72
   - Bouy wind and heat flux forecast through YD108.25GMT.

Saturday, 17 April 1999 (YD106.#)

1. First Forecast: APR17_BPE01 (no ADCP)
2. Attempted ADCP data processing, no luck.
3. Luettich notes failure of met data.
4. Debug and improve default plotting and html page scripts.
5. Cisco samples larval fish.
6. Email stayed on line, but no shore data was received due to problems with AVN postings.

Sunday, 18 April 1999 (YD107.#)

1. Debug and fix drogue3ddt code.
2. New buoy forecasts through YD110.25GMT
3. Attempted ADCP data processing, no luck.
4. Luettich notes failure of met data forecast.
5. Tested and ran PSQ4.
6. Email Products started to arrive, but continued problems on shore prevented generation of cbc files.
   - Bouy wind and heat flux forecast through YD110.25GMT.

Monday, 19 April 1999 (YD108.#)

1. Second Forecast 0000Z: APR19_BPE01 (no ADCP, no new cbc (persisted past 19 April 1999, 0300Z), used buoy wind and heat flux) wind and heat flux.
2. Discovered O2 compiler bug. When run with -O3 optimization, the code mysteriously generated salinity out of bounds errors despite the fact that the preceding ICQ4 had normal salinity values. This problem went away when the code was compiled with -O2.
3. Third Forecast 0000Z: APR19_BPE02. wind and heat flux.
4. Email shore products started to arrive in full as shore data transfer problems were ironed out by FTP.
   - Bouy wind and heat flux forecast through YD111.25GMT.
   - apr16-18h_fort.61
   - apr16-18h_fort.72
   - apr19-21f_fort.61
   - apr19-21f_fort.72

Tuesday, 20 April 1999 (YD109.#)

1. Initiated first full forecast run: APR20_FCS01. Used Drogue velocities from ARGOS 89 drifter to estimate velocity.
2. Email shore products:
   - Bouy wind and heat flux forecast through YD112.25GMT.
   - apr19h_fort.61
   - apr19h_fort.72
   - apr20-22f_fort.61
   - apr20-22f_fort.72

Wednesday, 21 April 1999 (YD110.#)

1. Began analyzing results of APR20_FCS01.
2. Email shore products:
   - Bouy wind and heat flux forecast through YD113.25GMT.
   - apr20h_fort.61
   - apr20h_fort.72
   - apr21-23f_fort.61
   - apr21-23f_fort.72

Thursday, 22 April 1999 (YD111.#)

1. APR22_FCS01.

Friday, 23 April 1999 (YD112.#)

1. APR23_FCS01.

Saturday, 24 April 1999 (YD113.#)

1. Rocked and rolled

Sunday, 25 April 1999 (YD114.#)

1. Arrived Woods Hole

2 APR15_BPE01

This model run was made on April 15th to develop an initial forecast (sans cruise data) of the likely hydrography we were sailing into. Most of the files used were on board when we sailed, as the ship's email was not functional at the time this run was made. Time period of model run: 4 April 1999 0100Z to 17 April 1999 0100Z, with forecast winds persisting from the 15th through the 17th.

1. run.APR15_BPE01.sh: Minimal runscript

```
#!/bin/sh
#----------------------------------------------------------------------
#
# QUODDY: Best prior estimate (BPE)
#
CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
input_files/CRUISE_Q4.1.inq
1999 93.0 1.0
1
1999 93.0 1.0
OBS/apr1-14_detided.cbc
1.0
0
1
EOD

mv OBS/*Q4* CRUISE_Q4.1/
mv OBS/DRIFTERS.pth CRUISE_Q4.1/
mv OBS/DRIFTERS.diag CRUISE_Q4.1/
cp ITER_01440.icq4 CRUISE_Q4.1/HOT-START.icq4
mv DAY*.icq4 CRUISE_Q4.1/
mv ITER_*.icq4 CRUISE_Q4.1/

exit
```

2. input_files:

   (a) CRUISE_Q4.1.inq

```
{Comment:}
BPE and test run for cruise
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
```

```
COLD-START 04 04 1999 3600.0
{Echo file:}
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS            [units]
1.00  1.00  1.00    [x, y, and z scaling factor]
43.500              [degree latitude]
10.0                [minimum depth]
17 04 1999 3600.0   [end date (d m y) and time (sec) of simulation]
180.0               [time step (seconds)]
21                  [number of vertical nodes]
```

3. CLIM_BCS:
   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology
4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. DROG.LTS: Drog positions at last time step.
7. IOS_tidetbl: M. Foreman's tidal timing parameters
8. MESH: bank150
9. OBS - Initial Conditions and cruise observations
   (a) DRIFTERS.ind - Arbitrarily seeded 37 drifters across bank.
   (b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (d) QFLUX.o1d - Heat Flux data and forecast.
      i. START TIME: 1999 YD90.0
      ii. CONTENTS: Provided by J. Manning from Bouy 44008. Data was drawn from columns 1 (GMT day) and 6 (Heat Flux, W/m^2) of file: MODALL.DAT.
      iii. END TIME: 1999 YD107.25
   (e) TAUXY.o1d - Wind Stress
      i. START TIME: 1999 YD90.04166

   ii. CONTENTS: Provided by R. Luettich. Used genTauxy.f on apr1-13_fort.72 and added to it apr14h.72 to create TAUXY.o1d.
   iii. END TIME: 1999 YD103.9999

(f) UV_INTEG.m3d - Modified EN302 cruise track. Dates of track reflect dates occuring during EL9904; track is spatially identical.

(g) apr1-14_detided.cbc
   i. START TIME: 1 April 1999 3600.0 seconds
   ii. CONTENTS: Provided by R. Luettich. Used detide_ADCIRC_elev.f on apr1-14_fort.61 to obtain apr1-14_detided.cbc.
   iii. END TIME: 335 hours later (15 April 1999, 0000Z)

10. SRC_Q4: Source code for this run

3 APR17_BPE01

This model run was made on April 17th as nominal first forecast (still sans cruise data) of the likely hydrography we were sailing into. Forecast updates were received from Luettich and Manning, allowing us to extend our forecast by 2 days with forecast winds, heat and cbc for the full forecast. At this time the creation of a default plots web page was included in the runscript.

Time period of model run: 9 April 1999 0000Z to 19 April 1999 0100Z, with AVN forecast winds.

1. run.APR17_BPE01.sh: Minimal runscript

   ```
   mkdir CRUISE_Q4.1
   CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
   input_files/CRUISE_Q4.1.inq
   1999 99.0 1.0
   1
   1999 99.0 1.0
   OBS/apr1-18_detided.cbc
   1.0
   0
   1
   99.0 20
   EOD

   mv OBS/*Q4* CRUISE_Q4.1/
   mv OBS/DRIFTERS.pth CRUISE_Q4.1/
   mv OBS/DRIFTERS.diag CRUISE_Q4.1/
   #cp ITER_#####.icq4 HOTSTART.icq4
   mv DAY*.icq4 CRUISE_Q4.1/
   mv ITER_*.icq4 CRUISE_Q4.1/

   cd CRUISE_Q4.1
   mkdir html
   matlab << EOF
   defplots
   quit
   EOF

   exit
   ```

2. input_files:

   (a) CRUISE_Q4.1.inq

   ```
   {Comment:}
   ```

```
APR17_BPE01
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 09 04 1999 0.0
{Echo file:}
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
19 04 1999 3600.0 [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

3. CLIM_BCS:
   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology
4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. DROG.LTS: Drog positions at last time step.
7. IOS_tidetbl: M. Foreman's tidal timing parameters
8. MESH: bank150
9. OBS - Initial Conditions and cruise observations
   (a) DRIFTERS.ind - 56 Drifters, one at each of the planned sampling locations, launched on 16 April 1999, 1200Z.
   (b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (d) QFLUX.o1d - Heat Flux data and forecast.
      i. START TIME: 1999 YD90.0

   ii. CONTENTS: Started from APR15_BPE01/OBS/QFLUX.o1d; data for days 105.125-108.25 was drawn from columns 1 and 6 of file 1604.dat (forecasts for GB NOAA Bouys emailed by Manning cron job to ship).
   iii. END TIME: 1999 YD108.25

(e) TAUXY.o1d - Wind Stress
   i. START TIME: 1999 YD90.04166
   ii. CONTENTS: Started from APR15_BPE01/OBS/TAUXY.o1d; data for days 103.999-108.1247 was drawn from files: apr15h_fort.72 (104.0-105.0) and apr16-18f_fort.72 (105.04-108.125) (both files received via email from R. Luettich).
   iii. END TIME: 1999 YD108.12474

(f) UV_INTEG.m3d - Same as APR15_BPE01/OBS/UV_INTEG.m3d.

(g) apr1-18_detided.cbc
   i. START TIME: 1 April 1999 3600.0 seconds
   ii. CONTENTS: Provided by R. Luettich. Used apr1-14_detided.cbc and appended apr15h_detided.cbc and apr16-18f_detided.cbc.
   iii. END TIME: 434 hours later (19 April 1999, 0300Z)

10. SRC_Q4: Source code for this run

4 APR19_BPE01

This model run was made on April 19th as second forecast (still not assimilative) of the likely hydrography we were sailing into. No new forecasts from Luettich, so all wind updates were based on Manning's buoy winds and heat fluxes, allowing us to extend our forecast a further 2 days with forecast winds and heat. The cbc persists from 19 April 1999 0300Z through this forecast. At this time a debugged version of drog3ddt was incorporated.

Time period of model run: 11 April 1999 0000Z to 21 April 1999 0000Z, with forecast winds from Manning Buoy data (and previous AVN).

1. run.APR19_BPE01.sh: Minimal runscript

   ```
   CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
   input_files/CRUISE_Q4.1.inq
   1999 101.0 1.0
   1
   1999 101.0 1.0
   OBS/apr1-18_detided.cbc
   1.0
   0
   1
   EOD

