0.1 1990-01

1. Problems

   (a) No issues running

2. Results

   (a) Level 1

      i. - Map
         A. - Max = 21.87-m, Mean = 6.31-m, U10 = 33.12-m/s
         B. - Maximum wave height in Northeast corner of grid
      ii. - Validation
         A. - Negative bias at peak wave heights for northern buoys. Positive bias throughout month for wave heights at southern buoys. Chaos.

   (b) Level 2

      i. - Map
         A. - Max = 8.45-m, Mean = 3.50-m, U10 = 25.19-m/s
      ii. - Validation
         A. - Similar to level 1

   (c) Level 3N

      i. - Map
         A. - Max = 5.68-m, Mean = 2.34-m, U10 = 23.21-m/s
      ii. - Validation
         A. - 44005 - Negative bias in wave height and mean period throughout month
         B. - 44007 - Low on only wave height peak during the month on the 30th
         C. - 44011 - Low at all peak wave height events in month.
         D. - 44013 - two peaks during month and both are low.

   (d) Level 3C

      i. - Map
         A. - Max = 4.65-m, Mean = 2.02-m, U10 = 20.71-m/s

ii. - Validation

    A. - 44009 - Decent fit for wave height, no constancy

    B. - 44056 - similar to 44009

(e) Level 3S1

  i. - Map

    A. - Max = 4.13-m, Mean = 2.14-m, U10 = 18.80-m/s

  ii. - Validation

    A. - 41008 - positive bias in wave height throughout month

    B. - 41009 - similar to 41008

    C. - 41010 - positive bias but under-estimating peaks

(f) Level 3S2

  i. - Map

    A. - Max = 3.91-m, Mean = 2.47-m, U10 = 14.09-m/s

  ii. - Validation

    A. - 41009 - positive bias in wave height

0.2   1990-02

1. Problems

(a) No issues running

2. Results

(a) Level 1

  i. - Map

    A. - Max = 13.86-m, Mean = 6.51-m, U10 = 30.83-m/s

  ii. - Validation

    A. - Overall, the trend has an under-estimation of all peak wave height events at most of the buoys. The southern buoys tend to be closer than the northern ones.

(b) Level 2

  i. - Map

    A. - Max = 8.48-m, Mean = 3.91-m, U10 = 24.25-m/s

    ii. - Validation

        A. - Similar to level 1

(c) Level 3N

    i. - Map

        A. - Max = 6.05-m, Mean = 2.43-m, U10 = 20.28-m/s

    ii. - Validation

        A. - 44005 - Negative bias throughout month

        B. - 44007 - Negative bias early on then a good fit for the end of the month

        C. - 44011 - Similar to 44005

        D. - 44013 - Two largest peaks in wave height are underestimated by model

(d) Level 3C

    i. - Map

        A. - Max = 5.29-m, Mean = 2.35-m, U10 = 23.21-m/s

    ii. - Validation

        A. - 44009 - Good fit overall

        B. - 44056 - Some phase issues throughout month

(e) Level 3S1

    i. - Map

        A. - Max = 4.75-m, Mean = 2.32-m, U10 = 20.52-m/s

    ii. - Validation

        A. - 41008 - positive bias in wave height overall

        B. - 41009 - better fit than 41008 but still high

        C. - 41010 - similar to 41009

(f) Level 3S2

    i. - Map

        A. - Max = 5.45-m, Mean = 2.50-m, U10 = 15.95-m/s

    ii. - Validation

        A. - 41009 - not a bad fit but some over-estimation of peaks.

0.3   1990-03

1. Problems

   (a) No issues running

2. Results

   (a) Level 1

      i. - Map

         A. - Max = 11.61-m, Mean = 5.51-m, U10 = 26.63-m/s

      ii. - Validation

         A. - Southern buoys have a pretty good fit to the wave heights. The northern buoys have the similar trend of negative bias at wave height peaks. Central buoys look pretty good.

   (b) Level 2

      i. - Map

         A. - Max = 6.85-m, Mean = 2.53-m, U10 = 22.05-m/s

      ii. - Validation

         A. - Similar to level 1

   (c) Level 3N

      i. - Map

         A. - Max = 4.12-m, Mean = 1.69-m, U10 = 18.53-m/s

      ii. - Validation

         A. - 44005 - Negative bias overall

         B. - 44007 - Negative bias at peaks

         C. - 44011 - Negative bias overall

         D. - 44007 - Negative bias overall

   (d) Level 3C

      i. - Map

         A. - Max = 4.44-m, Mean = 1.82-m, U10 = 18.69-m/s

      ii. - Validation

         A. - 44009 - good fit overall for wave height. Slight under-estimation of largest peak on the 31st

B. - 44056 - phase issues

(e) Level 3S1

    i. - Map

      A. - Max = 4.53-m, Mean = 1.92-m, U10 = 15.81-m/s

    ii. - Validation

      A. - 41002 - not enough data

      B. - 41008 - positive bias in wave height

      C. - 41009 - good fit

      D. - 41010 - good fit in wave height

(f) Level 3S2

    i. - Map

      A. - Max = 4.44-m, Mean = 2.06-m, U10 = 14.33-m/s

    ii. - Validation

      A. - 41009 - good fit

0.4 1990-04

1. Problems

(a) No issues running

2. Results

(a) Level 1

    i. - Map

      A. - Max = 10.96-m, Mean = 4.09-m, U10 = 27.00-m/s

    ii. - Validation

      A. - Similar trend to previous months. North has an underestimation of peaks, mid-Atlantic looks good, and southern buoys have a slight positive bias.

(b) Level 2

    i. - Map

      A. - Max = 6.16-m, Mean = 2.71-m, U10 = 21.66-m/s

    ii. - Validation

        A. - Similar to level 1

(c) Level 3N

    i. - Map

        A. - Max = 5.26-m, Mean = 1.80-m, U10 = 19.80-m/s

    ii. - Validation

        A. - 44005 - negative bias throughout

        B. - 44007 - decent fit with some fluctuations throughout the month

        C. - 44011 - under-estimated peak on the 12th

        D. - 44013 - good fit overall

(d) Level 3C

    i. - Map

        A. - Max = 3.77-m, Mean = 1.80-m, U10 = 18.35-m/s

    ii. - Validation

        A. - 44009 - good fit in wave height

        B. - 44056 - good fit, slight under-estimation on the 18th

(e) Level 3S1

    i. - Map

        A. - Max = 4.14-m, Mean = 1.81-m, U10 = 15.66-m/s

    ii. - Validation

        A. - 41002 - Slight phase issues, and some under-estimation at peaks

        B. - 41008 - phase issues, over-estimation overall

        C. - 41009 - positive bias

        D. - 41010 - phase issues and positive bias.

(f) Level 3S2

    i. - Map

        A. - Max = 4.24-m, Mean = 1.81-m, U10 = 13.81-m/s

    ii. - Validation

        A. - 41009 - positive bias

0.5   1990-05

1. Problems

   (a) No issues running

2. Results

   (a) Level 1

       i. - Map
          A. - Max = 7.91-m, Mean = 2.67-m, U10 = 24.06-m/s
       ii. - Validation
          A. - Wave heights are down from previous months, but the trend of under-estimated peak wave heights is constant. The northern buoys had a larger miss, and the southern buoys were closer to the measurements.

