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NCAR Auto-Nowcast (ANC) Forecaster Interface on AWIPS

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User's Guide

Decision Assistance Branch

Meteorological Development Laboratory

Office of Science and Technology

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1.0 Introduction

Auto-Nowcast (ANC) is a sophisticated complete nowcast system that uses a data fusion technique to optimize the use of meteorological data in nowcasting and very short range forecasting. It produces 0- 1 hr. thunderstorm nowcasting predictor fields derived from combining information from observation-based feature detections (such as radar, satellite, and surface networks), the Numerical Weather Prediction (NWP), and human forecaster input.

The software applications in the ANC environment include algorithms for identifying boundary-layer convergence zones, boundary-storm interactions, cumulus cloud detection and growth, boundary-relative shear profile, boundary-relative updraft strength and storm trends and tracks. A fuzzy-logic application is used to allow the user to combine the weighted outputs from the various analysis algorithms to produce time- and space-specific forecasts of thunderstorm initiation, growth and decay. The nowcast predictor fields, specially thunderstorm initiation, growth, and decay generated by ANC can be used as guidance by the forecasters in their warning decisions. ANC home page can be found at: http://www.rap.ucar.edu/projects/nowcast.

This document describes the AWIPS-ANC interface, which allows forecasters to overlay products, draw and adjust meteorological boundaries, and manipulate and view ANC forecast products on AWIPS D-2D.

2.0 ANC - AWIPS Forecaster Interface

The primary functions of the product are:

1. Allow the forecaster to enter mesoscale and/or synoptic scale convective boundaries;
2. Allow the forecaster to set a boundary in motion after its creation
3. Allow the forecaster to speed up or down the boundary motion
4. Allow forecaster to create a polygon delimiting regions of interest
5. Allow the forecaster to change Init60 values within of a region of interest delimited by a polygon, or modify all values of the whole field
6. Allow the forecaster to adjust or delete any active boundary/polygon
7. Send data of user defined or adjusted convective boundaries and defined polygons of regions of interest to ANC system for processing via the external workstation
8. Receive ANC fields and forecast products from ANC system via the external workstation
9. Display ANC fields and forecast products on AWIPS' D2D
10. Allow the forecaster to switch a regime selection

Under the D2D “SCAN” pull-down menu, there is a new menu entry called “Auto-Nowcaster”. Within the “Auto-Nowcaster” submenu, there are menu buttons for the AWIPS’ Boundary Editor, Polygon Editor, Regime Selection and available ANC display products (Figure 1).