   mv OBS/*Q4* CRUISE_Q4.1/
   mv OBS/DRIFTERS.pth CRUISE_Q4.1/
   mv OBS/DRIFTERS.diag CRUISE_Q4.1/
   cp ITER_01440.icq4 CRUISE_Q4.1/HOT-START.icq4
   mv DAY*.icq4 CRUISE_Q4.1/
   mv ITER_*.icq4 CRUISE_Q4.1/
   run.defplots CRUISE_Q4.1

   exit
   ```

2. input_files:

   (a) CRUISE_Q4.1.inq

   ```
   {Comment:}
   BPE and test run for cruise
   {Case name:}
   MESH/bank150
   {Boundary element incidence list:}
   MESH/bank150.elev.bel
   {Initial condition file:}
   COLD-START 11 04 1999 0000.0
   {Echo file:}
   ```

```
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
21 04 1999 0000.0 [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

3. CLIM_BCS:
   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology
4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. DROG.LTS: Drog positions at last time step.
7. IOS_tidetbl: M. Foreman's tidal timing parameters
8. MESH: bank150
9. OBS - Initial Conditions and cruise observations
   (a) DRIFTERS.ind - 50 Drifters placed along a section parallel to Schlitz's moorings, placed at 5 and 25 meters and passively advecting.
   (b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (d) QFLUX.o1d - Heat flux data and forecast.
      i. START TIME: 1999 YD90.0
      ii. CONTENTS: Started from APR17_BPE01/OBS/QFLUX.o1d; data for days 107.125-110.25 was drawn from columns 1 and 6 (bouy 44008) of file q107-110.dat (forecasts for GB NOAA Bouys emailed by Manning cron job to ship on Sunday 18 April 1999).
      iii. END TIME: 1999 YD110.25
   (e) TAUXY.o1d - Wind Stress
      i. START TIME: 1999 YD90.04166

    ii. CONTENTS: Started from APR17_BPE01/OBS/TAUXY.o1d; data for days 107.125-110.25 was drawn from columns 1, 17 and 18 (bouy 44011) of file q107-110.dat (forecasts for GB NOAA Bouys emailed by Manning cron job to ship on Sunday 18 April 1999).
    iii. END TIME: 1999 YD110.25

  (f) UV_INTEG.m3d - Same as APR15_BPE01/OBS/UV_INTEG.m3d.
  (g) apr1-18_detided.cbc
    i. START TIME: 1 April 1999 3600.0 seconds
    ii. CONTENTS: Used APR17_BPE01/OBS/apr1-18_detided.cbc; implies persistence of cbc past 0300Z 19 April 1999.
    iii. END TIME: 434 hours later (19 April 1999, 0300Z)

10. SRC_Q4: Source code for this run
  (a) `drog3ddt.f` has been corrected; no drogues lost across element boundaries.

5 APR19_BPE02

This run was for the same time period as APR19_BPE01 (11 April 1999 0000Z to 21 April 1999 0000Z) with the difference being the incorporation of the files:

```
apr16-18h_fort.61  ....  hindcast wind plus tidal bank150 bdry elevation
apr16-18h_fort.72  ....  hindcast winds at center of bank and buoys 5, 8, 11
apr19-21f_fort.61  ....  forecast wind plus tidal bank150 bdry elevation
apr19-21f_fort.72  ....  forecast winds at center of bank and buoys 5, 8, 11
```

which arrived e-mail at 1900EDT on 19 April. This model run was launched on April 20th (0100 EDT) as a second forecast (still not assimilative of drifter or ADCP data). In the Linux run, the file ITER_3940.icq4 was corrupted. This was noticed running PSQ4 when during the read of the icq4 files an "invalid character" error was reported and the execution of PSQ4 stopped. This was determined to be a fault in the JAZ disk.

1. run.APR19_BPE02.sh: Minimal runscript

```
CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
input_files/CRUISE_Q4.1.inq
1999 101.0 1.0
1
1999 101.0 1.0
OBS/apr1-21_detided_elev.cbc
1.0
0
1
EOD

mv OBS/*Q4* CRUISE_Q4.1/
mv OBS/DRIFTERS.pth CRUISE_Q4.1/
mv OBS/DRIFTERS.diag CRUISE_Q4.1/
cp ITER_01440.icq4 CRUISE_Q4.1/HOT-START.icq4
mv DAY*.icq4 CRUISE_Q4.1/
mv ITER_*.icq4 CRUISE_Q4.1/
run.defplots CRUISE_Q4.1

exit
```

2. input_files:

   (a) CRUISE_Q4.1.inq

```
{Comment:}
BPE and test run for cruise
{Case name:}
```

```
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 11 04 1999 0000.0
{Echo file:}
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
21 04 1999 0000.0 [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

3. CLIM_BCS:
   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology
4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. DROG.LTS: Drog positions at last time step.
7. IOS_tidetbl: M. Foreman's tidal timing parameters
8. MESH: bank150
9. OBS - Initial Conditions and cruise observations
   (a) DRIFTERS.ind - 50 Drifters placed along a section parallel to Schlitz's moorings, placed at 5 and 25 meters and passively advecting.
   (b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (d) QFLUX.o1d - Heat flux data and forecast.
      i. START TIME: 1999 YD86.25

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr19/Gen_QFLUX_file`Ḟor consistent use of BOUY 11 throughout the qflux file, we started from Jim's `MODALL.dat` (renamed to `APR15.dat`) and combined it with `APR16.dat` `APR18.dat` and `APR19.dat`Ȧll files were edited by hand (using *nedit*) to choose only column 1 (YD) and column 10 (heat flux in W/m2). File `Apr15.dat` was additionally editted since it kept a running tab of 3-day forecasts resulting in overlaps of forecast days. A repeated value of YD86.25 was deleted. Having cleaned `Apr15.dat` we appended `Apr16.dat` `Apr18.dat` and `Apr19.dat` using always the newest forecast day and replacing the oldest forecasts.

iii. END TIME: 1999 YD111.25

(e) TAUXY.o1d - Wind Stress

i. START TIME: 1999 YD90.04166

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr19/Gen_WindStress_file`Ṫhe files:

```
apr1-13_fort.72
apr14h_fort.72
apr15h_fort.72
apr16-18h_fort.72
apr19-21f_fort.72
```

were appended consecutively with the program `genTauxy.f` resulting in the file TAUXY.o1d. The chosen winds are always those on the center of the bank (1st record of the group of 4 seen in the later `fort.72` files).

iii. END TIME: 1999 YD111.1237

(f) UV_INTEG.m3d - Same as APR15_BPE01/OBS/UV_INTEG.m3d.

(g) apr1-21_detided_elev.cbc

i. START TIME: 1 April 1999 3600.0 seconds

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr19/Gen_cbc_elev_file`Ṫhe files:

```
apr1-13_fort.61
apr14h_fort.61
apr15h_fort.61
apr16-18h_fort.61
apr19-21f_fort.61
```

were concatenated by hand (using *nedit*) to generate `apr1-21_fort.61`U̇sing `detide_ADCIRC_elev.f` the file was detided and the file `apr1-21_detided_elev.cbc` created.

iii. END TIME: 507 hours later (21 April 1999, 0300Z)

10. SRC_Q4: Source code for this run

6 APR20_FCS01

This is our first run assimilating velocity drifter data. Jim provided a `UV_INTEG.m3d` file from the Argos 89 drifter. Our forecast set-up followed past FCAST runs with 3 forward Quoddy runs and 2 Truxton runs. See timing details below.

- The first simulation completed but the velocities were very large, e.g., daily averages of 5m/sec, and the drifters left the domain in one tidal cycle. Both O2 and Linux runs gave the same answer. The BPE results were very good (rms error about 0.2m/sec), the 2nd forward rms error was 1.5m/s and the third forward rms was 0.6m/s. This was run with 10 Fourier modes and a condition number of 0.01.
- Because the last records of this file were "ratty", another job was submitted with the data from `UV_INTEG.m3d` file cropped from YD109.5 forward (original one was renamed `UV_INTEG_argos89_orig.m3d`). The results were essentially the same as above – with an improvement in the BPE to 0.09m/s and a subsequent deterioration in the 2nd and 3rd forward iterations. This was also run with 10 Fourier modes and a condition number of 0.01.
- We launched a series of standalone Truxton tests comparing results by varying the number of Fourier modes, and running the WLS and SVD solutions.
  - i) Fourier modes=4, and condition number 0.01
  - ii) The WLS PRT bcs for both frequencies (M_2 and residual) were $\mathcal{O}(10^{-10})$. WLS cases run (rcond, w0, w1): (.0001 .01 10.0), (.0001 .01 100.0), (.0001 .01 1.0).
  - iii) SVD cases with condition numbers 0.01 and 0.001. The SVD results were similar in general trend and magnitude to the 10 Fourier mode (baseline) solution.
- We combined the data for Argos 89 and Argos 393 and generated a new `UV_INTEG.m3d` file. This has 330 observations as opposed to the 84 of the above runs. In the process of making this run, it was discovered that the time period of the forward run must encompass all of the oberved velocity observations (not unsurprising), or QUODDY will fail to write the UV_INTEG.ak and UV_INTEG.en files (this error is deceptive, as files left over from previous runs may "trick" TRUXTON into believing it has correct versions of these files).

1. run.APR20_FCAST.sh: runscript

```
#!/bin/sh
#------------------------------------------------------------------------
#
# QUODDY: Best prior estimate (BPE)
#
#------------------------------------------------------------------------
```

```
mkdir CRUISE_Q4.1
CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
input_files/CRUISE_Q4.1.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr1-22_detided_elev.cbc
1.0
0
1
103.0 120
EOD

mv OBS/*Q4* CRUISE_Q4.1/
mv OBS/DRIFTERS.pth CRUISE_Q4.1/
mv OBS/DRIFTERS.diag CRUISE_Q4.1/
mv DAY*.icq4 CRUISE_Q4.1/
mv ITER_*.icq4 CRUISE_Q4.1/

#------------------------------------------------------------------------
#
# TRUXTON: Inversion of errors from BPE
#
#------------------------------------------------------------------------

mkdir CRUISE_T6.ALL
CRUISE_T6 > CRUISE_T6.ALL/CRUISE_T6.1.res << EOD
input_files/CRUISE_T6.1.inq
2
2
0.140519E-03
0.100000E-11
CRUISE_Q4.1/UV_INTEG-Q4.m3d
CRUISE_Q4.1/UV_INTEG.Q4.ak.s2r
CRUISE_Q4.1/UV_INTEG.Q4.en.s3r
10
.01
CRUISE_T6.ALL/BCS_PRT1.s2c
NO
NO
CRUISE_T6.ALL/BCS_PRT2.s2c
NO
NO
CRUISE_T6.ALL/CRUISE_T6.1.dat
EOD
```

```
#-----------------------------------------------------------------------
#
# QUODDY: Second forward run
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.2
CRUISE_Q4 > CRUISE_Q4.2/CRUISE_Q4.2.res << EOD
input_files/CRUISE_Q4.2.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr1-22_detided_elev.cbc
0.0
2
1.0 1.0
0
107.0 60
EOD

mv OBS/*Q4* CRUISE_Q4.2/
mv OBS/DRIFTERS.pth CRUISE_Q4.2/
mv OBS/DRIFTERS.diag CRUISE_Q4.2/
mv DAY*.icq4 CRUISE_Q4.2/
mv ITER_* CRUISE_Q4.2/

#-----------------------------------------------------------------------
#
# TRUXTON: Second inverse solution
#
#-----------------------------------------------------------------------

CRUISE_T6 > CRUISE_T6.ALL/CRUISE_T6.2.res << EOD
input_files/CRUISE_T6.2.inq
2
2
0.140519E-03
0.100000E-11
CRUISE_Q4.2/UV_INTEG-Q4.m3d
CRUISE_Q4.2/UV_INTEG.Q4.ak.s2r
CRUISE_Q4.2/UV_INTEG.Q4.en.s3r
10
.01
CRUISE_T6.ALL/BCS_PRT3.s2c
NO
NO
```

```
CRUISE_T6.ALL/BCS_PRT4.s2c
NO
NO
CRUISE_T6.ALL/CRUISE_T6.2.dat
EOD

#-----------------------------------------------------------------------
#
# QUODDY: Third forward run
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.3
CRUISE_Q4 > CRUISE_Q4.3/CRUISE_Q4.3.res << EOD
input_files/CRUISE_Q4.3.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr1-22_detided_elev.cbc
0.0
4
1.0 1.0 1.0 1.0
0
105.0 20
EOD

mv OBS/*Q4* CRUISE_Q4.3/
mv OBS/DRIFTERS.pth CRUISE_Q4.3/
mv OBS/DRIFTERS.diag CRUISE_Q4.3/
mv DAY*.icq4 CRUISE_Q4.3/
mv ITER_* CRUISE_Q4.3/

#***********************************************************************
#***********************************************************************
```

2. input_files:

   (a) CRUISE_Q4.1.inq

```
{Comment:}
BPE and test run for cruise
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
```

```
COLD-START 12 04 1999 0000.0
{Echo file:}
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS           [units]
1.00  1.00  1.00   [x, y, and z scaling factor]
43.500             [degree latitude]
10.0               [minimum depth]
21 04 1999 0.0     [end date (d m y) and time (sec) of simulation]
180.0              [time step (seconds)]
21                 [number of vertical nodes]
```

(b) CRUISE_Q4.2.inq

```
{Comment:}
Second forward solution
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
CRUISE_Q4.1/ITER_01440.icq4
{Echo file:}
CRUISE_Q4.2/CRUISE_Q4.2.echo
{Simulation parameters:}
SI UNITS           [units]
1.00  1.00  1.00   [x, y, and z scaling factor]
43.500             [degree latitude]
10.0               [minimum depth]
21 04 1999 0.0     [end date (d m y) and time (sec) of simulation]
180.0              [time step (seconds)]
21                 [number of vertical nodes]
```

(c) CRUISE_Q4.3.inq

```
{Comment:}
Third forward solution
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
CRUISE_Q4.1/ITER_01440.icq4
{Echo file:}
CRUISE_Q4.3/CRUISE_Q4.3.echo
{Simulation parameters:}
SI UNITS           [units]
1.00  1.00  1.00   [x, y, and z scaling factor]
```

```
43.500             [degree latitude]
10.0               [minimum depth]
23 04 1999 10800.0 [end date (d m y) and time (sec) of simulation]
180.0              [time step (seconds)]
21                 [number of vertical nodes]
```

(d) CRUISE_T6.1.inq

```
First inverse of TRUXTON6
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 01 01 1995 0.0
{Echo file:}
CRUISE_T6.ALL/CRUISE_T6.1.echo
{Simulation parameters:}
SI UNITS           [units]
1.00  1.00  1.00   [x, y, and z scaling factor]
43.500             [degree latitude]
10.0               [minimum depth]
01 01 1995 0.0     [end date (d m y) and time (sec) of simulation]
180.0              [time step (seconds)]
21                 [number of vertical nodes]
```

(e) CRUISE_T6.2.inq

```
{Comment:}
Second inverse of TRUXTON6
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 01 01 1995 0.0
{Echo file:}
CRUISE_T6.ALL/CRUISE_T6.2.echo
{Simulation parameters:}
SI UNITS           [units]
1.00  1.00  1.00   [x, y, and z scaling factor]
43.500             [degree latitude]
10.0               [minimum depth]
01 01 1995 0.0     [end date (d m y) and time (sec) of simulation]
180.0              [time step (seconds)]
21                 [number of vertical nodes]
```

3. CLIM_BCS:

   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology

4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. CRUISE_Q4.2: Results Directory, discussed below.
7. CRUISE_Q4.3: Results Directory, discussed below.
8. CRUISE_T6.ALL: Results Directory, discussed below.
9. DROG.LTS: Drog positions at last time step.
10. IOS_tidetbl: M. Foreman's tidal timing parameters
11. MESH: bank150
12. OBS - Initial Conditions and cruise observations

   (a) DRIFTERS.ind - 4 drifters released according to Jim's releases.

