HydrOffice CA Tools Manual

Release 1.0.8

2018, CCOM/JHC,UNH

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CONTENTS

CHAPTER

ONE

IN BRIEF

CA Tools assist in the assessment of the adequacy of nautical charts.

Accepted data inputs are ENCs, bathymetric grids, and sounding selections. The output is GIS-layers that alert to the user various parts of their data that might require more attention. Summary reports are also printed for the record and review.

The objectives are to improve data accuracy, while also reducing the overall time required for ping-to-public.

CHAPTER

TWO

USER MANUAL

2.1 Installation

Note: If you download the frozen application (from the download page), you don't need to care about installation and dependencies (so you may just skip this section).

2.1.1 Installation using the Pydro distribution

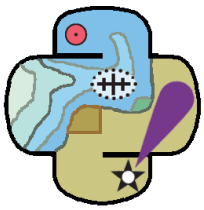


Fig. 2.1: The Pydro logo.

If you are on Windows, you can easily install QC Tools 2 as part of the NOAA Office of Coast Survey Pydro distribution.

Pydro is a suite of software tools used to support hydrography. It is (almost exclusively) built from open source components as well as public domain custom developed software. Pydro is maintained by Hydrographic Systems and Technology Branch (HSTB) to support NOAA operations (aiding Office of Coast Survey fleet) and is made available for public use.

You can download the latest Pydro installer from here.

2.2 ENC Adequacy

2.2.1 Overview

The **ENC Adequacy** tab will:

- Ingest an ENC and survey soundings (see *Data inputs*).
- Identify survey's selected soundings with discrepancy as compared to the current chart (see *Chart Comparison*).

2.2.2 Data inputs

Ingest an ENC (.000), and a survey soundings selection (.000).

- Select the **ENC Adequacy** tab on top of the CA Tools interface.

In **Data inputs:**

- Drag-and-drop an ENC (.000) onto the **Current ENC** field. The **"+"** browse button may also be used.
- Drag-and-drop a survey sounding selection (.000 only) onto the **Survey Soundings** field. The **"+"** browse button may also be used.
- The directory and filename of loaded data will populate in the respective field of **Data inputs**.
- With the addition of a ENC and sounding selection, the **Chart Comparison** tab on the bottom of the interface will become available (Fig. 2.2).