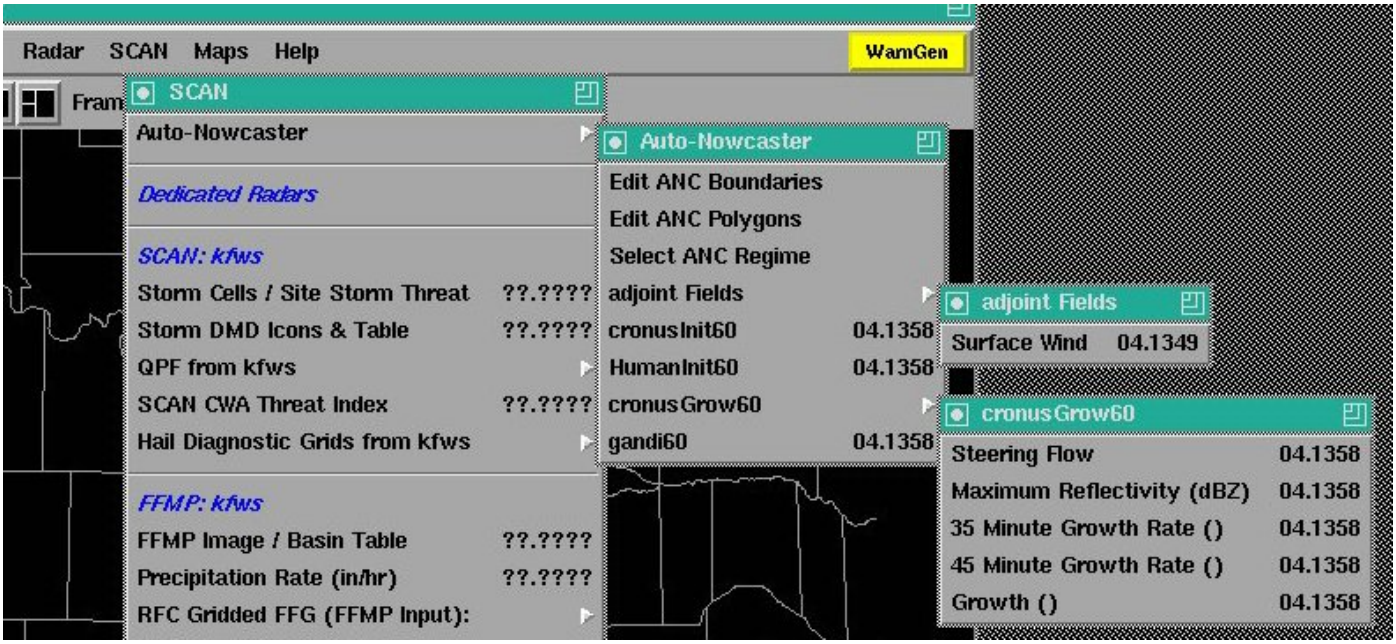

Figure 1: ANC menus on D2D

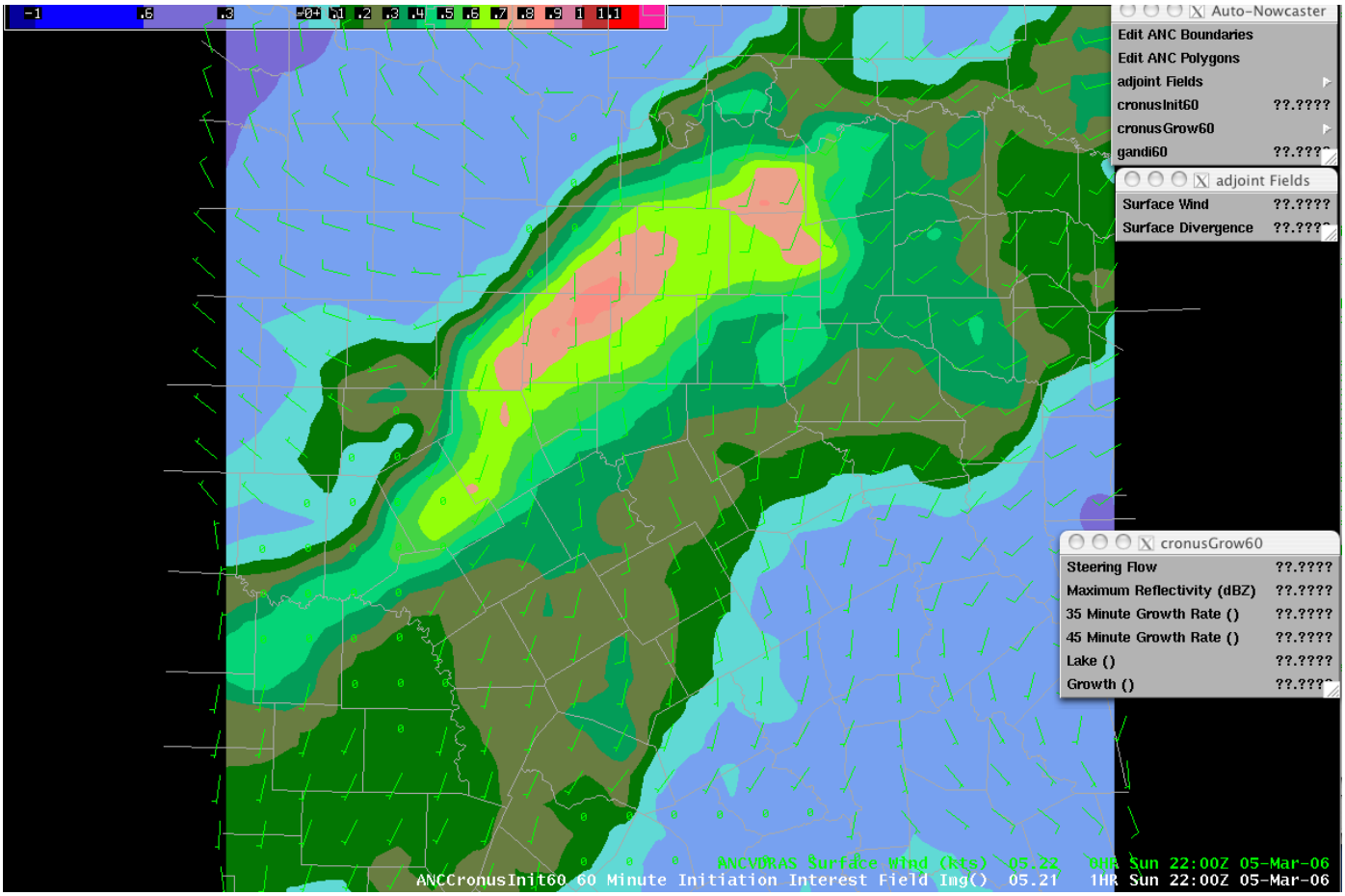

Figure 2: Init 60 and adjoint winds

3.0 ANC Products

As illustrated in Figures 1 and 2, many of the ANC products are now available for display within the D2D. Figure 2 gives an example of the CronusInit60 convective initiation field overlaid with adjoint surface winds.