   (b) Level 2

       i. - Map
          A. - Max = 6.21-m, Mean = 2.38-m, U10 = 21.68-m/s
       ii. - Validation
          A. - Similar to level 1

   (c) Level 3N

       i. - Map
          A. - Max = 4.23-m, Mean = 1.74-m, U10 = 21.06-m/s
       ii. - Validation
          A. - 44005 - Negative bias throughout month
          B. - 44007 - Under-estimated peak wave heights
          C. - 44011 - Negative bias
          D. - 44013 - Negative bias

   (d) Level 3C

       i. - Map
          A. - Max = 4.39-m, Mean = 1.54-m, U10 = 21.16-m/s
       ii. - Validation
          A. - 44009 - Decent fit

B. - 44056 - Under-estimation of only real peak on the 23rd.

(e) Level 3S1

    i. - Map

        A. - Max = 2.85-m, Mean = 1.31-m, U10 = 14.43-m/s

    ii. - Validation

        A. - 41002 - Under-estimation at each peak

        B. - 41008 - some positive bias at lower waves and good fit at larger waves

        C. - 41009 - positive bias in wave height

        D. - 41010 - Some over-estimation, some under-estimation.

(f) Level 3S2

    i. - Map

        A. - Max = 2.14-m, Mean = 1.40-m, U10 = 11.14-m/s

    ii. - Validation

        A. - 41009 - positive bias in wave height

0.6   1990-06

1. Problems

(a) No issues running

2. Results

(a) Level 1

    i. - Map

        A. - Max = 8.61-m, Mean = 2.66-m, U10 = 23.14-m/s

    ii. - Validation

        A. - Low wave conditions (¡ 4-m), but a good fit overall in wave height.

(b) Level 2

    i. - Map

        A. - Max = 5.40-m, Mean = 1.84-m, U10 = 20.86-m/s

    ii. - Validation

        A. - Similar to level 1

(c) Level 3N

    i. - Map

        A. - Max = 3.74-m, Mean = 1.50-m, U10 = 19.04-m/s

    ii. - Validation

        A. - 44005 - Negative bias at peaks and positive bias at low waves

        B. - 44007 - Decent fit

        C. - 44011 - Negative bias early and late in month. Good fit in middle

        D. - 44013 - negative bias at peak

(d) Level 3C

    i. - Map

        A. - Max = 4.89-m, Mean = 1.35-m, U10 = 17.03-m/s

    ii. - Validation

        A. - 44009 - good fit, low waves

        B. - 44056 - good fit, some phase issues

(e) Level 3S1

    i. - Map

        A. - Max = 4.39-m, Mean = 1.34-m, U10 = 14.70-m/s

    ii. - Validation

        A. - 41002 - phase issues at peak.

        B. - 41008 - positive bias

        C. - 41009 - positive bias in wave height

        D. - 41010 - good fit, slight positive bias

(f) Level 3S2

    i. - Map

        A. - Max = 3.67-m, Mean = 1.47-m, U10 = 12.68-m/s

    ii. - Validation

        A. - 41009 - positive bias in wave height

0.7   1990-07

1. Problems

   (a) No issues running

2. Results

   (a) Level 1

      i. - Map
         A. - Max = 10.79-m, Mean = 2.19-m, U10 = 41.54-m/s
         B. - 4 storm tracks, none make landfall.
         C. - Maximum wind speed concentrated to small area off of Scandinavia.

      ii. - Validation
         A. - The month had one major wave height event near the end of the month. The model results seem to match up really well with the measurements at the buoys. The rest of the month was pretty quite.

   (b) Level 2

      i. - Map
         A. - Max = 11.02-m, Mean = 1.71-m, U10 = 28.31-m/s
         B. - One track doing loops off of South Carolina.

      ii. - Validation
         A. - Similar to level 1

   (c) Level 3N

      i. - Map
         A. - Max = 8.08-m, Mean = 1.30-m, U10 = 19.72-m/s

      ii. - Validation
         A. - 44005 - good fit, can't really compare to event at end of the month. model looks high
         B. - 44007 - good fit
         C. - 44011 - under-estimation early in the month, but good fit for rest
         D. - 44013 - similar to 44011

10

    (d) Level 3C

        i. - Map

           A. - Max = 5.60-m, Mean = 1.23-m, U10 = 16.90-m/s

           B. - one storm track starting in grid

        ii. - Validation

           A. - 44009 - good fit overall, low waves

           B. - 44056 - low waves, decent fit

    (e) Level 3S1

        i. - Map

           A. - Max = 8.13-m, Mean = 1.30-m, U10 = 26.18-m/s

           B. - storm did loop off coast

        ii. - Validation

           A. - 41002 - event at end of the month has slight under-estimation

           B. - 41008 - good fit

           C. - 41009 - positive bias early, good fit at peak

           D. - 41010 - similar to 41009

    (f) Level 3S2

        i. - Map

           A. - Max = 3.86-m, Mean = 1.47-m, U10 = 19.07-m/s

        ii. - Validation

           A. - 41009 - positive bias early, good fit at peak

0.8   1990-08

1. Problems

    (a) No issues running

2. Results

    (a) Level 1

        i. - Map

           A. - Max = 12.71-m, Mean = 2.32-m, U10 = 34.98-m/s

B. - 7 storms in grid, none making landfall

ii. - Validation

A. - Low wave month again. Largest waves are remnant of the storm at the end of last month. The event was captured very well by 44137.