```
{Comment:}
EL9904 drifters (tracking begins at time when all are in the water)
{# of model dt's btwn drogue position updates (itrack)}
1
{# of drog updates btwn drogue outputs (iprint)}
1
{grid scaling factors in x,y directions (MKS->1.0)}
1.0 1.0 1.0
{drog coordinate scaling factors}
1.0 1.0 1.0
Number of starting drogues (ndr)
4
Starting positions, x,y,z for ndr drogues
   3.200712e5  -1.299312e5 -35. 1999 106.9583
   3.200712e5  -1.299312e5 -13. 1999 106.9617
   3.164574e5  -1.133274e5 -35. 1999 107.1667
   3.176894e5  -1.171541e5 -13. 1999 107.6806
```

   (b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
   (c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.

(d) QFLUX.o1d - Heat flux data and forecast.

i. START TIME: 1999 YD86.25

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_QFLUX_file` . Starting with `QFLUX.o1d` from `../Apr20/Gen_QFLUX_file` , the latest fluxes (columns 1 and 10) from `APR20.dat` were inserted at the end of the Apr19 `QFLUX.o1d` replacing the values from YD109.125 forward. Consistent use of BOUY 11 throughout the qflux file is kept.

iii. END TIME: 1999 YD112.25

(e) TAUXY.o1d - Wind Stress

i. START TIME: 1999 YD90.04166

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_WindStress_file` . The files:

```
apr1-13_fort.72
apr14h_fort.72
apr15h_fort.72
apr16-18h_fort.72
apr19h_fort.72
apr20-22f_fort.72
```

were appended consecutively with the program `genTauxy.f` resulting in the file TAUXY.o1d. The chosen winds are always those on the center of the bank (1st record of the group of 4 seen in the later `fort.72` files).

iii. END TIME: 1999 YD112.1237

(f) UV_INTEG.m3d - Provided by Jim from the Argos 89 and ARGOS 393 drifter.

(g) apr1-22_detided_elev.cbc

i. START TIME: 1 April 1999 3600.0 seconds

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_cbc_elev_file`The files:

```
apr19h_fort.61
apr20-22f_fort.61
```

were concatenated by hand (using *nedit*) and replaced the last 3 days of the `apr1-21\_detided\_elev.cbc` file. Using `detide_ADCIRC_elev.f` the file was detided and the file `apr1-22_detided_elev.cbc` created.

iii. END TIME: 531 hours later (22 April 1999, 0300Z)

13. SRC_Q4: Source code for this run

14. SRC_T6: Source code for this run

7 APR22_FCS01

- Standard forecast run with `Rcond` in the TRUXTON runs increased to 0.1 and OBS files update to included latest wind, cbc and heat flux data.

1. run.APR22_FCAST.sh: runscript

```
#!/bin/sh
#-----------------------------------------------------------------------
#
# QUODDY: Best prior estimate (BPE)
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.1
CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
input_files/CRUISE_Q4.1.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr10-23_detided_elev.cbc
1.0
0
1
103.0 120
EOD

mv OBS/*Q4* CRUISE_Q4.1/
mv OBS/DRIFTERS.pth CRUISE_Q4.1/
mv OBS/DRIFTERS.diag CRUISE_Q4.1/
mv DAY*.icq4 CRUISE_Q4.1/
mv ITER_*.icq4 CRUISE_Q4.1/

#-----------------------------------------------------------------------
#
# TRUXTON: Inversion of errors from BPE
#
#-----------------------------------------------------------------------

mkdir CRUISE_T6.ALL
CRUISE_T6 > CRUISE_T6.ALL/CRUISE_T6.1.res << EOD
input_files/CRUISE_T6.1.inq
2
2
0.140519E-03
0.100000E-11
```

```
CRUISE_Q4.1/UV_INTEG-Q4.m3d
CRUISE_Q4.1/UV_INTEG.Q4.ak.s2r
CRUISE_Q4.1/UV_INTEG.Q4.en.s3r
10
.1
CRUISE_T6.ALL/BCS_PRT1.s2c
NO
NO
CRUISE_T6.ALL/BCS_PRT2.s2c
NO
NO
CRUISE_T6.ALL/CRUISE_T6.1.dat
EOD

#-----------------------------------------------------------------------
#
# QUODDY: Second forward run
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.2
CRUISE_Q4 > CRUISE_Q4.2/CRUISE_Q4.2.res << EOD
input_files/CRUISE_Q4.2.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr10-23_detided_elev.cbc
0.0
2
1.0 1.0
0
107.0 60
EOD

mv OBS/*Q4* CRUISE_Q4.2/
mv OBS/DRIFTERS.pth CRUISE_Q4.2/
mv OBS/DRIFTERS.diag CRUISE_Q4.2/
mv DAY*.icq4 CRUISE_Q4.2/
mv ITER_* CRUISE_Q4.2/

#-----------------------------------------------------------------------
#
# TRUXTON: Second inverse solution
#
#-----------------------------------------------------------------------
```

```
CRUISE_T6 > CRUISE_T6.ALL/CRUISE_T6.2.res << EOD
input_files/CRUISE_T6.2.inq
2
2
0.140519E-03
0.100000E-11
CRUISE_Q4.2/UV_INTEG-Q4.m3d
CRUISE_Q4.2/UV_INTEG.Q4.ak.s2r
CRUISE_Q4.2/UV_INTEG.Q4.en.s3r
10
.1
CRUISE_T6.ALL/BCS_PRT3.s2c
NO
NO
CRUISE_T6.ALL/BCS_PRT4.s2c
NO
NO
CRUISE_T6.ALL/CRUISE_T6.2.dat
EOD

#-----------------------------------------------------------------------
#
# QUODDY: Third forward run
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.3
CRUISE_Q4 > CRUISE_Q4.3/CRUISE_Q4.3.res << EOD
input_files/CRUISE_Q4.3.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr10-23_detided_elev.cbc
0.0
4
1.0 1.0 1.0 1.0
0
105.0 20
EOD

mv OBS/*Q4* CRUISE_Q4.3/
mv OBS/DRIFTERS.pth CRUISE_Q4.3/
mv OBS/DRIFTERS.diag CRUISE_Q4.3/
mv DAY*.icq4 CRUISE_Q4.3/
mv ITER_* CRUISE_Q4.3/
```

```
#*********************************************************************
#*********************************************************************
```

2. input_files:

   (a) CRUISE_Q4.1.inq

```
{Comment:}
BPE and test run for cruise
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 12 04 1999 0000.0
{Echo file:}
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
21 04 1999 43200.0    [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

   (b) CRUISE_Q4.2.inq

```
{Comment:}
Second forward solution
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
CRUISE_Q4.1/ITER_01440.icq4
{Echo file:}
CRUISE_Q4.2/CRUISE_Q4.2.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
21 04 1999 43200.0    [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

   (c) CRUISE_Q4.3.inq

```
{Comment:}
Third forward solution
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
CRUISE_Q4.1/ITER_01440.icq4
{Echo file:}
CRUISE_Q4.3/CRUISE_Q4.3.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
23 04 1999 10800.0 [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

(d) CRUISE_T6.1.inq

```
{Comment:}
First inverse of TRUXTON6
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 01 01 1995 0.0
{Echo file:}
CRUISE_T6.ALL/CRUISE_T6.1.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
01 01 1995 0.0    [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

(e) CRUISE_T6.2.inq

```
{Comment:}
Second inverse of TRUXTON6
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
```

```
{Initial condition file:}
COLD-START 01 01 1995 0.0
{Echo file:}
CRUISE_T6.ALL/CRUISE_T6.2.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
01 01 1995 0.0    [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

3. CLIM_BCS:
   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology
4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. CRUISE_Q4.2: Results Directory, discussed below.
7. CRUISE_Q4.3: Results Directory, discussed below.
8. CRUISE_T6.ALL: Results Directory, discussed below.
9. DROG.LTS: Drog positions at last time step.
10. IOS_tidetbl: M. Foreman's tidal timing parameters
11. MESH: bank150
12. OBS - Initial Conditions and cruise observations
    (a) DRIFTERS.ind - 4 drifters released according to Jim's releases.

```
{Comment:}
EL9904 drifters (tracking begins at time when all are in the water)
{# of model dt's btwn drogue position updates (itrack)}
1
{# of drog updates btwn drogue outputs (iprint)}
1
{grid scaling factors in x,y directions (MKS->1.0)}
```

```
1.0 1.0 1.0
{drog coordinate scaling factors}
1.0 1.0 1.0
Number of starting drogues (ndr)
4
Starting positions, x,y,z for ndr drogues
   3.200712e5  -1.299312e5 -35. 1999 106.9583
   3.200712e5  -1.299312e5 -13. 1999 106.9617
   3.164574e5  -1.133274e5 -35. 1999 107.1667
   3.176894e5  -1.171541e5 -13. 1999 107.6806
```

(b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.