4.0 ANC Boundary Editor

The “Boundary Editor” allows the forecaster to add new convective boundaries ('boundaries'), adjust the positions of existing boundaries, set a stationary boundary to motion, modify the speed of a moving boundary or end an active boundary.

Selecting “Edit Boundary” menu button will launch the “Boundary Editor” GUI (Figure 3).

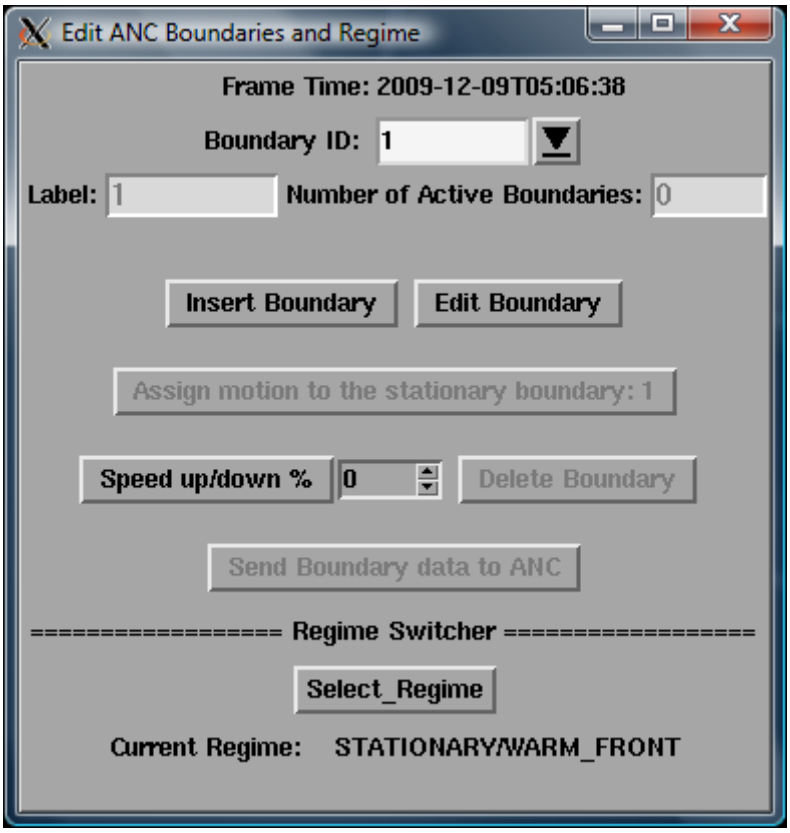

Figure 3: ANC Boundary Editor GUI

4.1 Active Boundaries

Once the “Boundary Editor” GUI is loaded, existing active boundaries will be displayed on D2D. Click the arrow button of the “Boundary ID”, a pull-down list of all active boundary ids will be showed (Figure 4).

Click on the id for the boundary you want to edit (if it is empty, click anywhere on this pull-down list or click 'Esc' button to close it), the selected number will be filled in the entry besides "Boundary ID" label. Please check this Boundary ID number every time before you do any further modifications of existing active boundaries.