(b) Level 2

i. - Map

A. - Max = 14.02-m, Mean = 1.54-m, U10 = 38.91-m/s

B. - 2 storm tracks in grid. One passing off Canadian coast

ii. - Validation

A. - Similar to level 1

(c) Level 3N

i. - Map

A. - Max = 6.47-m, Mean = 1.07-m, U10 = 17.42-m/s

ii. - Validation

A. - 44005 - good fit, except for high waves at the beginning of the month

B. - 44007 - similar to 44005

C. - 44011 - similar to 44005

D. - 44013 - under-estimated event on the 19th

(d) Level 3C

i. - Map

A. - Max = 2.55-m, Mean = 0.85-m, U10 = 14.69-m/s

ii. - Validation

A. - 44009 - Phase issues for storm on the 20th

B. - 44056 - similar to 44009

(e) Level 3S1

i. - Map

A. - Max = 1.85-m, Mean = 0.90-m, U10 = 9.48-m/s

ii. - Validation

A. - 41002 - Some wave height fluctuations were missed but low wave heights

      B. - 41008 - really low wave heights

      C. - 41009 - really low wave heights but positive bias

      D. - 41010 - low wave height, good fit

(f) Level 3S2

    i. - Map

      A. - Max = 1.81-m, Mean = 1.11-m, U10 = 8.71-m/s

    ii. - Validation

      A. - 41009 - low wave heights, positive bias

0.9 1990-09

1. Problems

(a) No issues running

2. Results

(a) Level 1

    i. - Map

      A. - Max = 11.85-m, Mean = 3.14-m, U10 = 31.88-m/s

      B. - 4 storm tracks, all offshore

    ii. - Validation

      A. - All waves under 4-m with some slight under-estimation of the peaks at the northern buoys. Not a lot of excitement

(b) Level 2

    i. - Map

      A. - Max = 11.85-m, Mean = 2.03-m, U10 = 35.05-m/s

      B. - One track at offshore boundary

    ii. - Validation

      A. - Similar to level 1

(c) Level 3N

    i. - Map

      A. - Max = 3.10-m, Mean = 1.56-m, U10 = 15.75-m/s

 ii. - Validation

  A. - 44005 - under-estimation of each peak wave height

  B. - 44007 - pretty good fit except for 2-m waves on the 2nd

  C. - 44011 - under-estimation of each peak

  D. - 44013 - low waves, missed only two peaks during the month

(d) Level 3C

 i. - Map

  A. - Max = 2.46-m, Mean = 1.22-m, U10 = 13.16-m/s

 ii. - Validation

  A. - 44001 - not a ton of data, but looks good

  B. - 44009 - good fit, a little low at peaks

  C. - 44012 - similar to 44009

  D. - 44015 - good fit

  E. - 44056 - slight phase issues, big difference on mean period

(e) Level 3S1

 i. - Map

  A. - Max = 2.58-m, Mean = 1.19-m, U10 = 12.19-m/s

 ii. - Validation

  A. - 41002 - slight phase issues

  B. - 41008 - tends to be high at the peaks

  C. - 41009 - good fit

  D. - 41010 - pretty good fit

(f) Level 3S2

 i. - Map

  A. - Max = 2.58-m, Mean = 1.17-m, U10 = 11.46-m/s

 ii. - Validation

  A. - 41009 - good fit

0.10 1990-10

1. Problems

(a) No issues running

2. Results

   (a) Level 1

      i. - Map

        A. - Max = 12.67-m, Mean = 3.58-m, U10 = 29.07-m/s

        B. - 5 tracks in domain. One making landfall through Gulf of Mexico.

      ii. - Validation

        A. - A couple of decent events with one storm running up the US coastline. The trend shows the usual under-estimation of peak wave heights for the northern buoy locations and an over-estimation of all wave heights for the southern buoy locations. The central buoys have some right on and some with the same under-estimation.

   (b) Level 2

      i. - Map

        A. - Max = 13.89-m, Mean = 2.33-m, U10 = 32.41-m/s

        B. - 3 storms in domain, one running up the US coastline.

      ii. - Validation

        A. - similar to level 1

   (c) Level 3N

      i. - Map

        A. - Max = 6.30-m, Mean = 1.97-m, U10 = 24.67-m/s

        B. - one storm in southeast corner of grid

      ii. - Validation

        A. - 44005 - under-estimation of peaks

        B. - 44007 - good fit, some under-estimation of peaks

        C. - 44011 - similar to 44005

        D. - 44013 - under-estimation of only major event on the 27th

   (d) Level 3C

      i. - Map

        A. - Max = 7.20-m, Mean = 1.99-m, U10 = 27.37-m/s

ii. - Validation

    A. - 44001 - Under-estimation of peaks

    B. - 44009 - similar to 44001

    C. - 44012 - good fit

    D. - 44014 - under-estimation of the peaks

    E. - 44015 - similar to 44014

    F. - 44056 - over-estimation for peak on the 13th, under-estimation of peak on the 26th. Mean period = bad.

(e) Level 3S1

  i. - Map

    A. - Max = 7.25-m, Mean = 2.10-m, U10 = 21.08-m/s

  ii. - Validation

    A. - 41008 - over-estimation of largest peak on the 10th

    B. - 41009 - good fit, slight over-estimation on secondary peak on the 13th.

    C. - 41010 - similar to 41008

(f) Level 3S2

  i. - Map

    A. - Max = 6.81-m, Mean = 2.12-m, U10 = 18.60-m/s

  ii. - Validation

    A. - 41009 - good fit, slight over-estimation of secondary peak on the 13th

0.11   1990-11

1. Problems

(a) No issues running

2. Results

(a) Level 1

  i. - Map

    A. - Max = 10.24-m, Mean = 4.35-m, U10 = 27.39-m/s

ii. - Validation

    A. - High wave energy month. Southern buoy locations had a very good fit for wave height. The central and northern buoy locations tended to under-estimate wave heights at the peaks. Mean period were consistently low.

(b) Level 2

    i. - Map

        A. - Max = 9.05-m, Mean = 3.45-m, U10 = 26.66-m/s

    ii. - Validation

        A. - Similar to level 1

(c) Level 3N

    i. - Map

        A. - Max = 6.89-m, Mean = 2.40-m, U10 = 23.00-m/s

    ii. - Validation

        A. - 44005 - Large under-estimation of peaks **BAD**

        B. - 44007 - under-estimation of only two peaks during month

        C. - 44011 - negative bias throughout month

        D. - 44013 - Under-estimated each peak including the 19th by 2-m.

(d) Level 3C

    i. - Map

        A. - Max = 5.00-m, Mean = 1.75-m, U10 = 20.30-m/s

    ii. - Validation

        A. - 44001 - under-estimated only peak, but sparse data

        B. - 44009 - low on peaks and mean period

        C. - 44012 - low on only peak during the month

        D. - 44014 - similar to 44009

        E. - 44015 - similar to 44009

        F. - 44056 - low on peaks and phase issues, mean period is high

(e) Level 3S1

    i. - Map

A. - Max = 4.70-m, Mean = 1.92-m, U10 = 17.93-m/s
ii. - Validation
    A. - 41008 - good fit
    B. - 41009 - good fit
    C. - 41010 - good fit

(f) Level 3S2
    i. - Map
        A. - Max = 4.70-m, Mean = 2.04-m, U10 = 15.49-m/s
    ii. - Validation
        A. - 41009 - good fit, a little low at times.

0.12   1990-12

1. Problems

   (a) No issues running

2. Results

   (a) Level 1
       i. - Map
           A. - Max = 17.81-m, Mean = 5.14-m, U10 = 32.02-m/s
       ii. - Validation
           A. - Same general trend for winter month. Lots of small storms. Wave heights peaks are under-estimated at most northern buoys. The southern buoy locations tend to have a positive bias throughout the month.

   (b) Level 2
       i. - Map
           A. - Max = 7.21-m, Mean = 3.42-m, U10 = 21.62-m/s
       ii. - Validation
           A. - Similar to level 1

