

Stage Area Rating Application – AreaComp2

Jeremiah Lant and David S. Mueller
USGS, Office of Surface Water
May 2012

INTRODUCTION

The AreaComp2 application is a graphical user interface used to analyze ADCP data and compute a relationship between channel area and stage for an ADCP measurement. The stage area relationship (stage area rating) can be used in the computation of discharge using index-velocity methods.

AreaComp2 allows users to import data files from multiple sources including an ADCP file, a comma-separated value file, and an AreaComp1.3 file. Users can export processed data into comma-separated value files. Users can save and open AreaComp2 files. AreaComp2 also allows users to view processed data and interact with the plots.

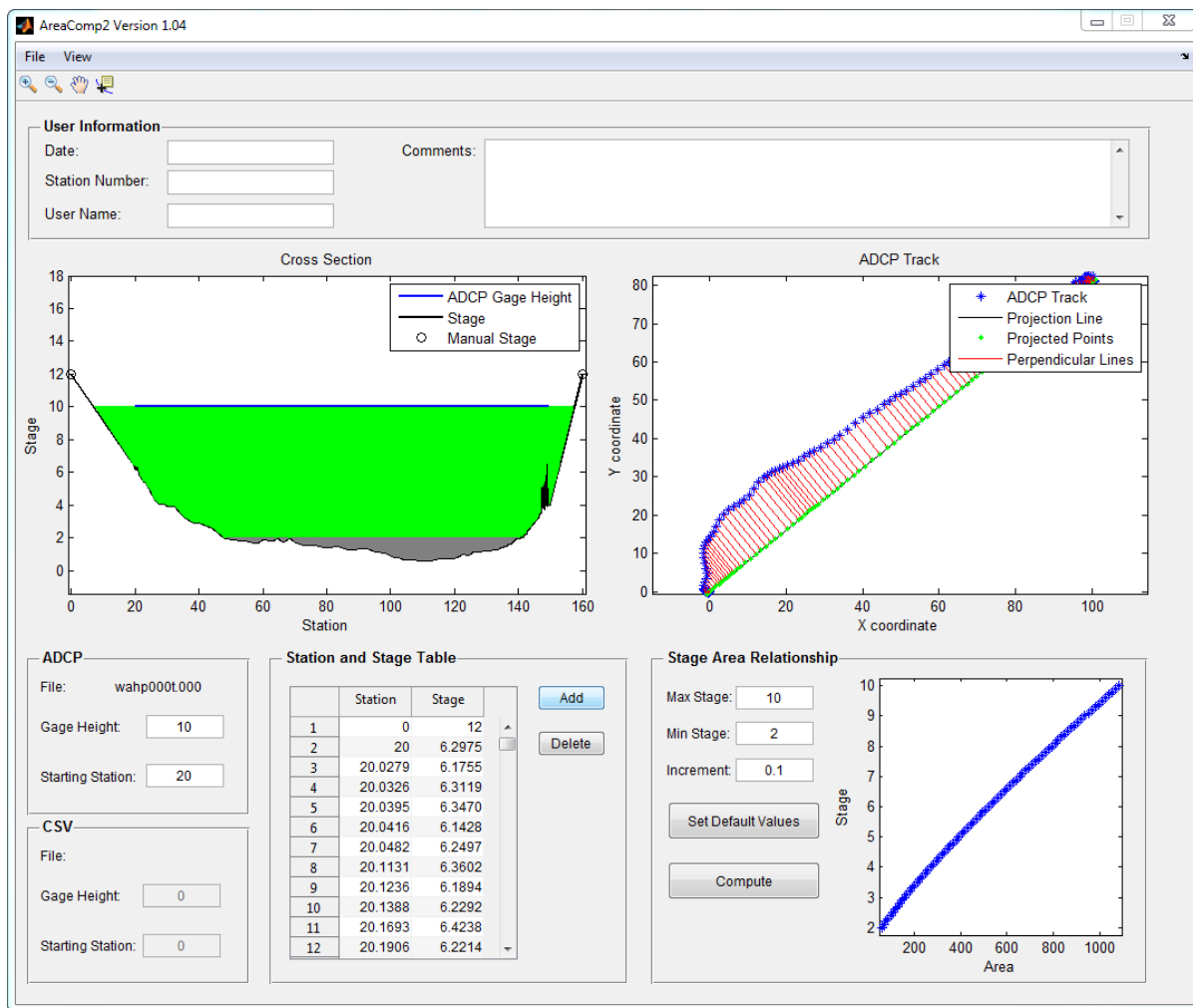


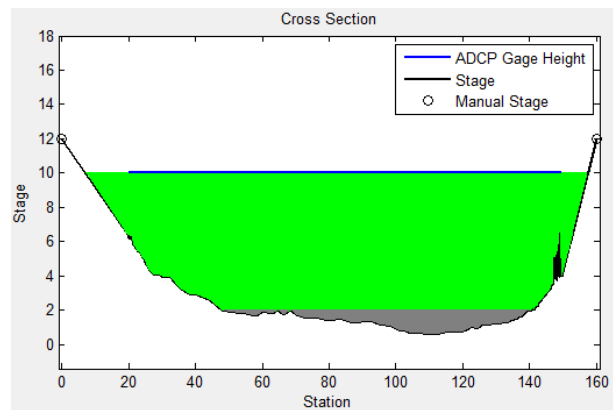
Figure 1. AreaComp2 interface with ADCP data.

PLOTS

AreaComp2 displays two plots of the data: a cross-section plot and an ADCP bottom track based ship track plot.

Cross-Section Plot:

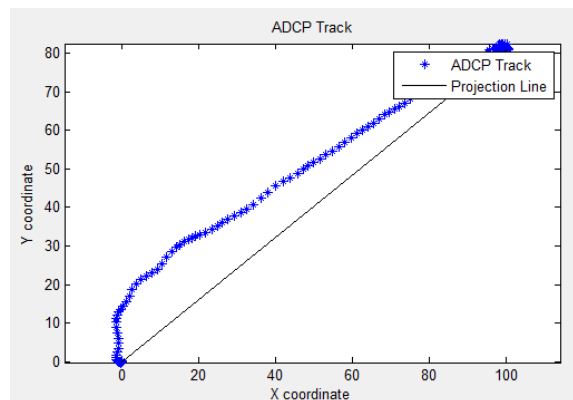
The cross-section plot shows station versus stage. The cross-section plot automatically updates when gage height and station offsets are adjusted in the “ADCP” or “CSV” panels. For an ADCP data file, the gage height line is blue and the cross-section line is black. For a CSV data file, the gage height line is red and the cross-section line is black with green markers