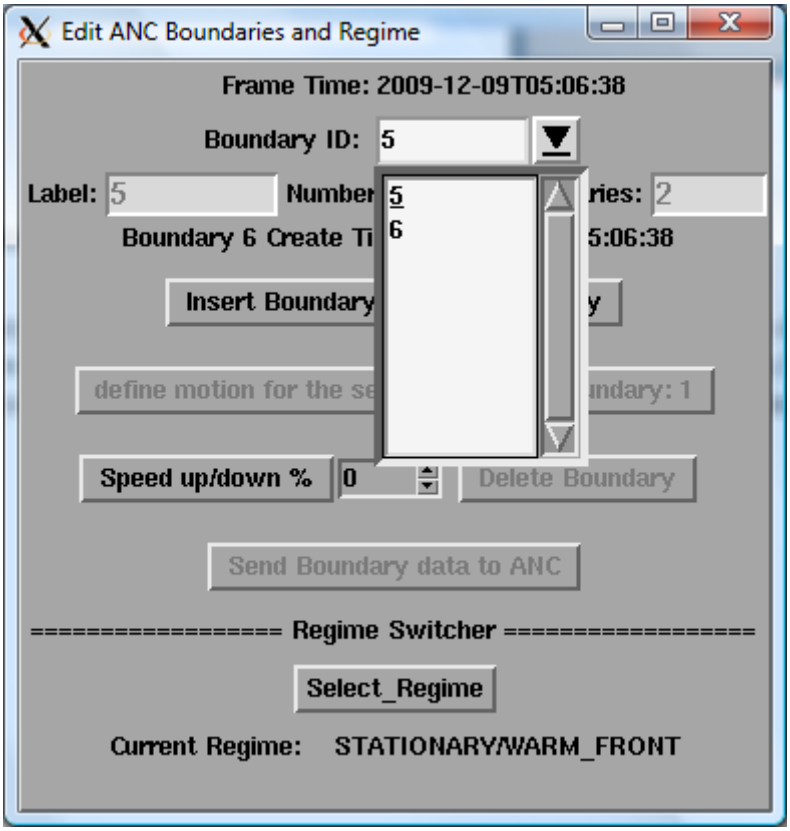

Figure 4: List of active boundaries

4.2 Create and Edit New Boundaries

To define a new boundary, select a D2D frame whose frame time will be this new boundary's creation time, click the "Insert Boundary" button, an editable boundary will be displayed on the center of D2D screen. The boundary id is automatically assigned. The maximum boundary id found in the drop-down boundary id list is incremented by 1. The boundaries may be modified by dragging them to a new position or clicking the middle mouse button to add or delete a vertex. Please be aware that any updated or new boundaries must be saved. The label on the button "Send Boundary data to ANC" turns red after any updates to remind you that this button must be clicked to save the data. Once the data is saved, the boundaries on D2D will become un-editable (Figure 5). If later you feel the need to adjust a boundary, select the boundary from the Boundary ID pull-down list and click the "Edit Boundary" button and the selected boundary will become editable.

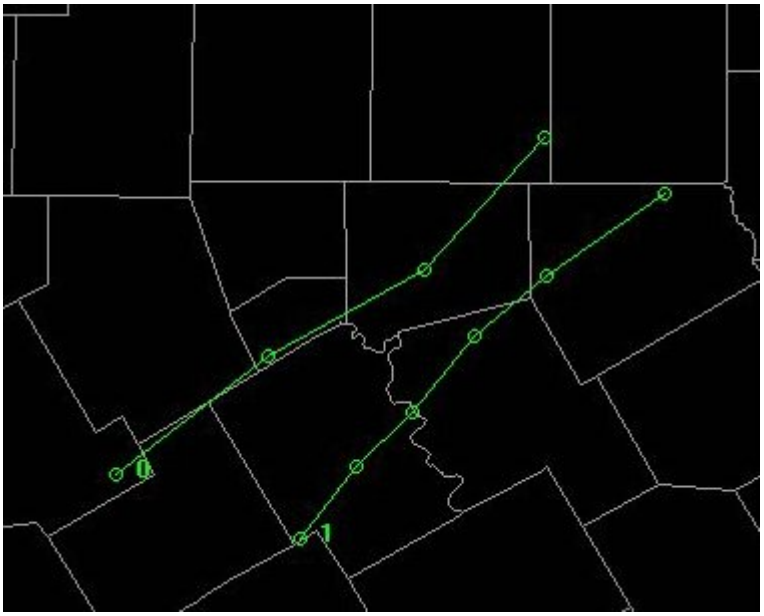

Figure 5: Active boundaries

4.3 Set Boundary in Motion

A new boundary is stationary by default. A boundary may be set to motion initially when creating the boundary or after saving the stationary boundary. To assign motion vectors to a particular boundary after already saving the stationary boundary; select the boundary id from the drop-down list, select the "Edit Boundary" button, choose a D2D frame other than the one in which you edited the boundary, and click the "Assign motion to the stationary boundary" button. To assign motion vectors to a boundary prior to saving the boundary; choose a D2D frame other than the one in which you edited the boundary, and click the "Assign motion to the stationary boundary" button. In both cases a new editable poly-line will show up on top of the original boundary line (Figure 6). Drag and adjust the poly-line to the desired position and shape. The original boundary line, which represents the stationary position, will be shown as a non-editable dashed line (Figure 7). Use the step forward and backward buttons on D2D to loop through the frames and verify whether the boundary motion has been properly defined*. Click the "Send Boundary data to ANC" once you are happy with the positions. The boundary will become un-editable.

*Please note that the boundary motion vectors are calculated for each point on the boundary. Dragging the entire boundary will result in a constant velocity for all points on the boundary, however, shifting one point relative to others will result in a different velocity for that point. The velocities are calculated by determining the displacement in space and time between the editable points on the boundary and the position of the points on the original boundary.