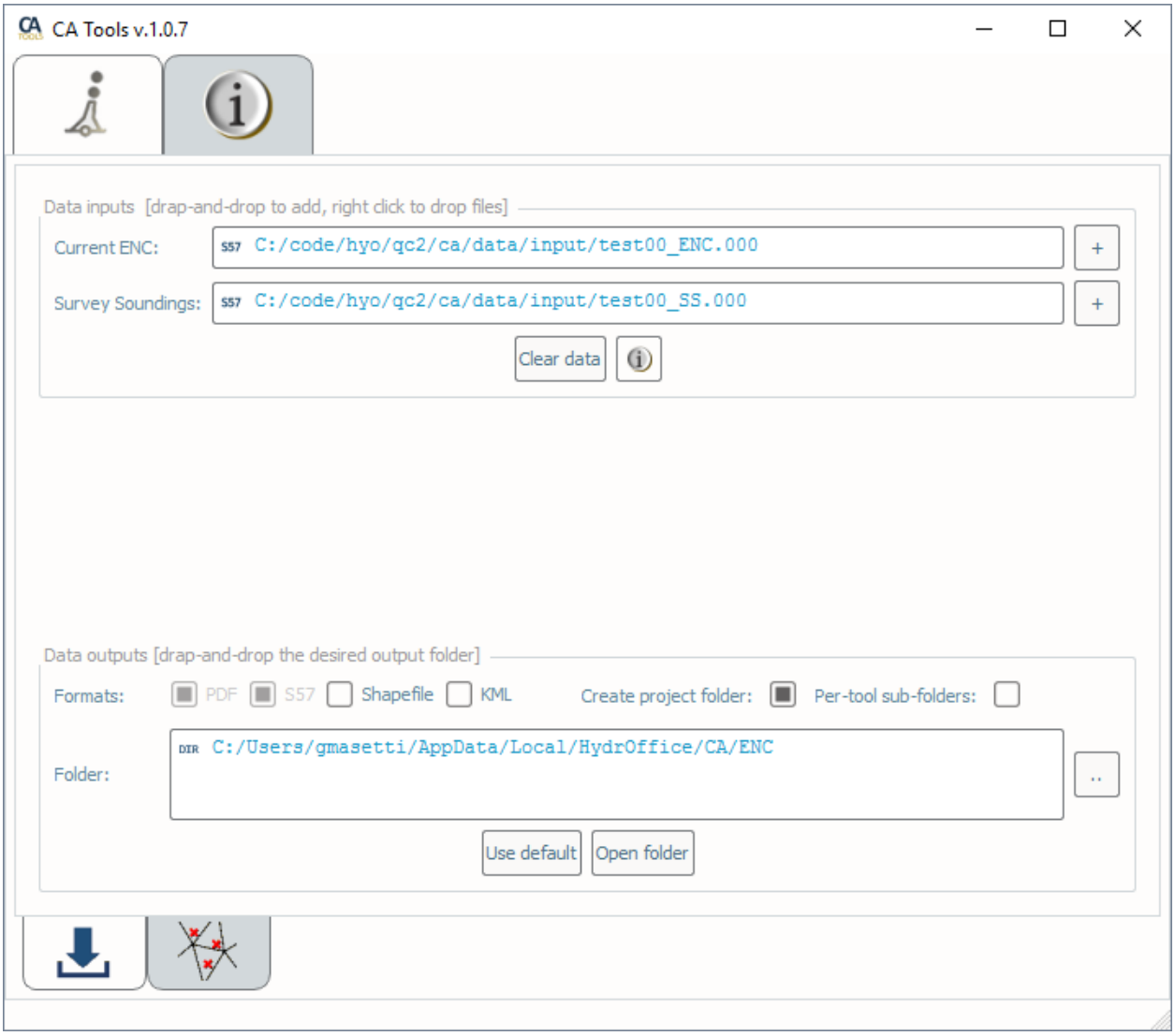


Fig. 2.2: ENC Adequacy tab.

- The **Clear data** button may be used to remove all data inputs.

In **Data outputs:**

- The output **Formats** may be customized. The user has the option to suppress **Shapefile** and **KML** output.
- Output files location is controlled by the **Create project folder** and **Per-tool sub-folder** flags. The four available combinations are:
  - No flags set (see Fig. 2.3, pane A). The outputs are stored directly under the default or user-defined location.
  - Only the **Per-tool sub-folders** flag set (see Fig. 2.3, pane B). The outputs are stored in a tool-specific sub-folder (in the default or user defined-location).
  - Only the **Create project folder** flag set (see Fig. 2.3, pane C). The outputs are stored in a survey folder (in the default or user defined-location). *This is the default setting.*
  - Both flags set (see Fig. 2.3, pane D). The outputs are stored in tool-specific sub-folders in a survey folder (in the default or user defined-location).