   (c) Level 3N
       i. - Map

A. - Max = 4.73-m, Mean = 2.55-m, U10 = 19.38-m/s

    ii. - Validation

        A. - 44005 - Negative bias throughout month

        B. - 44007 - under-estimated only peak by 2-m on the 5th

        C. - 44011 - similar to 44005

        D. - 44013 - under-estimated peak on 5th but only by ¡ 1-m.

(d) Level 3C

    i. - Map

        A. - Max = 4.19-m, Mean = 2.14-m, U10 = 17.73-m/s

    ii. - Validation

        A. - 41001 - low on all peaks

        B. - 44009 - not bad fit but still low on some peaks

        C. - 44012 - not enough data

        D. - 44014 - low on all peaks

        E. - 44015 - low on peaks and high on low waves

        F. - 44056 - similar to 44015, high mean period

(e) Level 3S1

    i. - Map

        A. - Max = 4.55-m, Mean = 2.17-m, U10 = 16.48-m/s

    ii. - Validation

        A. - 41002 - good fit, a little low on peak on the 9th.

        B. - 41008 - positive bias for most of the month

        C. - 41009 - similar to 41008

        D. - 41010 - good fit

(f) Level 3S2

    i. - Map

        A. - Max = 4.65-m, Mean = 2.56-m, U10 = 14.99-m/s

    ii. - Validation

        A. - 41009 - positive bias throughout the month

0.13   1990-stats

0.13.1   Level 1
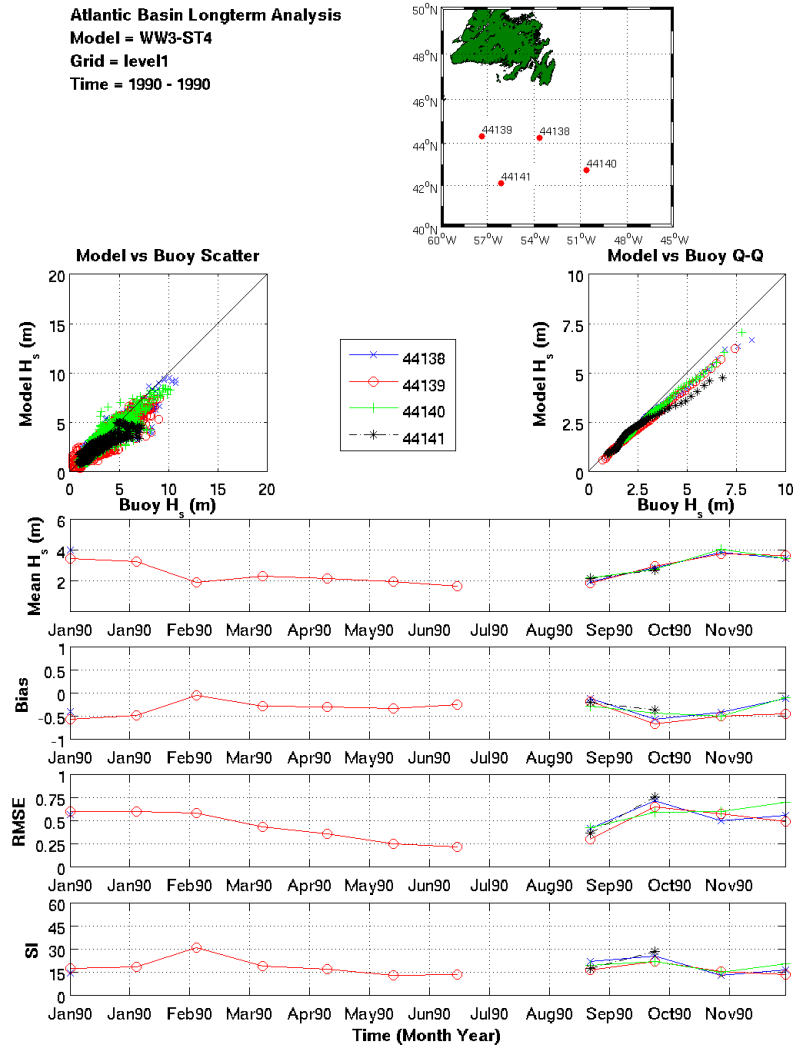
Figure 1: Comp 1 for Level 1
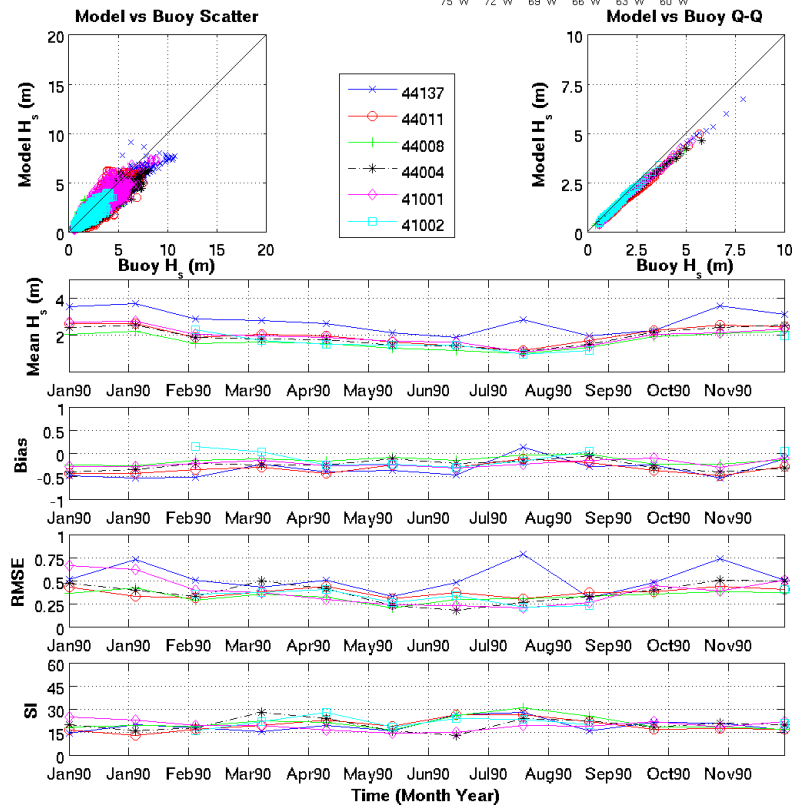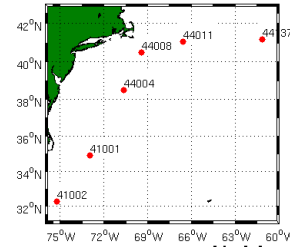
Figure 2: Comp 2 for Level 1
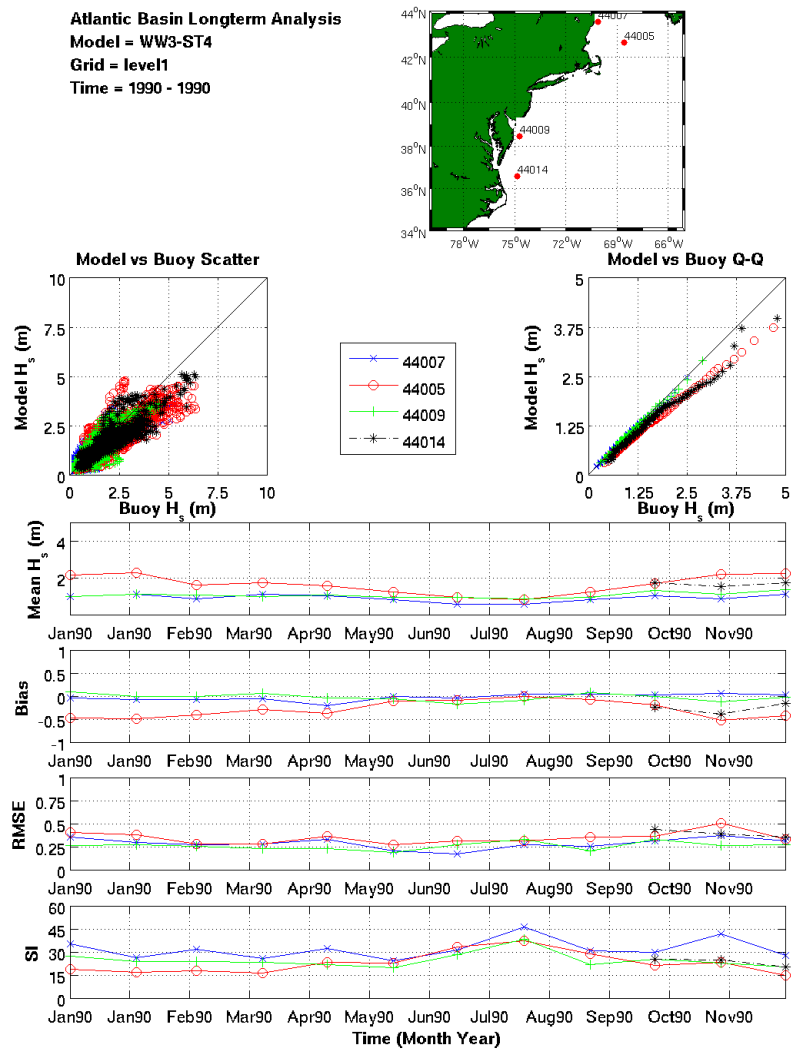
Figure 3: Comp 3 for Level 1
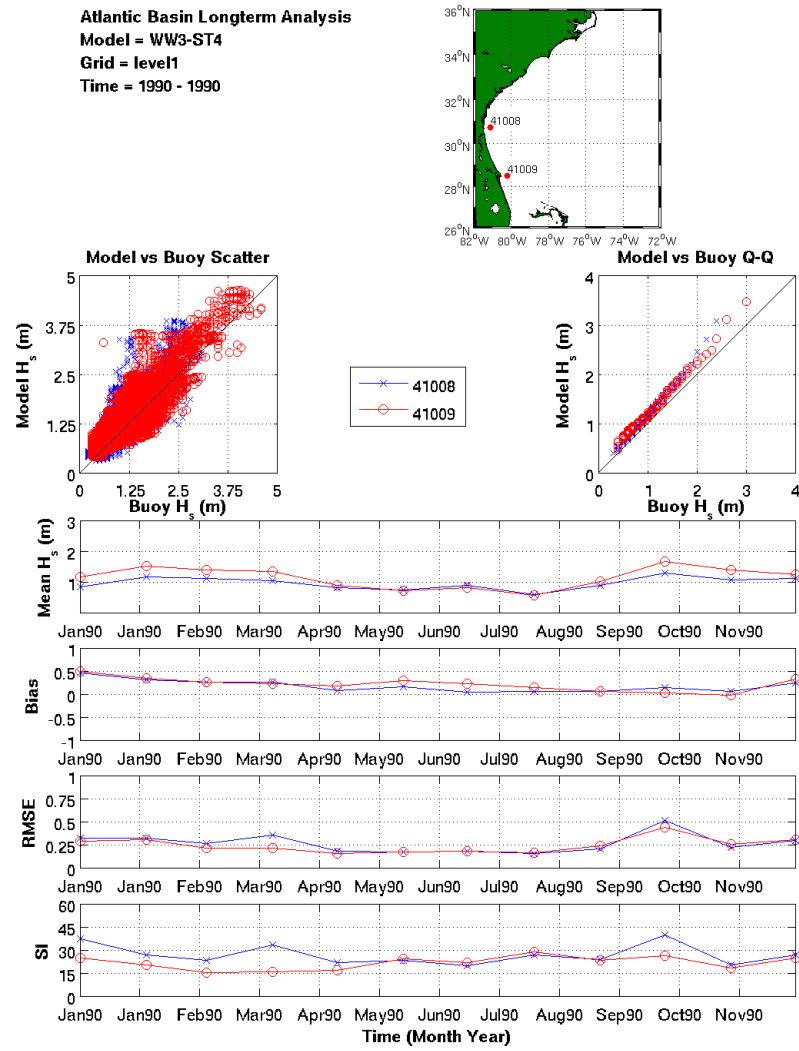
Figure 4: Comp 4 for Level 1