(c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.

(d) QFLUX.o1d - Heat flux data and forecast.

   i. START TIME: 1999 YD86.25

   ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_QFLUX_file` . Starting with `QFLUX.o1d` from `../Apr20/Gen_QFLUX_file` , the latest fluxes (columns 1 and 10) from `APR20.dat` were inserted at the end of the Apr19 `QFLUX.o1d` replacing the values from YD109.125 forward. Consistent use of BOUY 11 throughout the qflux file is kept.

   iii. END TIME: 1999 YD113.25

(e) TAUXY.o1d - Wind Stress

   i. START TIME: 1999 YD90.04166

   ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_WindStress_file` . The files:

   ```
   apr1-13_fort.72
   apr14h_fort.72
   apr15h_fort.72
   apr16-18h_fort.72
   apr19h_fort.72
   apr20h_fort.72
   apr21-23f_fort.72
   ```

   were appended consecutively with the program `genTauxy.f` resulting in the file TAUXY.o1d. The chosen winds are always those on the center of the bank (1st record of the group of 4 seen in the later `fort.72` files).

   iii. END TIME: 1999 YD113.1237

(f) UV_INTEG.m3d - Provided by Jim from the Argos 89 and ARGOS 393 drifter.

(g) apr10-23_detided_elev.cbc

   i. START TIME: 10 April 1999 0.0 seconds

   ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_cbc_elev_file`The files:

`apr19h_fort.61`
`apr20-22f_fort.61`
were concatenated by hand (using *nedit*) and replaced the last 3 days of the `apr1-21\_detided\_elev.cbc` file. Using `detide_ADCIRC_elev.f` the file was detided, creating an `apr1-23_detided_elev.cbc` from which the first 10 days were deleted and the file `apr10-23_detided_elev.cbc` created.

iii. END TIME: 531 hours later (22 April 1999, 0300Z)

13. SRC_Q4: Source code for this run

14. SRC_T6: Source code for this run

8 APR23_FCS01

- Standard forecast run with `Rcond` in the TRUXTON runs increased to 0.1 and OBS files update to included latest wind, cbc and heat flux data. Includes wind event on April 24 that precluded further drifter and assimilative operations.

1. run.sh: runscript

```
#!/bin/tcsh

#-----------------------------------------------------------------------
#
# Clean up old results and store source of run.
#
#-----------------------------------------------------------------------

rm -rf CRUISE_Q4.? CRUISE_T6.ALL DROG.LTS *~ */*~ runsource.* *.icq4

set RUN=`pwd`
rm -f ../{$RUN:t:r}.tar.Z
tar cf ../{$RUN:t:r}.tar *
mv ../{$RUN:t:r}.tar runsource.tar
compress runsource.tar

#-----------------------------------------------------------------------
#
# QUODDY: Best prior estimate (BPE)
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.1
CRUISE_Q4 > CRUISE_Q4.1/CRUISE_Q4.1.res << EOD
input_files/CRUISE_Q4.1.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr10-25_detided_elev.cbc
1.0
0
1
103.0 120
EOD

mv OBS/*Q4* CRUISE_Q4.1/
mv OBS/DRIFTERS.pth CRUISE_Q4.1/
mv OBS/DRIFTERS.diag CRUISE_Q4.1/
```

```
mv DAY*.icq4 CRUISE_Q4.1/
mv ITER_*.icq4 CRUISE_Q4.1/

#-----------------------------------------------------------------------
#
# TRUXTON: Inversion of errors from BPE
#
#-----------------------------------------------------------------------

mkdir CRUISE_T6.ALL
CRUISE_T6 > CRUISE_T6.ALL/CRUISE_T6.1.res << EOD
input_files/CRUISE_T6.1.inq
2
2
0.140519E-03
0.100000E-11
CRUISE_Q4.1/UV_INTEG-Q4.m3d
CRUISE_Q4.1/UV_INTEG.Q4.ak.s2r
CRUISE_Q4.1/UV_INTEG.Q4.en.s3r
10
.1
CRUISE_T6.ALL/BCS_PRT1.s2c
NO
NO
CRUISE_T6.ALL/BCS_PRT2.s2c
NO
NO
CRUISE_T6.ALL/CRUISE_T6.1.dat
EOD

#-----------------------------------------------------------------------
#
# QUODDY: Second forward run
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.2
CRUISE_Q4 > CRUISE_Q4.2/CRUISE_Q4.2.res << EOD
input_files/CRUISE_Q4.2.inq
1999 102.0 1.0
1
1999 102.0 1.0
OBS/apr10-25_detided_elev.cbc
0.0
2
1.0 1.0
```

```
0
107.0 60
EOD

mv OBS/*Q4* CRUISE_Q4.2/
mv OBS/DRIFTERS.pth CRUISE_Q4.2/
mv OBS/DRIFTERS.diag CRUISE_Q4.2/
mv DAY*.icq4 CRUISE_Q4.2/
mv ITER_* CRUISE_Q4.2/

#-----------------------------------------------------------------------
#
# TRUXTON: Second inverse solution
#
#-----------------------------------------------------------------------

CRUISE_T6 > CRUISE_T6.ALL/CRUISE_T6.2.res << EOD
input_files/CRUISE_T6.2.inq
2
2
0.140519E-03
0.100000E-11
CRUISE_Q4.2/UV_INTEG-Q4.m3d
CRUISE_Q4.2/UV_INTEG.Q4.ak.s2r
CRUISE_Q4.2/UV_INTEG.Q4.en.s3r
10
.1
CRUISE_T6.ALL/BCS_PRT3.s2c
NO
NO
CRUISE_T6.ALL/BCS_PRT4.s2c
NO
NO
CRUISE_T6.ALL/CRUISE_T6.2.dat
EOD

#-----------------------------------------------------------------------
#
# QUODDY: Third forward run
#
#-----------------------------------------------------------------------

mkdir CRUISE_Q4.3
CRUISE_Q4 > CRUISE_Q4.3/CRUISE_Q4.3.res << EOD
input_files/CRUISE_Q4.3.inq
1999 102.0 1.0
```

```
1
1999 102.0 1.0
OBS/apr10-25_detided_elev.cbc
0.0
4
1.0 1.0 1.0 1.0
0
105.0 20
EOD

mv OBS/*Q4* CRUISE_Q4.3/
mv OBS/DRIFTERS.pth CRUISE_Q4.3/
mv OBS/DRIFTERS.diag CRUISE_Q4.3/
mv DAY*.icq4 CRUISE_Q4.3/
mv ITER_* CRUISE_Q4.3/

#**********************************************************************
#**********************************************************************
```

2. input_files:

   (a) CRUISE_Q4.1.inq

```
{Comment:}
BPE and test run for cruise
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 12 04 1999 0000.0
{Echo file:}
CRUISE_Q4.1/CRUISE_Q4.1.echo
{Simulation parameters:}
SI UNITS            [units]
1.00  1.00  1.00    [x, y, and z scaling factor]
43.500              [degree latitude]
10.0                [minimum depth]
23 04 1999 50400.0      [end date (d m y) and time (sec) of simulation]
180.0               [time step (seconds)]
21                  [number of vertical nodes]
```

   (b) CRUISE_Q4.2.inq

```
{Comment:}
Second forward solution
{Case name:}
MESH/bank150
```

```
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
CRUISE_Q4.1/ITER_01440.icq4
{Echo file:}
CRUISE_Q4.2/CRUISE_Q4.2.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
23 04 1999 50400.0    [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

(c) CRUISE_Q4.3.inq

```
{Comment:}
Third forward solution
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
CRUISE_Q4.1/ITER_01440.icq4
{Echo file:}
CRUISE_Q4.3/CRUISE_Q4.3.echo
{Simulation parameters:}
SI UNITS          [units]
1.00  1.00  1.00  [x, y, and z scaling factor]
43.500            [degree latitude]
10.0              [minimum depth]
26 04 1999 10800.0 [end date (d m y) and time (sec) of simulation]
180.0             [time step (seconds)]
21                [number of vertical nodes]
```

(d) CRUISE_T6.1.inq

```
{Comment:}
First inverse of TRUXTON6
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 01 01 1995 0.0
{Echo file:}
CRUISE_T6.ALL/CRUISE_T6.1.echo
```

```
{Simulation parameters:}
SI UNITS            [units]
1.00  1.00  1.00    [x, y, and z scaling factor]
43.500              [degree latitude]
10.0                [minimum depth]
01 01 1995 0.0      [end date (d m y) and time (sec) of simulation]
180.0               [time step (seconds)]
21                  [number of vertical nodes]
```

(e) CRUISE_T6.2.inq