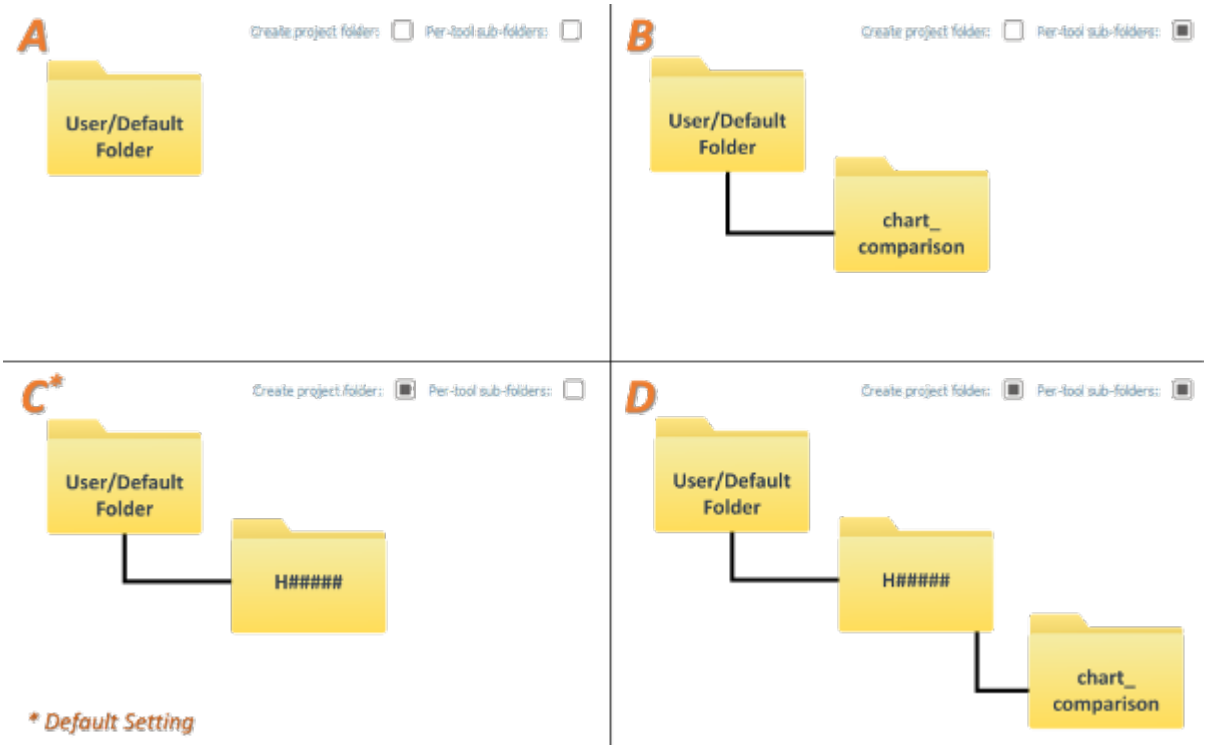


Fig. 2.3: The resulting folder structure based on the four available combinations of output flags.

- The default output **Folder** location is listed; however, this may be modified via drag-and-drop (or browse to) a user-specified output folder. To return to the default output folder location, click **Use default**.
- The ensuing functions will open the output folder automatically upon execution; however, if needed, the specified output folder may be accessed by clicking the **Open folder** button.

2.2.3 Chart Comparison

How To Use?

Identify survey soundings with a shoal discrepancy as compared to the chart, evaluated via “triangle rule”.

- Select the **Chart Comparison** tab on the bottom of the CA Tools interface.

- In **Parameters** (Fig. 2.4, left side):
  - Check the **Detect deeps** checkbox if you want that the deep discrepancies are also evaluated. The **Discrepancy threshold** values also apply to deep discrepancies.
- For custom analysis:
  - Click the **Unlock** button, and click **OK** to the dialogue.
  - Set the **DtoN threshold** values to set a threshold for DtoN, in meters and in percentage of water depth.
  - Set the **Discrepancy threshold** values to set a threshold for chart discrepancy, in meters and in percentage of water depth.
  - Check the **Set Shoreline Depth** checkbox if you wish to define a specific depth value to be paired with SLCONS and COALNE features.
  - Check the **Force Compilation Scale** checkbox if you want to manually set the compilation scale to use for the interpolation of long edges (i.e., 1cm at the compilation scale).
- In **Execution** (Fig. 2.4, right side), click **Chart Comparison v1**.