indicating each data point in the CSV file. When a user manually adds data using the “Add” button in the “Station Stage Table” panel or edits table data directly in the “Station Stage Table” panel, a new station stage point is plotted as a transparent circle with a black outline indicating a new point has been added or an old point has been edited.



After a user computes a stage area rating using the “Compute” button in the “Stage Area Rating” panel, the computed area is filled green and the area below the specified minimum stage value is filled grey.

ADCP Bottom Track Plot:

The ADCP bottom track plot shows the track of an ADCP. The menu item “View” allows additional features to be plotted on the ADCP bottom track plot. These additional features include the projected points and the perpendicular lines used to calculate the stationing for an ADCP data file. The perpendicular lines feature consists of lines connecting each bottom track point to its corresponding projected point.

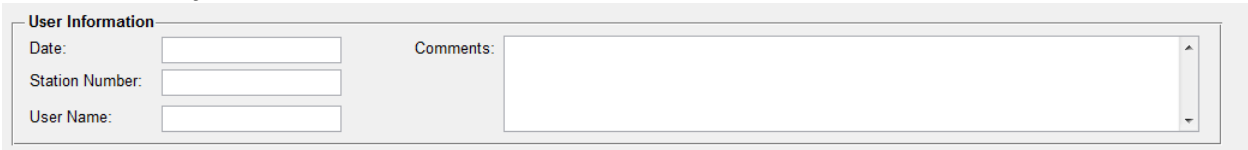


PANELS

AreaComp2 is organized into different sets of panels that display information and data of interest. The panels also allow for user interaction where users can add relevant information, adjust

gage height and stationing to desired datum, add new station and stage data, and compute a stage area relationship. The following is a description of each panel:

Panel – “User Information”