```
{Comment:}
Second inverse of TRUXTON6
{Case name:}
MESH/bank150
{Boundary element incidence list:}
MESH/bank150.elev.bel
{Initial condition file:}
COLD-START 01 01 1995 0.0
{Echo file:}
CRUISE_T6.ALL/CRUISE_T6.2.echo
{Simulation parameters:}
SI UNITS            [units]
1.00  1.00  1.00    [x, y, and z scaling factor]
43.500              [degree latitude]
10.0                [minimum depth]
01 01 1995 0.0      [end date (d m y) and time (sec) of simulation]
180.0               [time step (seconds)]
21                  [number of vertical nodes]
```

3. CLIM_BCS:
   (a) BCS_K1.s2c: Taken from FCAST 1.0
   (b) BCS_M2.s2c: Taken from FCAST 1.0
   (c) BCS_N2.s2c: Taken from FCAST 1.0
   (d) BCS_O1.s2c: Taken from FCAST 1.0
   (e) BCS_S2.s2c: Taken from FCAST 1.0
   (f) BCS_Z0.s2c: Provided by C. Naimie; March-April Climatology
4. CRUISE_Q4: link to executable in SRC_Q4
5. CRUISE_Q4.1: Results Directory, discussed below.
6. CRUISE_Q4.2: Results Directory, discussed below.
7. CRUISE_Q4.3: Results Directory, discussed below.
8. CRUISE_T6.ALL: Results Directory, discussed below.

9. DROG.LTS: Drog positions at last time step.
10. IOS_tidetbl: M. Foreman's tidal timing parameters
11. MESH: bank150
12. OBS - Initial Conditions and cruise observations
    (a) DRIFTERS.ind - 4 drifters released according to Jim's releases.
    (b) ICS.S.s3r - Salinity: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
    (c) ICS.T.s3r - Temperature: Derived from CMAST hydrography taken on a cruise that ended 8 April 1999.
    (d) QFLUX.o1d - Heat flux data and forecast.
        i. START TIME: 1999 YD86.25
        ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_QFLUX_file` . Starting with `QFLUX.o1d` from `../Apr22_FCS01` , the latest fluxes (columns 1 and 10) from `APR22.dat` and `APR23.dat` were inserted at the end, replacing the values from YD109.125 forward. Consistent use of BOUY 44011 throughout the qflux file is kept.
        iii. END TIME: 1999 YD115.25
    (e) TAUXY.o1d - Wind Stress
        i. START TIME: 1999 YD90.04166
        ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_WindStress_file` . The files:
            ```
            apr1-13_fort.72
            apr14h_fort.72
            apr15h_fort.72
            apr16-18h_fort.72
            apr19h_fort.72
            apr20h_fort.72
            apr21h_fort.72
            apr22h_fort.72
            apr21-23f_fort.72
            ```
            were appended consecutively with the program `genTauxy.f` resulting in the file TAUXY.o1d. The chosen winds are always those on the center of the bank (1st record of the group of 4 seen in the later `fort.72` files).