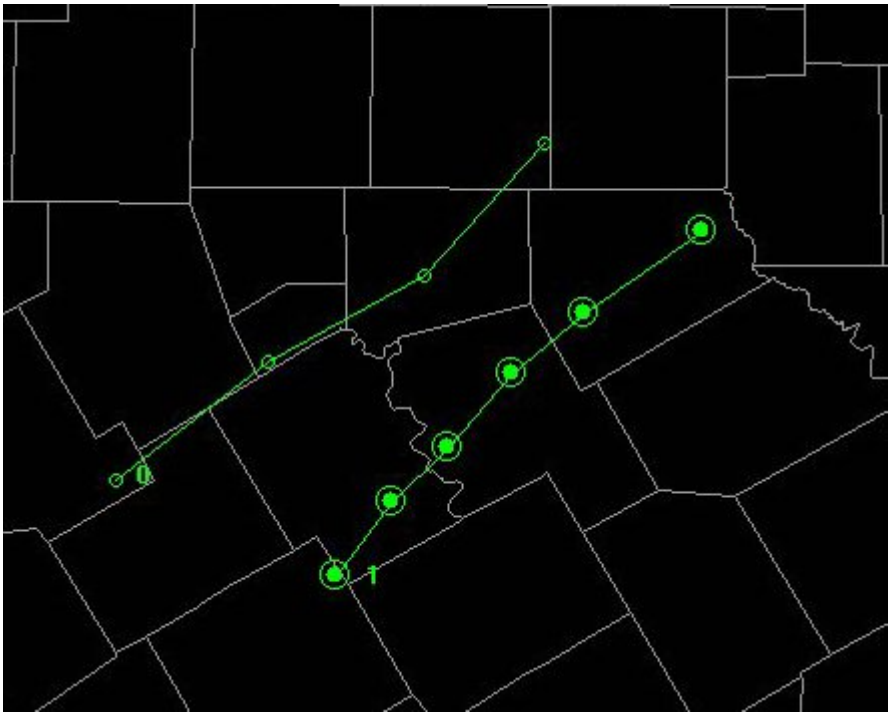

Figure 6: Set boundary to motion

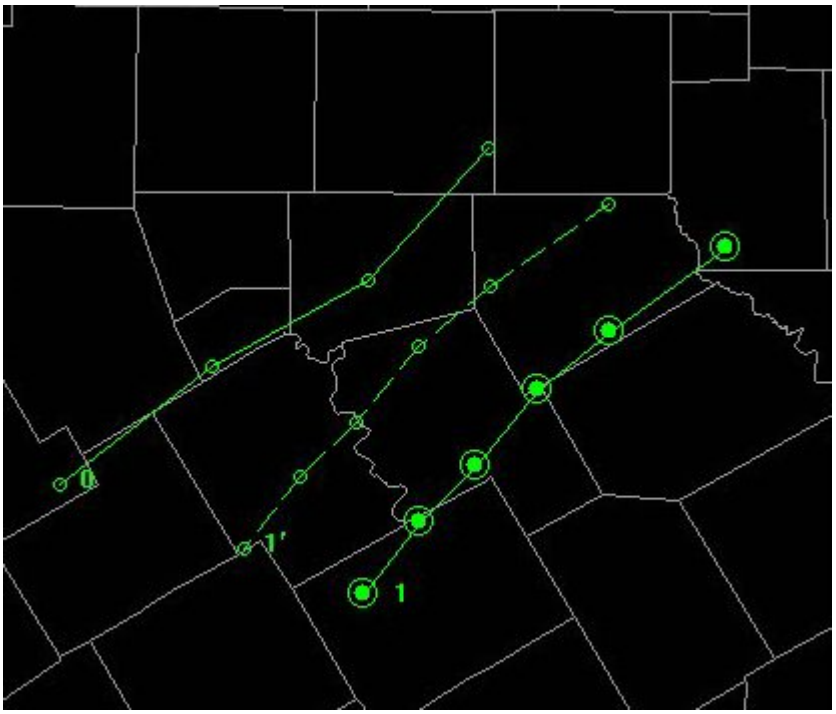

Figure 7: Define boundary motion

4.4 Modify Boundary Position

Over time the ANC boundaries are likely to get out of sync with the real boundaries. There are three ways to adjust the boundary's positions; 1) select the boundary id, click "Edit Boundary" button, and reposition the boundary, which does NOT recalculate the motion vectors for the boundary, 2) select the boundary id, click "Edit Boundary" button, step forward or back a frame or two, and select "Redefine motion for the selected moving boundary", and adjust the position of the boundary, which DOES recalculate the motion vectors, or 3) use the "Apply Speedup %" to linearly adjust the speed of the boundary.