0.13.2   Level 2
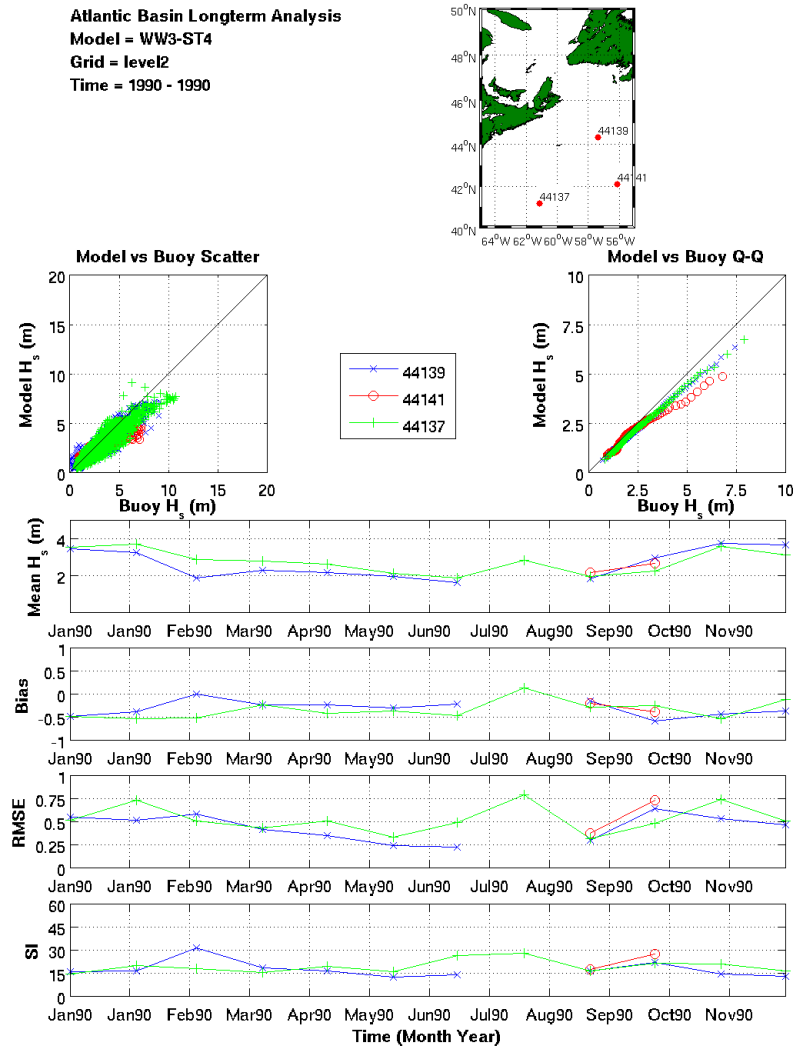
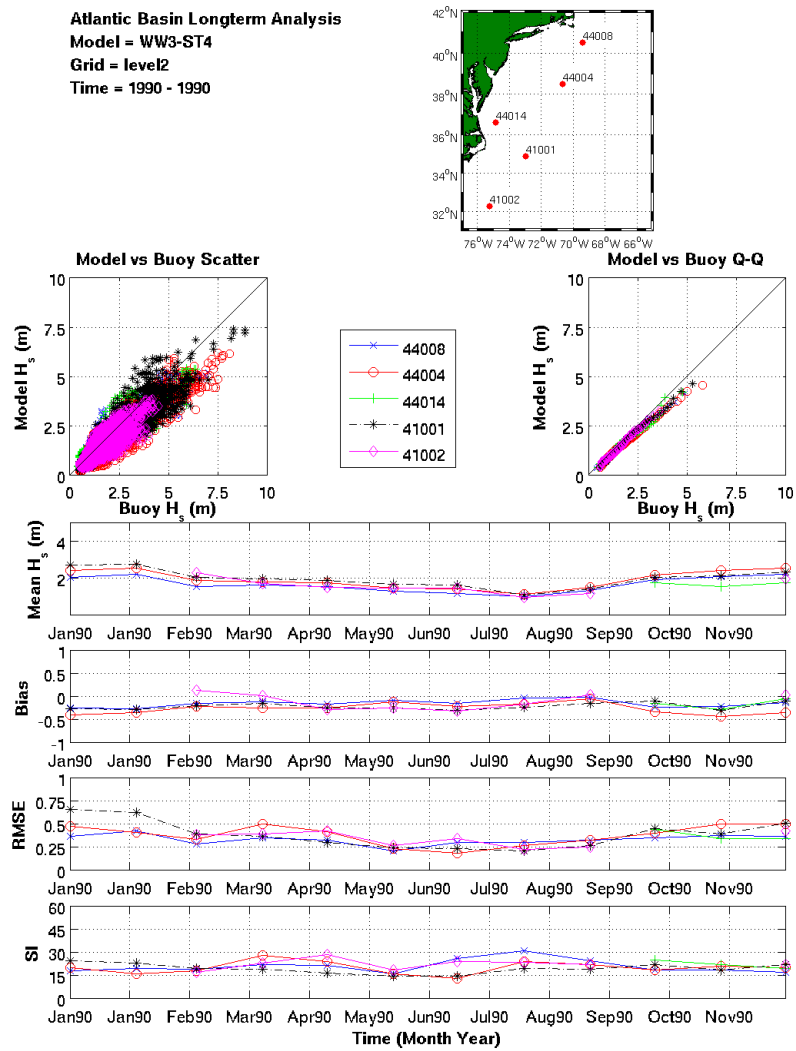
Figure 5: Comp 1 for Level 2
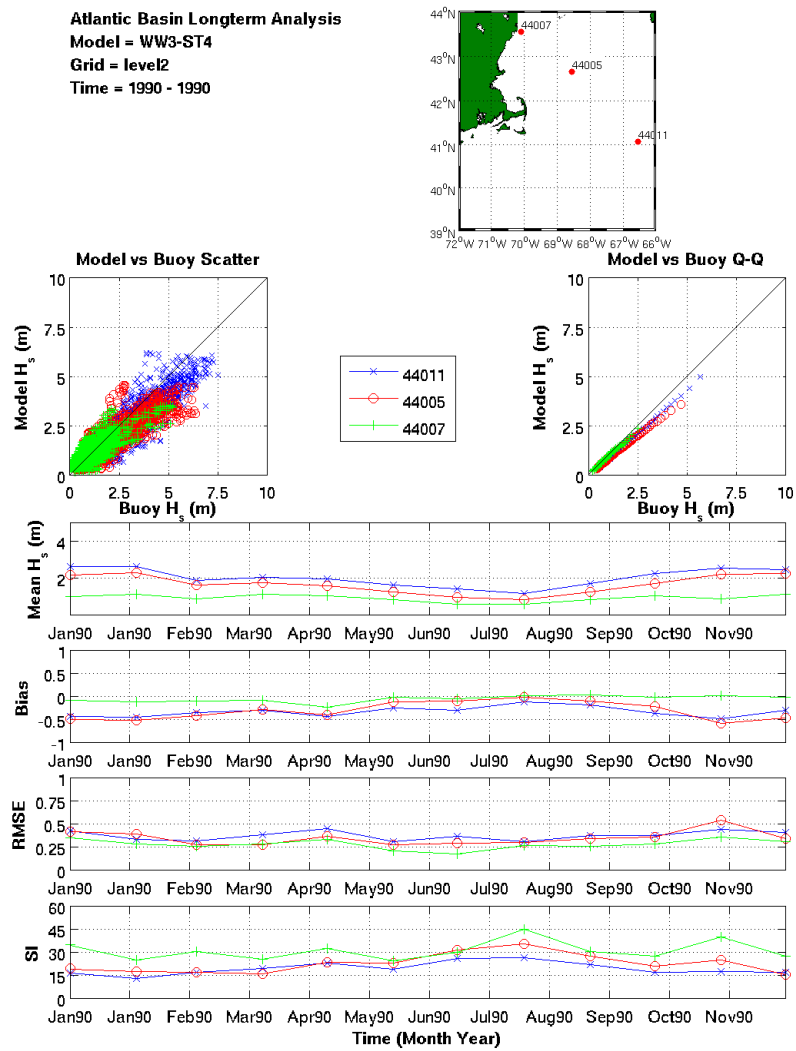
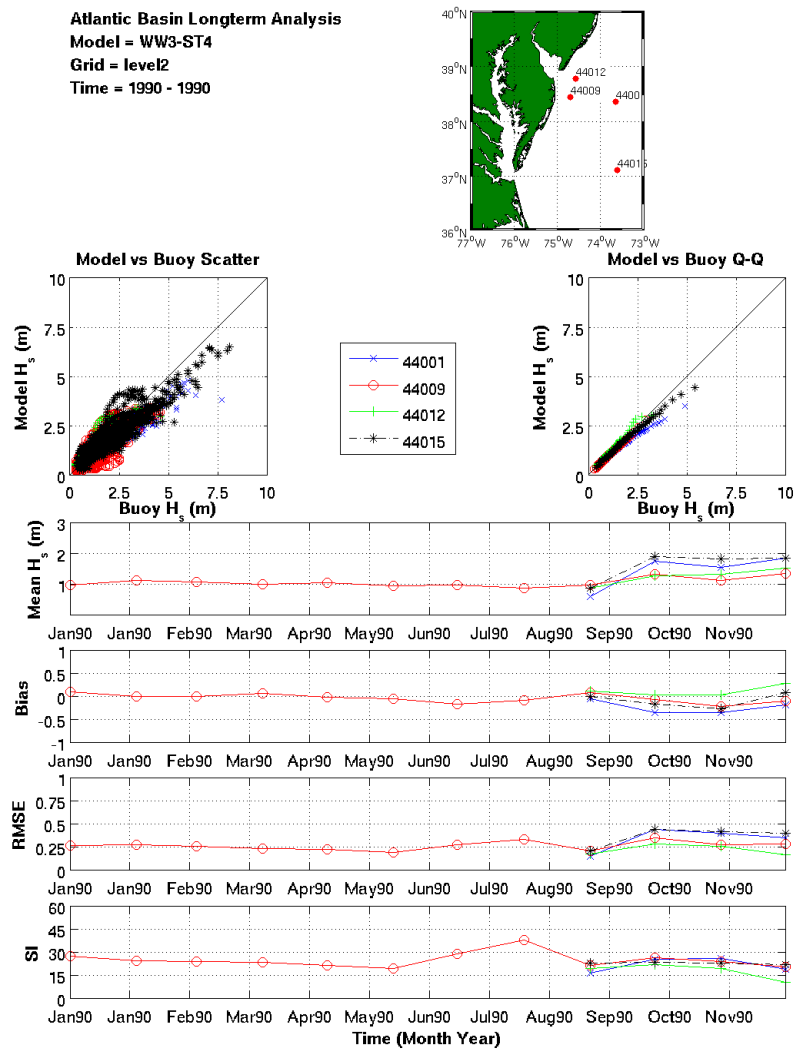Figure 6: Comp 2 for Level 2