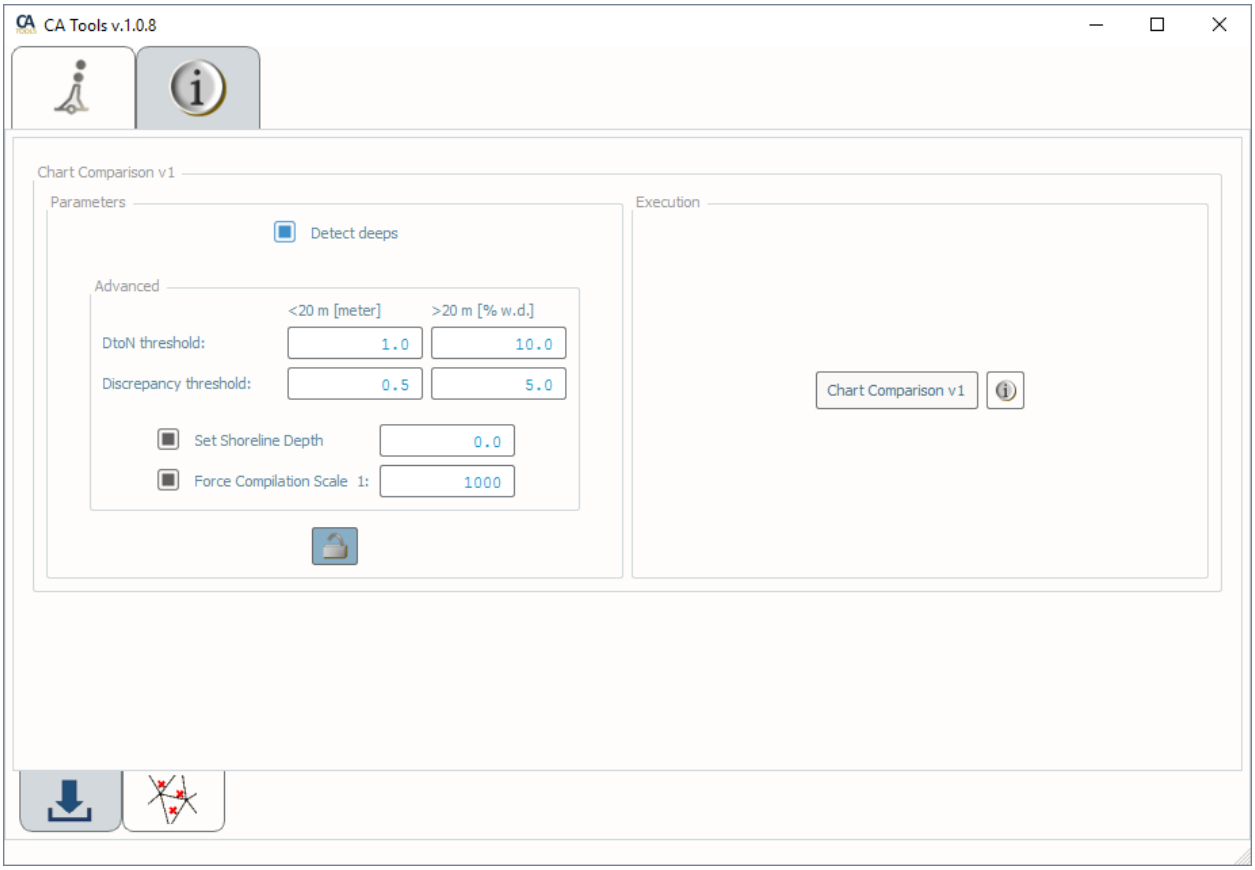


Fig. 2.4: Chart Comparison interface.

- After executing, the output window opens automatically, and the results are shown by textbox (Fig. 2.5).
- After executing, the results are also shown graphically (Fig. 2.6). ENC soundings are colored by depth, and flagged survey soundings shoal of the ENC soundings are colored by their discrepancy.
- From the output window, drag-and-drop the output into the processing software to guide the review.
- Note the output consists of up to 4 distinct files: DtoN, discrepancies, deeps, and untested features.

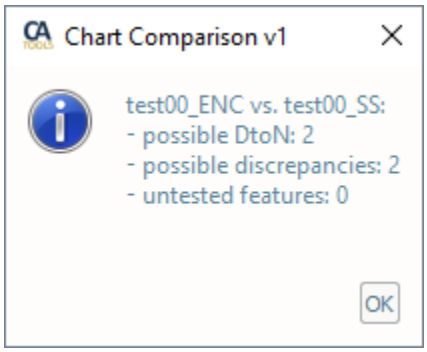


Fig. 2.5: Chart Comparison's output message.