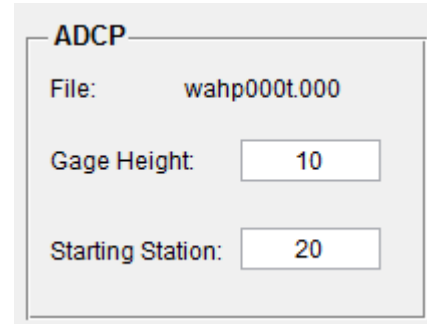


The "User Information" panel is a rectangular window with a light gray background. It features a title bar at the top with the text "User Information". Below the title bar, there are three input fields on the left side, each with a label: "Date:", "Station Number:", and "User Name:". To the right of these fields is a large, empty text area with a vertical scrollbar on its right edge, labeled "Comments:".

The “User Information” panel can be used to enter the date, station number, user name, and relevant comments about the station of interest. This user information is saved in the “AreaComp2” data file (File -> Save -> AreaComp2 File).

Panel – “ADCP”

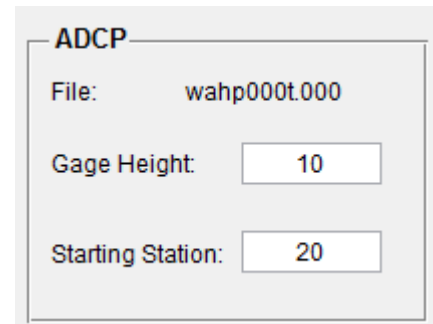
The “ADCP” panel can be used to adjust ADCP data to the desired datum using the gage height and starting station. The name of the ADCP data file is also displayed within the panel.



The "ADCP" panel is a rectangular window with a light gray background and a title bar at the top with the text "ADCP". Below the title bar, the text "File: wahp000t.000" is displayed. Below this, there are two input fields: "Gage Height:" with the value "10" and "Starting Station:" with the value "20".

Panel – “CSV”

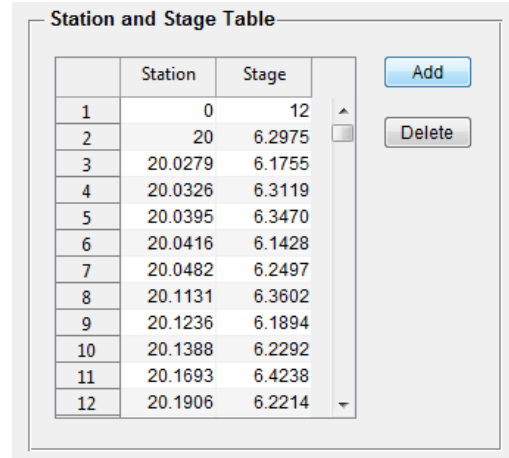
The “CSV” panel can be used to adjust station and stage data, contained in a comma-separated value (CSV) file or imported from AreaComp version 1.3, to the desired datum using the gage height and starting station. The name of the CSV data file is also displayed within the panel.



The "ADCP" panel is a rectangular window with a light gray background and a title bar at the top with the text "ADCP". Below the title bar, the text "File: wahp000t.000" is displayed. Below this, there are two input fields: "Gage Height:" with the value "10" and "Starting Station:" with the value "20".

Panel – “Station and Stage Table”

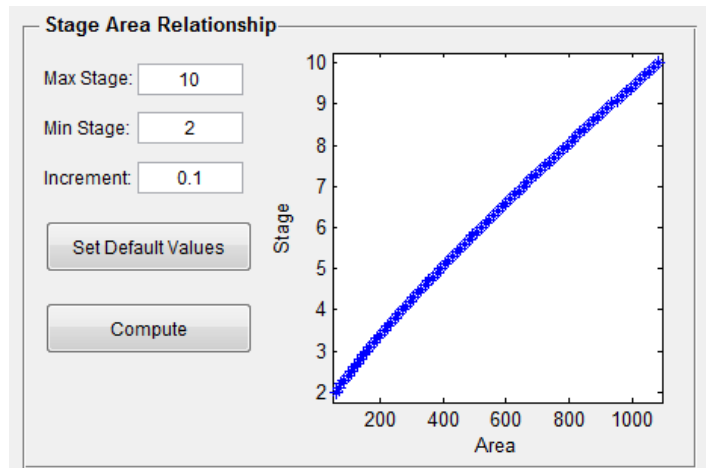
The “Station and Stage Table” panel can be used to view and edit station and stage data. Users can edit data directly in the table, add new a new row of data using the Add button, or delete an entire row or rows of station and stage data using the “Delete” button. Multiple rows can be selected for deletion using CNTL-click or SHIFT-click to select rows. Due to the way Matlab handles tables if the entire cell is not highlighted the user may need to click outside the table before the Delete or Add buttons will work or simply click the button twice.