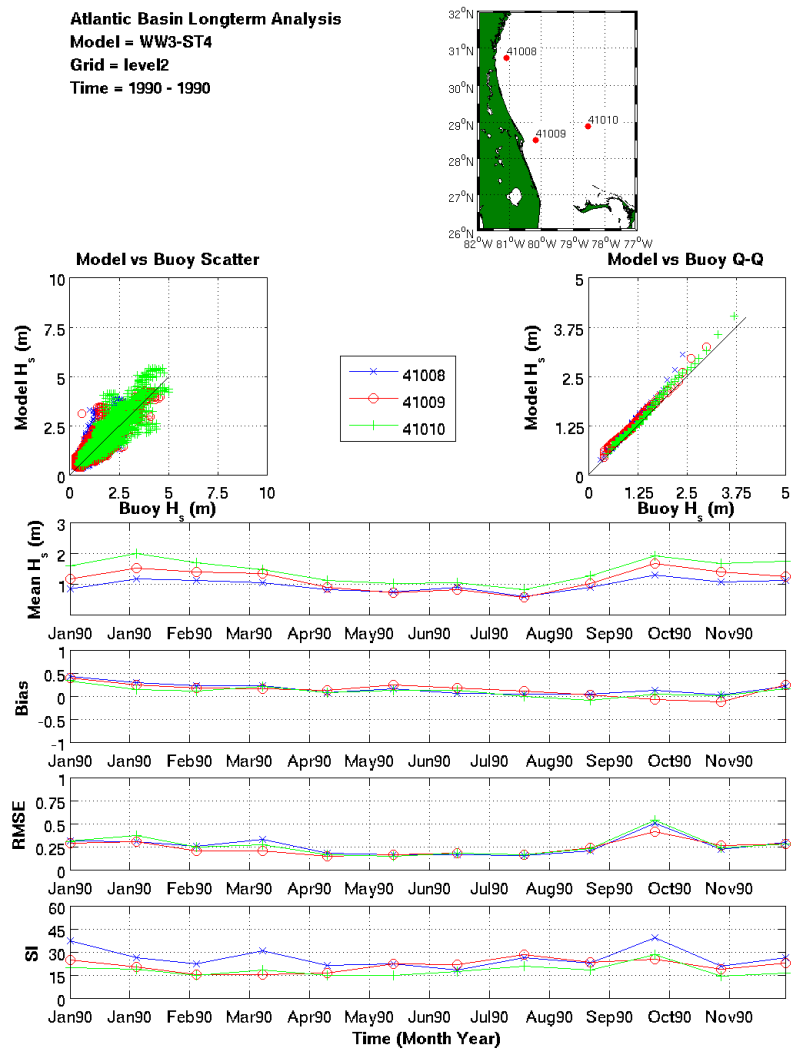Figure 7: Comp 3 for Level 2

Figure 8: Comp 4 for Level 2
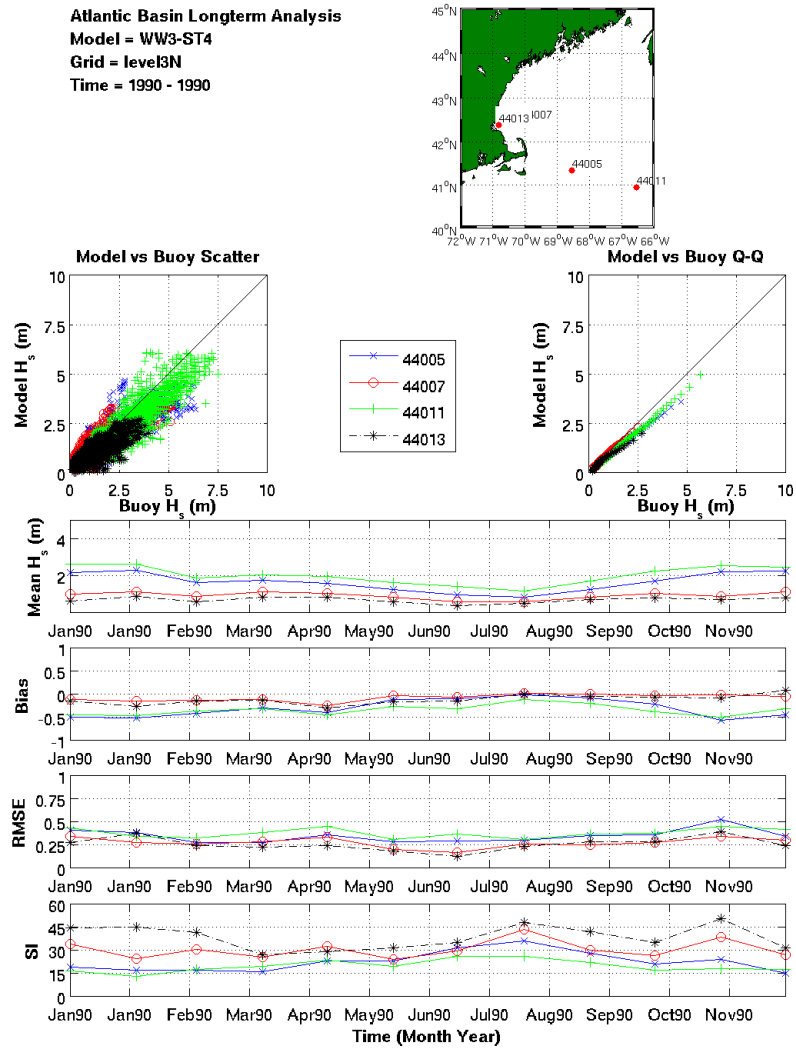
Figure 9: Comp 5 for Level 2

0.13.3 Level 3N
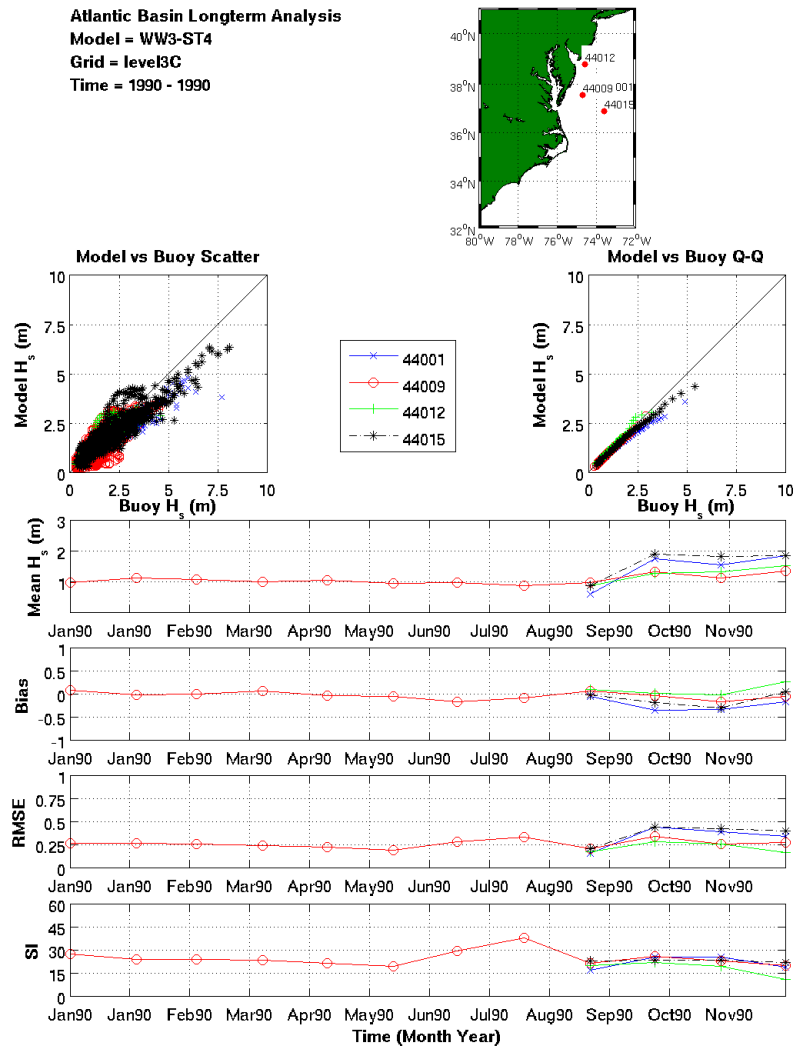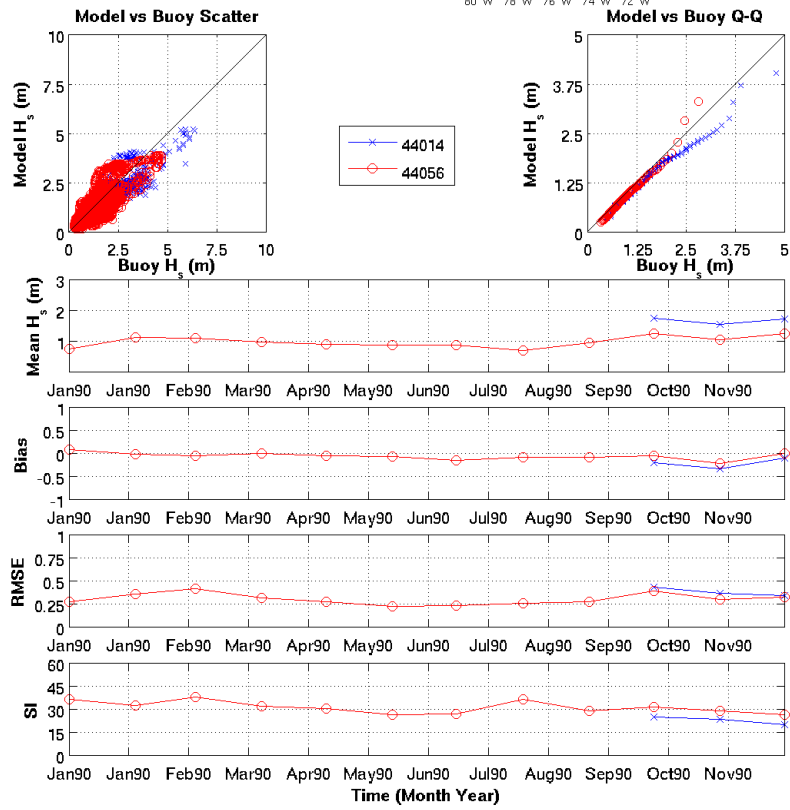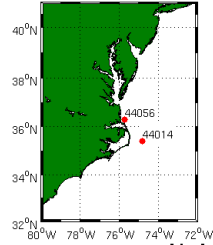