If using the "Edit Boundary" button, the active boundary line will become editable, allowing you to change the position of the line and vertices. Additionally, you may add or delete vertices from the line. These adjustments will not affect the vertex motion vectors unless you have also selected the "Redefine motion for the selected moving boundary" button. Using "Edit Boundary" alone make the most sense if the boundary's motion is correctly represented but the shape needs to be adjusted.

Before selecting the "Redefine motion for the selected moving boundary" button, make sure that the boundary is adjusted to its correct position on the frame where you selected "Edit Boundary". Then move forward or backward a frame so that the frame time is different from the edit time as displayed on the GUI. Next drag the boundary to its position at that frame time. Please be aware that the software only re-computes motions for vertices that are moved. A vertex can move faster or slower than the rest of the vertices, the motion is completely dependent on the position of that vertex at the edit time and current frame time. If the movement of a moved vertex is inconsistent with the boundary motion and moving the point does not result in an acceptable movement you can always delete the vertex and insert a new one at location where the vertex should be in the current frame. A motion will automatically be computed by interpolation of the motion of the two neighboring vertices.

The "Apply Speedup %" button allows you to directly increase or decrease the motion vectors by a specified percentage. To make the linear change, set the desired percentage by typing in the value or clicking to the desired value and then click the "Apply Speedup %" button.

Always validate the boundary positions by looping through the D2D frames before clicking the "Send Boundary data to ANC" button.

4.5 End Boundary

If a boundary is obsolete, select the boundary id that you want to end from the "Boundary ID" drop-down list, step to the frame from which the boundary is no longer valid, and click the "Delete Boundary" button. A confirmation window will pop up, allowing you to select "Yes"; which will remove the boundary from later frames immediately, there is no need to select "Send Boundary data to ANC".

5.0 ANC Polygon Editor

The Polygon Editor allows forecasters to modify the Init60 field by “nudging” the values within polygon delimited regions of interest or adjusting the whole field.

Selecting “Edit ANC Polygons” menu button will launch the “Polygon Editor” GUI (Figure 8). Note: the “Valid ___ Minutes” is intended for future use.

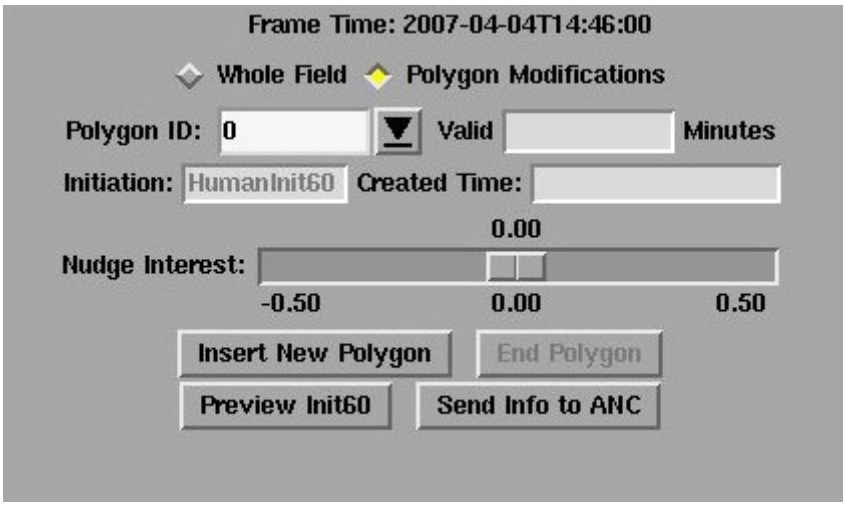

Figure 8: ANC Polygon Editor

5.1 Create New Polygons

“Preview” function is implemented to allow forecasters to view the ‘modified’ HumanInit60 values before they are sent to the ANC system. In order to utilize the “Preview” feature, first load HumanInit60, and then the Polygon Editor.

On the top of the Polygon Editor GUI, there are two radio buttons. Select the “Polygon Modification” button to work with polygons. Select the “Insert New Polygon” button to create a new polygon. A new editable polygon will be displayed on D2D screen. The polygon’s shape and location can be modified (Figure 9).