        iii. END TIME: 1999 YD115.1235
    (f) UV_INTEG.m3d - Provided by Jim from the Argos 89 and ARGOS 393 drifter.
    (g) apr10-25_detided_elev.cbc
        i. START TIME: 10 April 1999 0.0 seconds

ii. CONTENTS: in `~cisco/CRUISE_PreProcess/Apr20/Gen_cbc_elev_file`. The files:

`apr20h_fort.61`
`apr21h_fort.61`
`apr22h_fort.61`
`apr23-25f_fort.61`

were concatenated by hand (using *nedit*) and replaced the last 3 days of the `apr10-23\_detided\_elev.cbc` file. Using `detide_ADCIRC_elev.f` the file was detided, creating an `apr1-23_detided_elev.cbc` from which the first 10 days were deleted and the file `apr10-23_detided_elev.cbc` created.

iii. END TIME: 388 hours later (22 April 1999, 0300Z)

13. SRC_Q4: Source code for this run

14. SRC_T6: Source code for this run

9 RESULTS

Ship (and shore) posting from Modeling O2:

`http://stout/~realtime`

Web page to be posted at Dartmouth.

9.1 APR23_FCS01.

The last case run on the cruise EL9903 was `APR23_FCS01` which icluded the assimilation of 5 dirfter `m3d` files. Two of the drifters were Jim Manning's (Argos drifters 89 and 393) and three were Ted Durbin's. (See full description in previous section.) The results described below detail comparisons between observed locations of drifters 89 and 393 and model-predicted locations based on "best prior estimates" (BPE) and forecasts (FCAST). The general location of the drifters ad their forcast positions on 26 April 0000Z is shown in Figure 2.

1. *BPE vs Observed.* The comparison of the observed position on 23 April 1999 of the two drifters and the BPE with the release point on 17 April (i.e., with no assimilation of drifter data) is shown in Figure 3. The agreement between observed locations (the green dots) and the model location is remarkable considering the 6-day length of the run. Note how the model has captured the difference in the direction of drift between the drifter drogued at 35m (drifter 89; top panel) and that one drogued at 13 m (drifter 393; bottom panel).

2. *FCAST vs Observed.* The comparison of the position of the FCAST model drifter trajectories at the end of the run (26 April 0000Z) for the original release point and time (9-day run; top panels) versus the release reinitialized at the observed location on 23 April (3-day runs; bottom panels) is shown in Figures 4 and 5. Drifter 89's forecast ending position for the release at the original site (top) appears to be slightly shoalward of the ending position of the forecast from the reinitialized position (bottom). For drifter 93, the ending position for the 9-day run (top panel) is "downstream" of the 3-day reinitialized run.