Figure 10: Comp 1 for Level 3N

0.13.4 Level 3C

Figure 11: Comp 1 for Level 3C

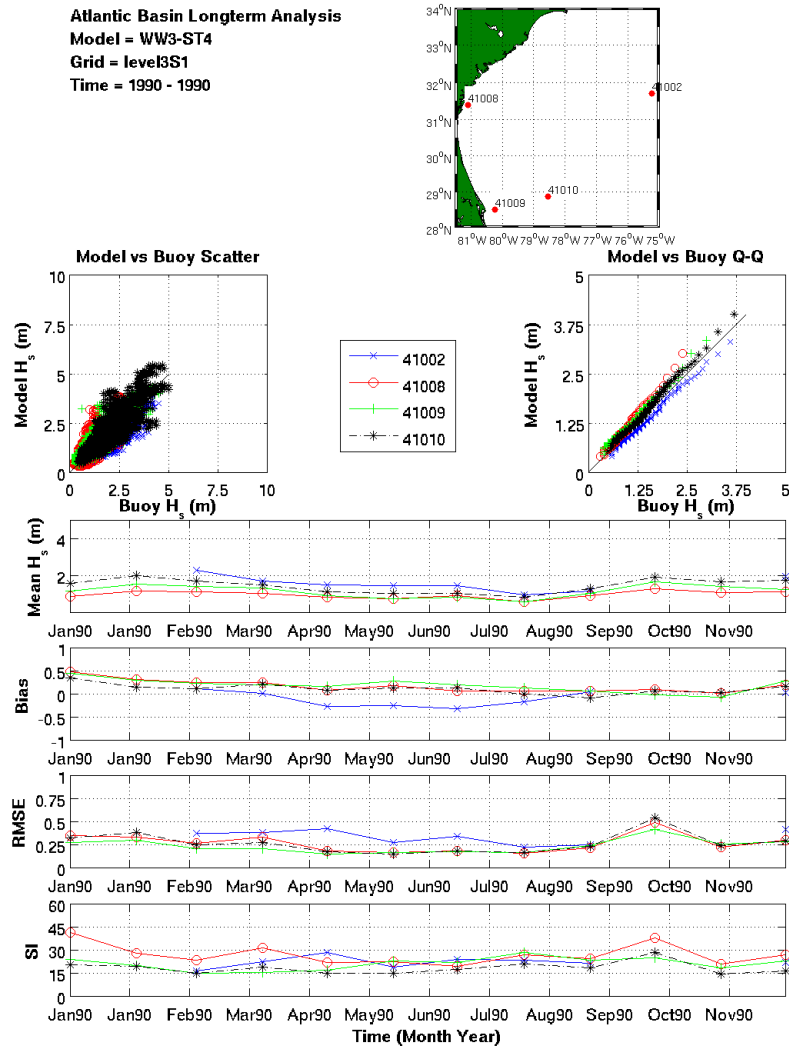Figure 12: Comp 2 for Level 3C
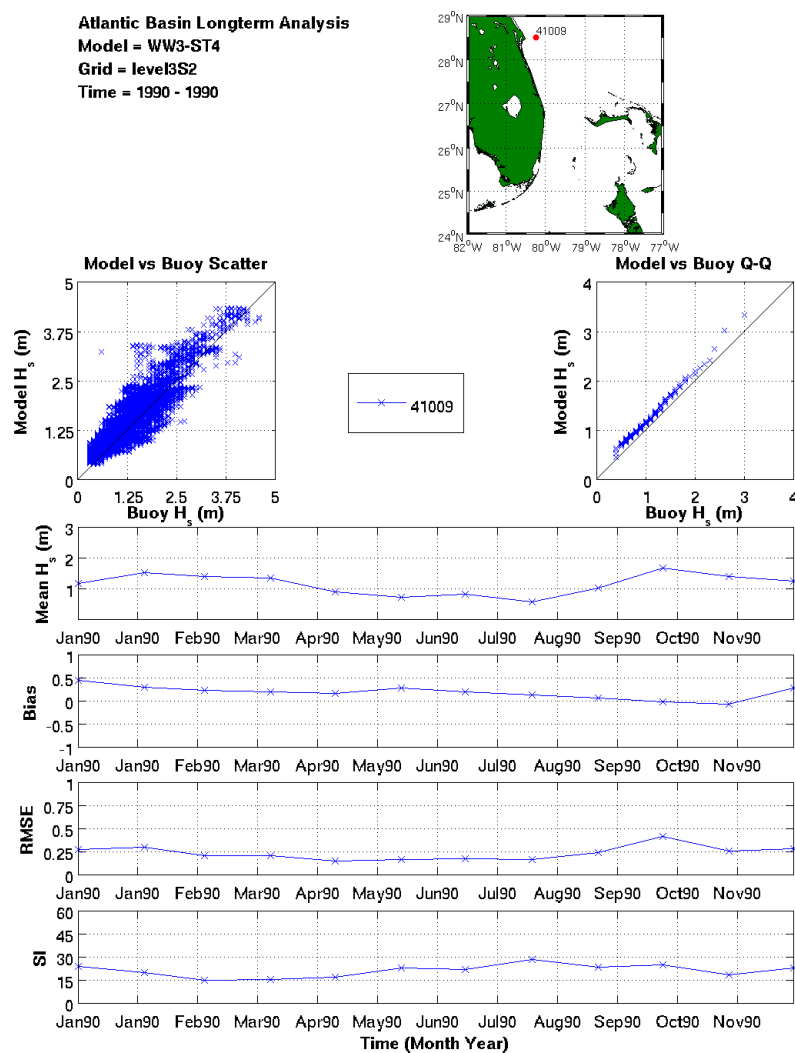
0.13.5   Level 3S1

Figure 13: Comp 1 for Level 3S1

0.13.6 Level 3S2

Figure 14: Comp 1 for Level 3S2