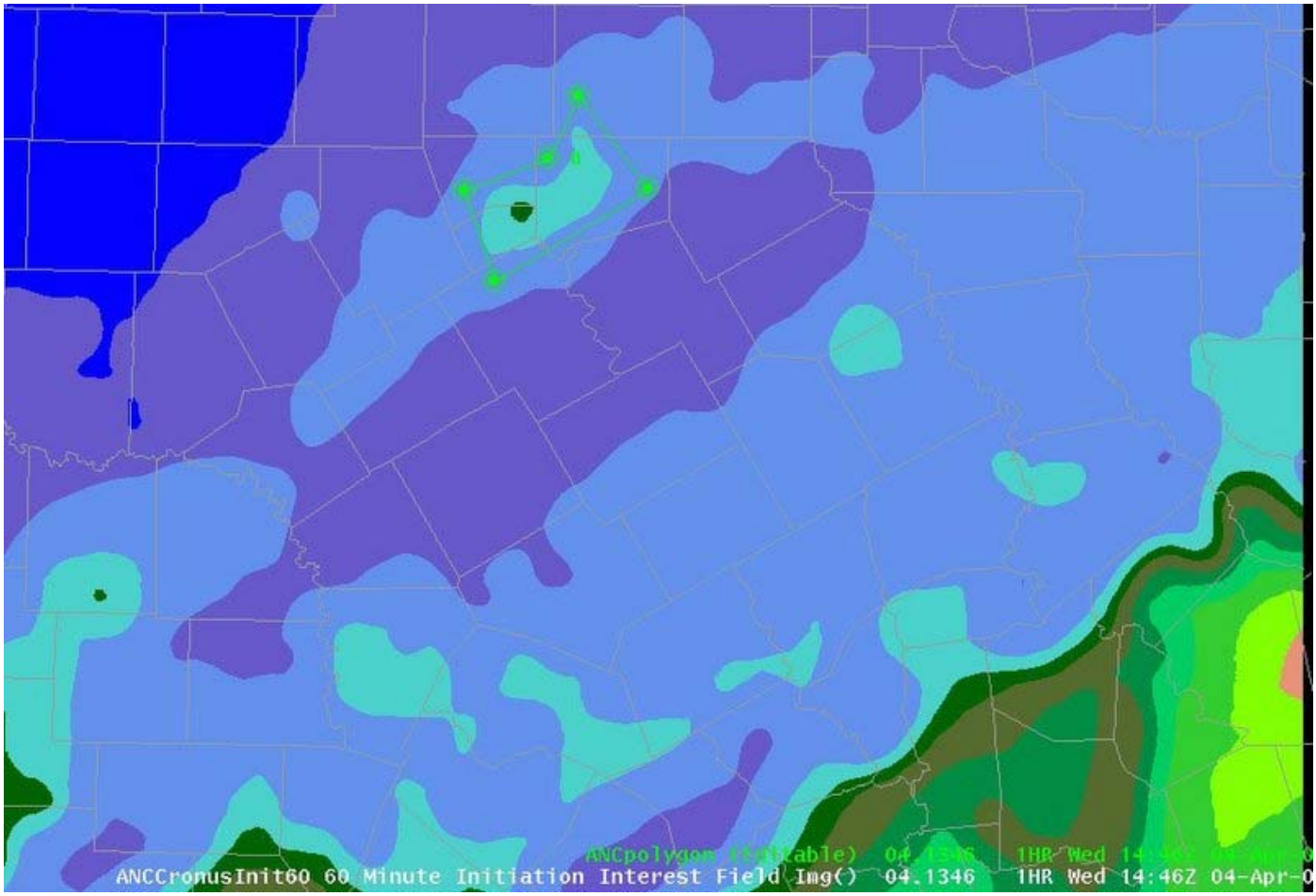

Figure 9: Create a new polygon

5.2 Assign Nudge Values

To assign nudge interest to an existing polygon, click the “Polygon Modification” radio button which is located on the top of the Polygon Editor window. Verify that the “Polygon ID” entry is the desired polygon ID. If is not the correct ID; select the correct id value from the Polygon ID pull-down list. Move the slider to assign the desired nudge interest value for the selected polygon (Figure 10).

Select the “Whole Field” radio button if you want to assign the nudge to the whole field. Then move the slider to set the nudge value to the Whole Field (Figure 11).

To double check assigned nudge values, select the polygon from the Polygon ID pull-down list, the slider will move to indicate the assigned nudge value associated with that polygon. If the“Whole Field” radio button is selected, the slider will shows the nudge value for the whole field.

To verify your changes, click the “Preview Init60” button and the modified HumanInit60 will display on D2D (note: it might take a little time for this operation). If additional changes are needed do so. Otherwise, click the “Send Info to ANC” button to send these changes to ANC system.