3. *FCAST positions and final locations.* The hourly locations of the forecast positions for drifters 89 and 393 are shown in Figures 6 and 7. On 24 April there was a period of strong winds which provided an opportunity for comparing forecast and observed drifter tracks in the presence of wind forcing. Up to this point the cruise was characterized by realtively weak wind forcing. The drifters had to be picked up on 24 April around noon since the forecast was for continued winds which would have delayed the return to port, or endangered the drifter recovery operation. Thus, the time over which the winds' effect on the drifter positions was cur short.

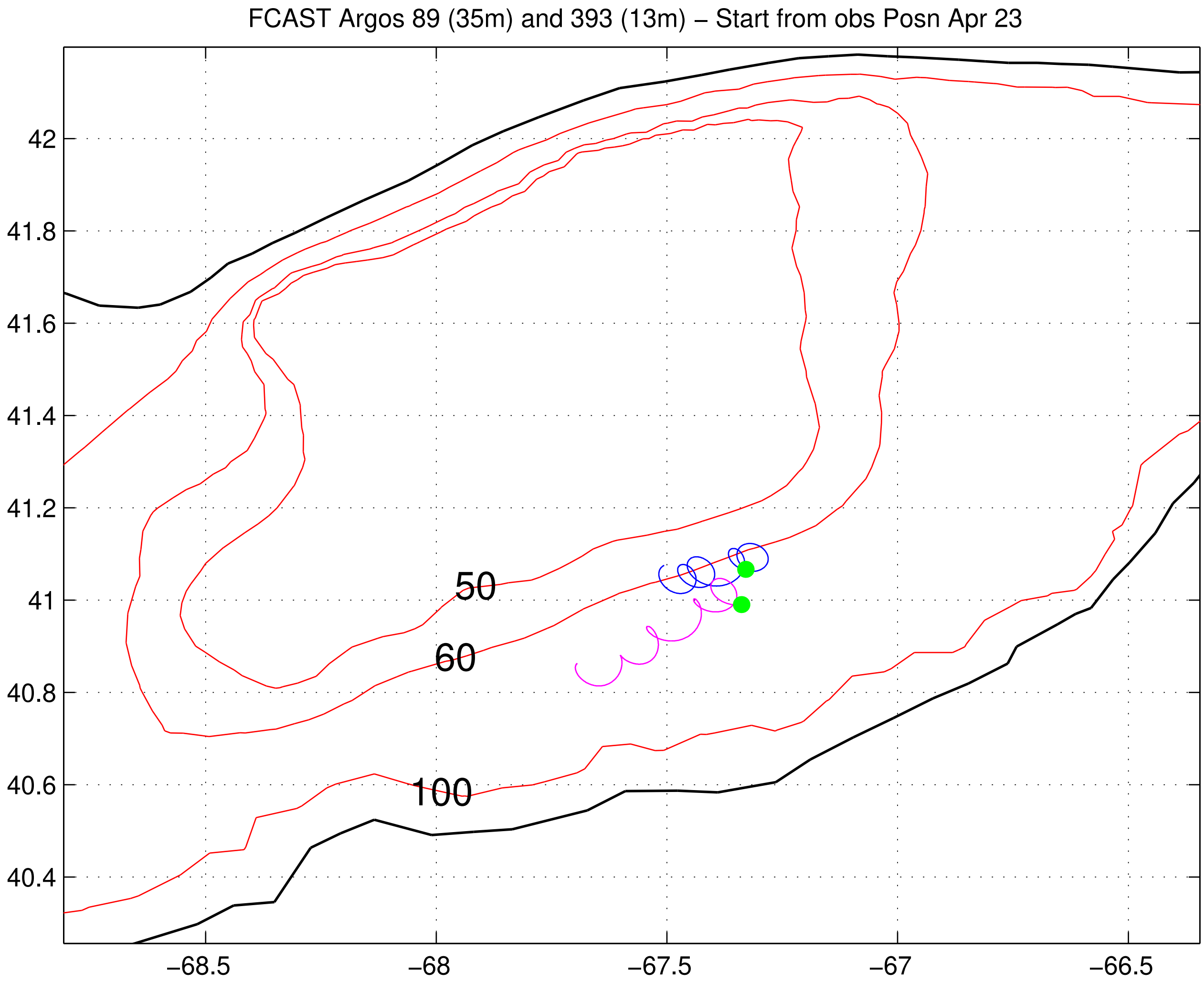

Figure 2: Drifter locations on 23 April (green dots) and forecast positions over a 3-day period ending on 26 April 0000Z. The shoalward drifter #89 was drogued at 35m; the seaward drifter #393 was drogued at 13m. Isobath in meters.

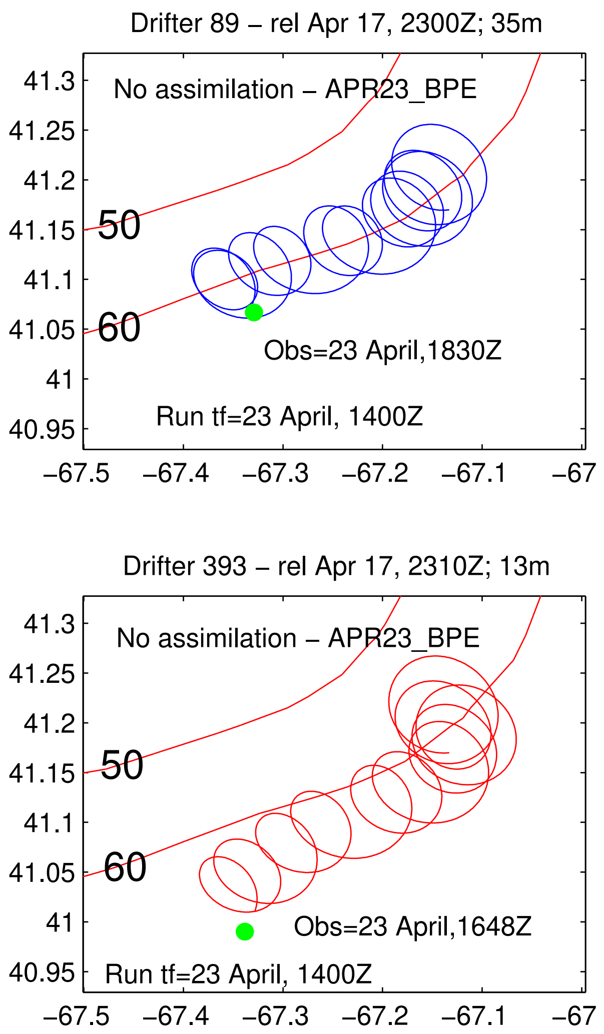

Figure 3: Comparison of BPE model drifter locations (full drifter paths) and observed locations after 6 days (green dots). Isobath in meters.

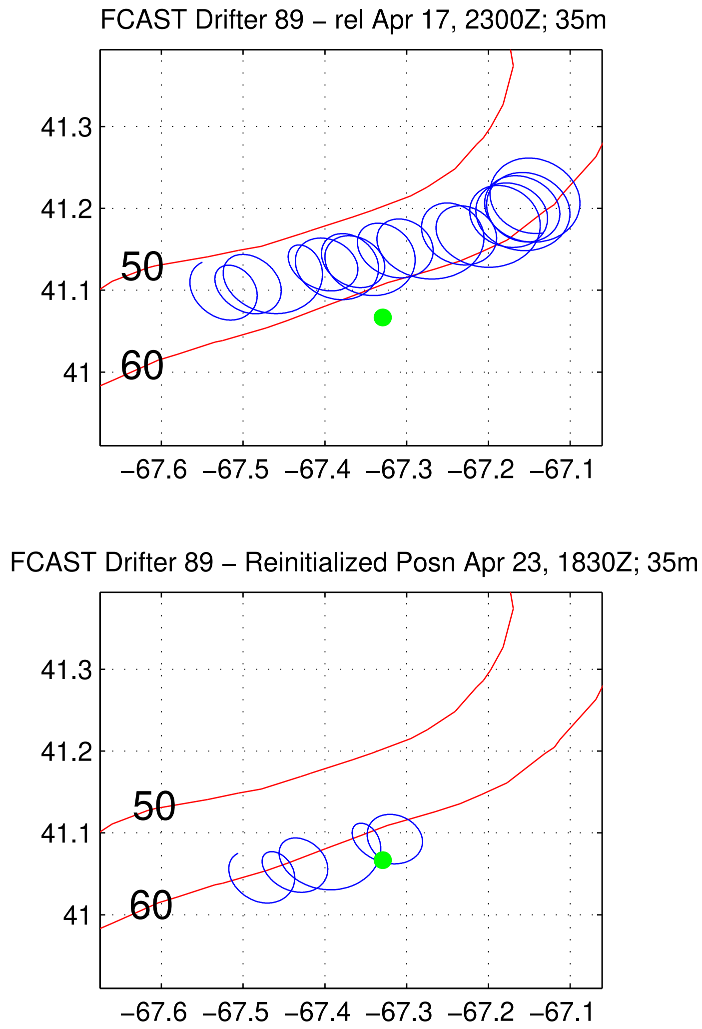

Figure 4: Comparison of FCAST model drifter #89 location after 9 days on 26 April 0000Z using original release site (top panel) and a 3-day run reinitialized to observed position on 23 April (bottom panel) (full drifter paths) and observed locations after 6 days (green dots). Isobath in meters.

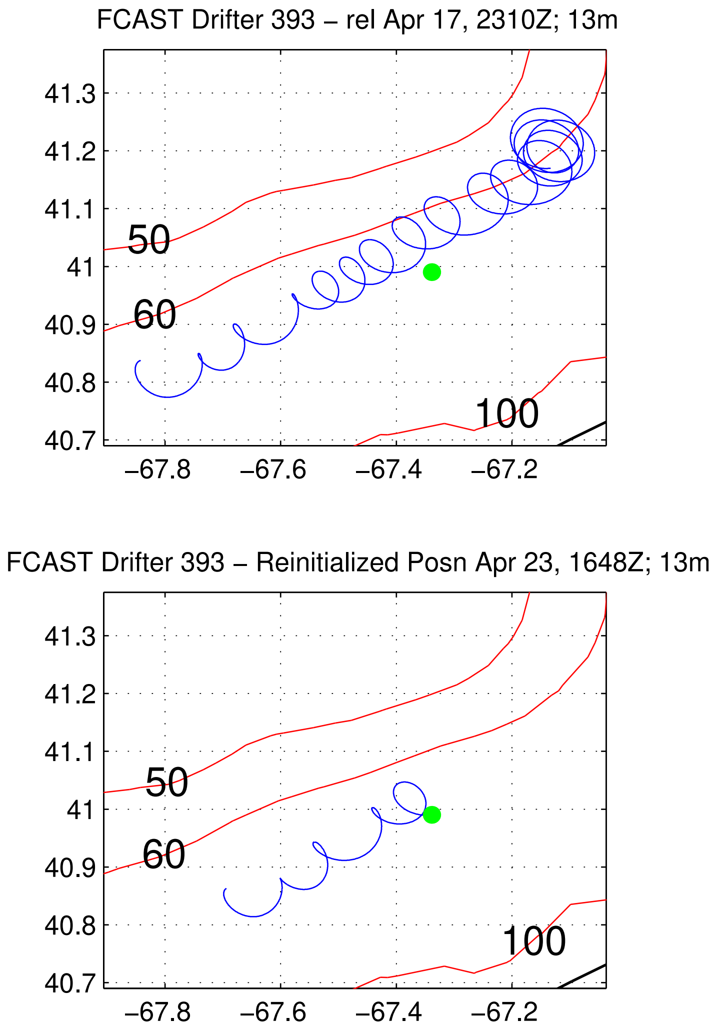

Figure 5: Comparison of FCAST model drifter #393 location after 9 days on 26 April 0000Z using original release site (top panel) and a 3-day run reinitialized to observed position on 23 April (bottom panel) (full drifter paths) and observed locations after 6 days (green dots). Isobath in meters.

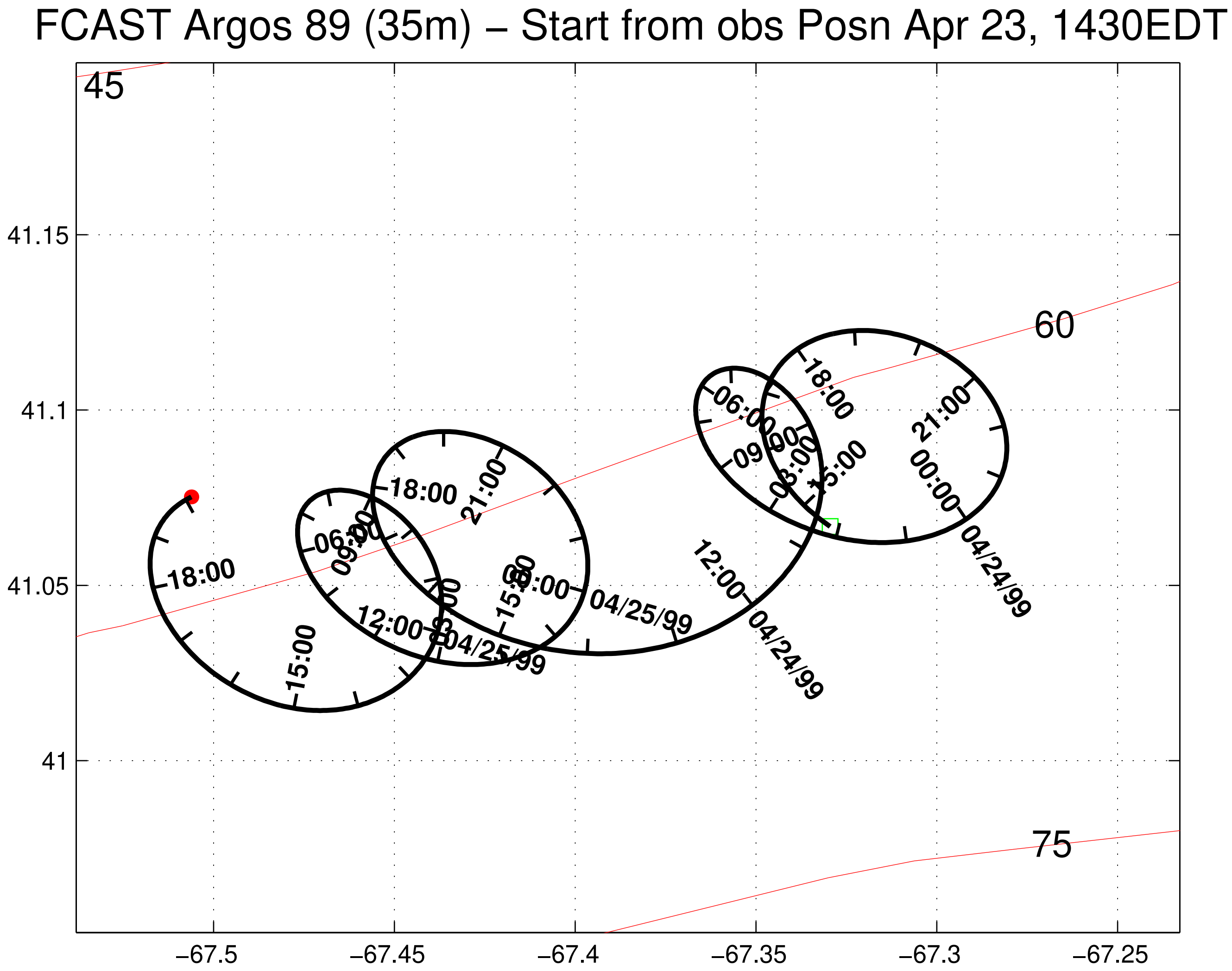

Figure 6: Hourly FCAST location of model drifter #89 over a 3-day run reinitialized to its observed position on 23 April (starting location indicated by green box, ending location by red dot). All times in EDT (EDT=GMT-4hours). Drifter 89 was collected on 24 April at ????EDT at the location (TO BE FILLED IN - get info from Jim). Isobath in meters.

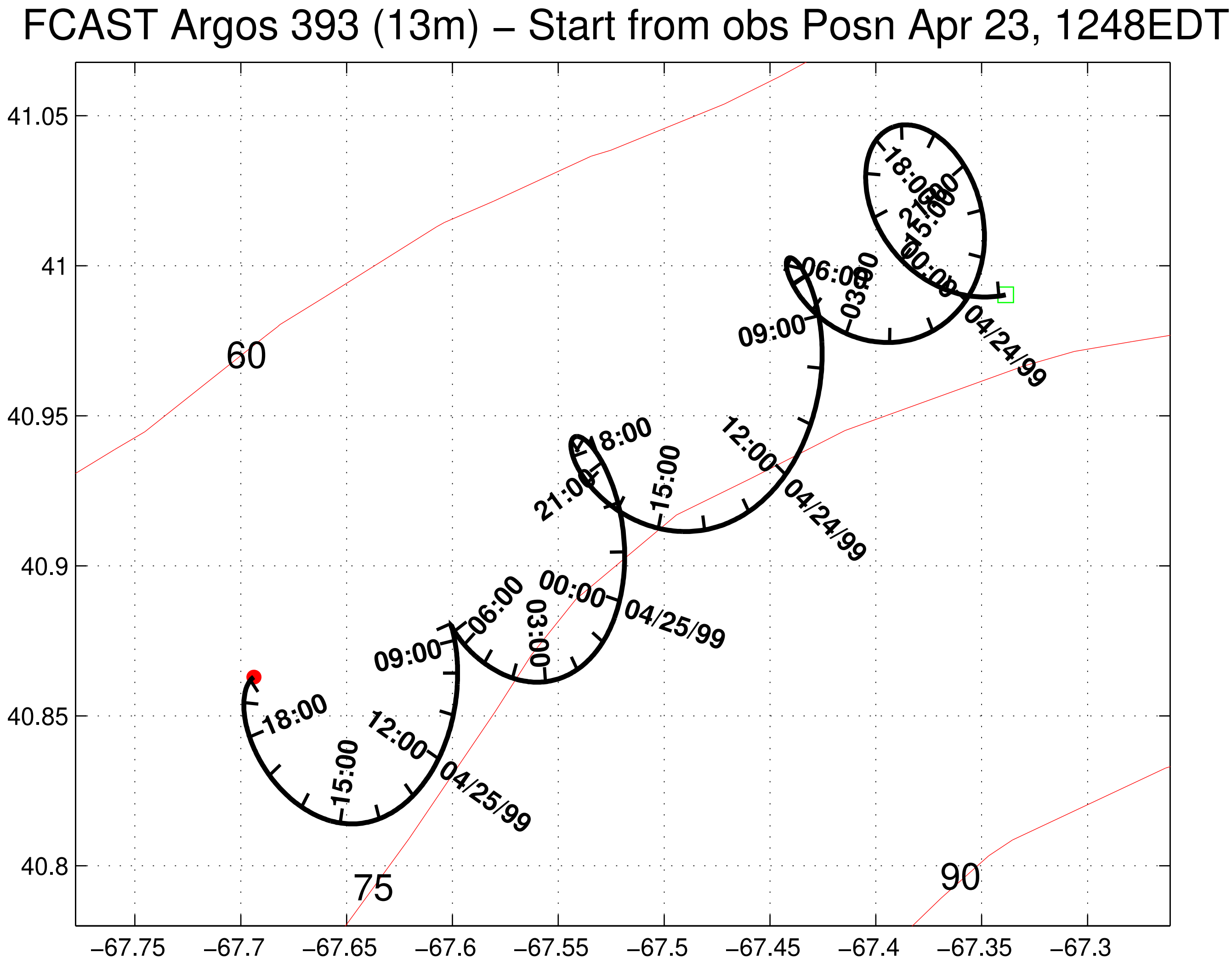

Figure 7: Hourly FCAST location of model drifter #393 over a 3-day run reinitialized to its observed position on 23 April (starting location indicated by green box, ending location by red dot). All times in EDT (EDT=GMT-4hours). Drifter 393 was collected on 24 April at ????EDT at the location (TO BE FILLED IN - get info from Jim). Isobath in meters.

10 Discussion