	Station	Stage
1	0	12
2	20	6.2975
3	20.0279	6.1755
4	20.0326	6.3119
5	20.0395	6.3470
6	20.0416	6.1428
7	20.0482	6.2497
8	20.1131	6.3602
9	20.1236	6.1894
10	20.1388	6.2292
11	20.1693	6.4238
12	20.1906	6.2214

Panel – “Stage Area Relationship”

The “Stage Area Relationship” panel can be used to compute a stage area relationship. The stage area rating is computed for a range of stages between the minimum and maximum stage values in a specified increment. Default values for the maximum and minimum stage are computed from the station and stage table. A value of 0.1 is used as the default stage increment. Users can change the maximum stage, minimum stage, and stage increment as needed. The “Set Default Values” button resets the maximum stage, minimum stage, and stage increment to the default values.



The “Compute” button computes the stage area relationship and plots the result in the panel. A table of the computed stage area relationship can be viewed (View -> Stage Area Rating Table) and exported as a CSV file (File -> Export -> Stage Area Rating File (CSV file)). For an AreaComp 1.3 file (*.act), the maximum stage, the minimum stage, and the increment are taken from the file.

MENUS

File Menu - Import:

Import - Sontek .m File: Import a SonTek MATLAB File (*.mat).

Import - TRDI Classic ASCII File: Import a TRDI Classic ASCII File (*.txt).

Import – CSV: Import comma-separated value (CSV) data files (*.txt, *.csv). These files can contain corresponding station and depth (or elevation) data for a known cross section. The user

will be prompted to specify whether the data are depths or elevations. NOTE: AreaComp2 does allow comma separated value files to be imported and combine with imported ADCP data files.

Import AreaComp1.3 *.act File: Imports data previously saved using AreaComp version 1.3.

File Menu - Export:

Export – Station Stage (CSV): Exports the final station and stage data to a comma separated value file.

Export – Stage Area Rating (CSV): Export the computed stage area rating to a comma separated values file.

File Menu - Open :

Open – AreaComp2 File: Opens a previously saved AreaComp2 file (stored in Matlab format with suffix “mat”).

File Menu - Save

Save - AreaComp2 File: Saves the current data and information in AreaComp2 to a Matlab binary file that can later be reloaded using Open – AreaComp2 File.

View Menu – Stage Area Rating Table

Opens a new window with a table showing the stage and computed area, sorted from smallest to largest stage.

View Menu – Track Plot Features

Track Plot Features – Projected Line: This is on by default and shows the line connecting the first and last points of the ship track. This is the line onto which the data will be projected and the cross sectional area computed. If projecting the collected data onto this line would not provide a representative cross section the user should select a different data file to use in the computation. The straighter the ship track the more accurate the cross section will be.

Track Plot Features – Projected Points: Shows the points from the ship track projected onto the projection line (green points).

Track Plot Features – Perpendicular Lines: Shows lines perpendicular to the projection line connecting each point in the ship track with the projected point on the projection line.

TOOLBAR

The icons in the toolbar can be used to zoom in, zoom out, pan, and probe the data in any of the plots displayed in the AreaComp2 GUI. The probe data interactively displays data values after a user clicks on a data point in any of the plots.



GENERAL PROCEDURE

1. Import ADCP data.
2. Use gage height and station offsets to adjust ADCP data to the desired datum.
3. Use the following options to add additional station and stage (or elevation) data (i.e. surveyed bank elevations):
 - Option 1:* Manually enter stage (or elevation) data referenced to the desired datum using the "Add" button.
 - Option 2:* Import a CSV file with station and stage (or elevation) data. User can reference data to the desired datum in AreaComp2 by adjusting the gage height and station offsets in the "CSV" panel.
 - Option 3:* Use Excel to manually enter station and stage (or elevation) data, and save as a CSV file. Import the CSV file into AreaComp2 and adjust offset to achieve desired datum.