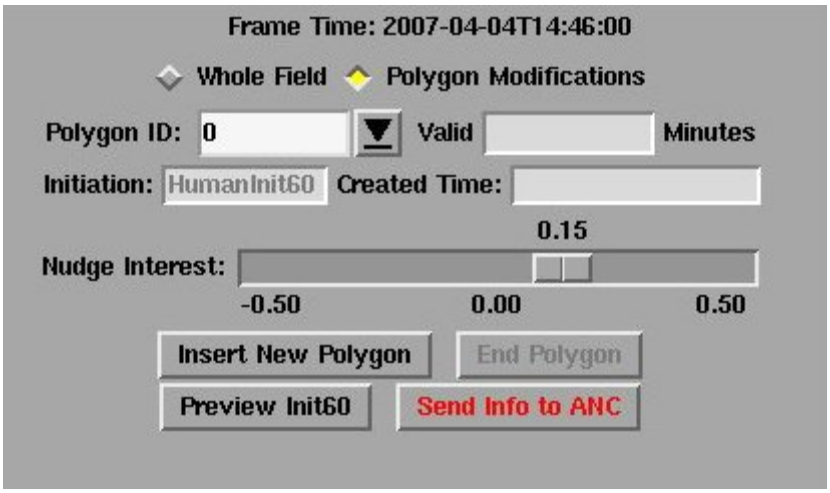

Figure 10: Assign nudge value to a polygon

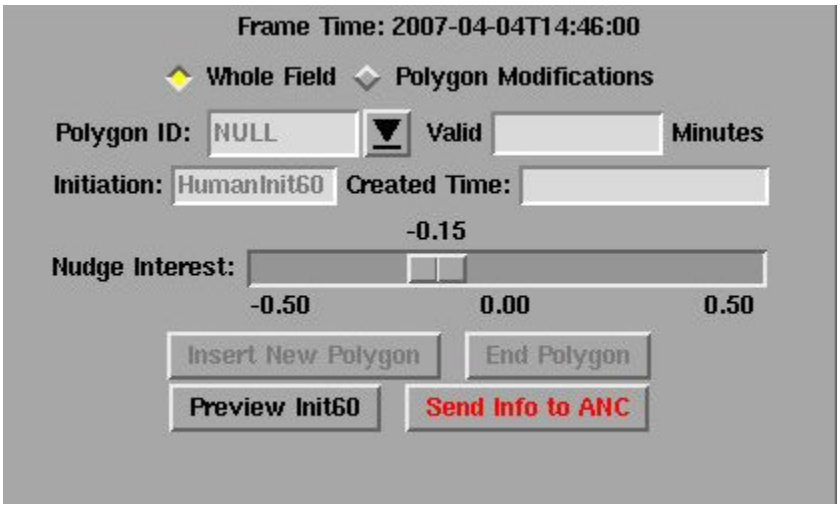

Figure 11: Assign nudge value to the Whole Field

5.3 End Polygon

Similar to boundaries, if a polygon is obsolete, select the frame from which the polygon should no longer exist and click the "End Polygon" button. Select "Yes" when prompted within the confirmation window to really delete the polygon. Remember to click the "Send Info to ANC" button to send the data updates to the ANC system.

6.0 Regime Selection

The regime can be switched by using the "Regime Switcher" which is found at the bottom of the Boundary and Regime GUI (Figure 3) or by launching the Regime Switcher from the D2D "Auto-Nowcaster"

submenu, or from the screen background menu of an AWIPS machine. On the Boundary and Regime GUI select the "Select_Regime" push button and then choose your regime of choice. The regime change is immediately sent to ANC. On the stand-alone Regime Switcher click the "Regime" menu to select the proper value (Figure 12) and then click the "Send Info to ANC" button to send the selection to ANC.

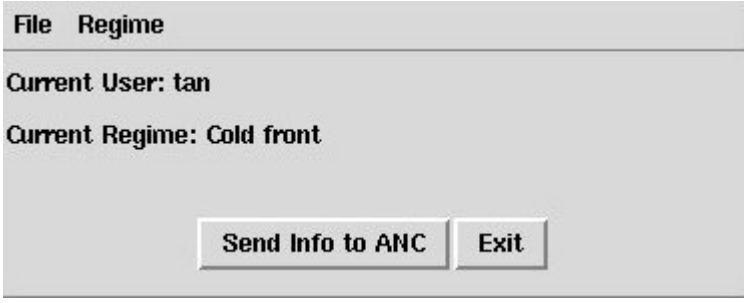

Figure 12: Regime Switcher

7.0 Appendix: Acronyms and Abbreviations

ANC	Auto-NowCaster
AWIPS	Advanced Weather Interactive Processing System
D2D	Display 2-Dimensional
GUI	Graphical User Interface
MDL	Meteorological Development Laboratory
NCAR	National Center for Atmospheric Research
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
SCAN	System for Convection Analysis and Nowcasting
WFO	Weather Forecast Office

8.0 MDL Contact Information

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9.0 Meteorological Development Laboratory (MDL)

Web page: http://www.nws.noaa.gov/mdl/