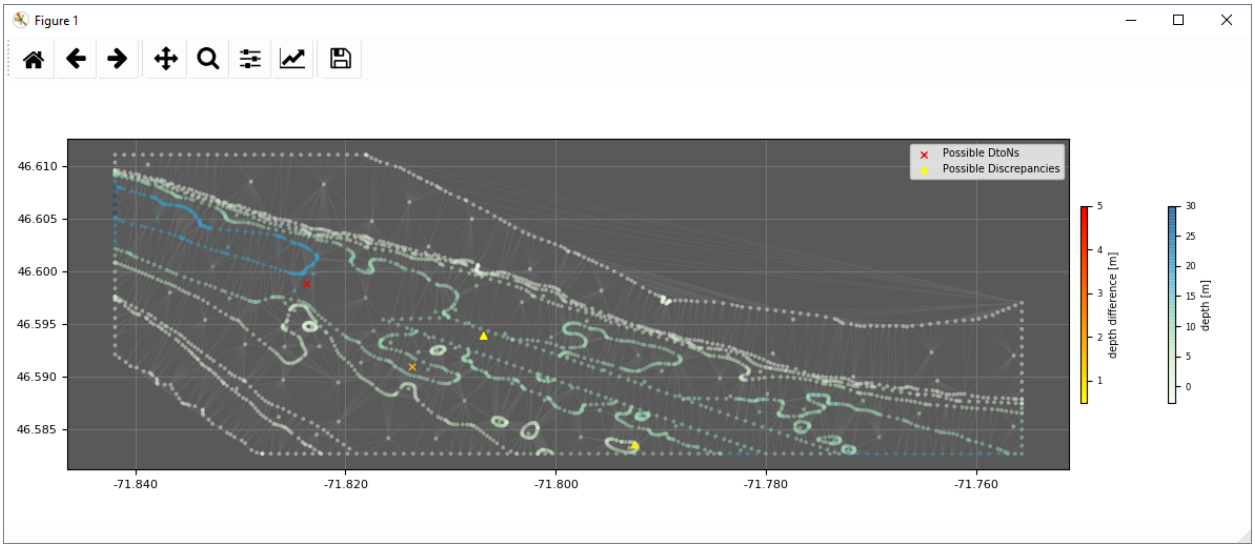


Fig. 2.6: Chart Comparison's output plot.

- If shapefile or kml output is selected, the TIN (triangulated irregular network) used by the algorithm is also generated.
- For easy sorting and identification of potential DTONs, the magnitude of the discrepancy against the chart is stored both as:
  - Blue notes (within the S57 attribute NINFOM).
  - Soundings (storing the discrepancy value as the depth coordinate).

Note: To visualize the NOAA S-57 features in CARIS software installs *NOAA S-57 Support Files for CARIS*.

How Does It Work?

A TIN is created from several features present in the input ENC:

- SOUNDG points.
- DEPCNT lines with valid VALDCO attribute.
- DRGARE polygons with valid DRVAL1 attribute.
- Point features with valid VALSOU attribute.
- COALNE and SLCONS lines.
- DEPARE polygons (only for ENC cell boundaries).

The input nodes are augmented by interpolating the linear feature based on the compilation scale (the length corresponding to 1cm at the compilation scale). The compilation scale is retrieved from the ENC unless the **Force Compilation Scale** checkbox is checked. If such a checkbox is checked, a valid scale denominator value is entered in the corresponding field).

The survey soundings are categorized, within the tilted triangles of the TIN, using the vertical distance.

The flags alert both for dangers to navigation (DtoNs) or chart discrepancies.

It is possible to customize the DtoN and discrepancy thresholds that are used by the algorithm to categorize the survey soundings.

In the example in Fig. 2.7, a 10.1-meter survey sounding is flagged (black circle) since it represents a DtoN candidate. In fact, it is at 5 meters of vertical distance from the underline tilted triangle (in magenta).

If a survey sounding is within a "flat" triangle, it is initially categorized as untested. Then, an attempt to its categorization is performed by looking at the underlining DEPARE (if available).

For more details, see Section 2.5.

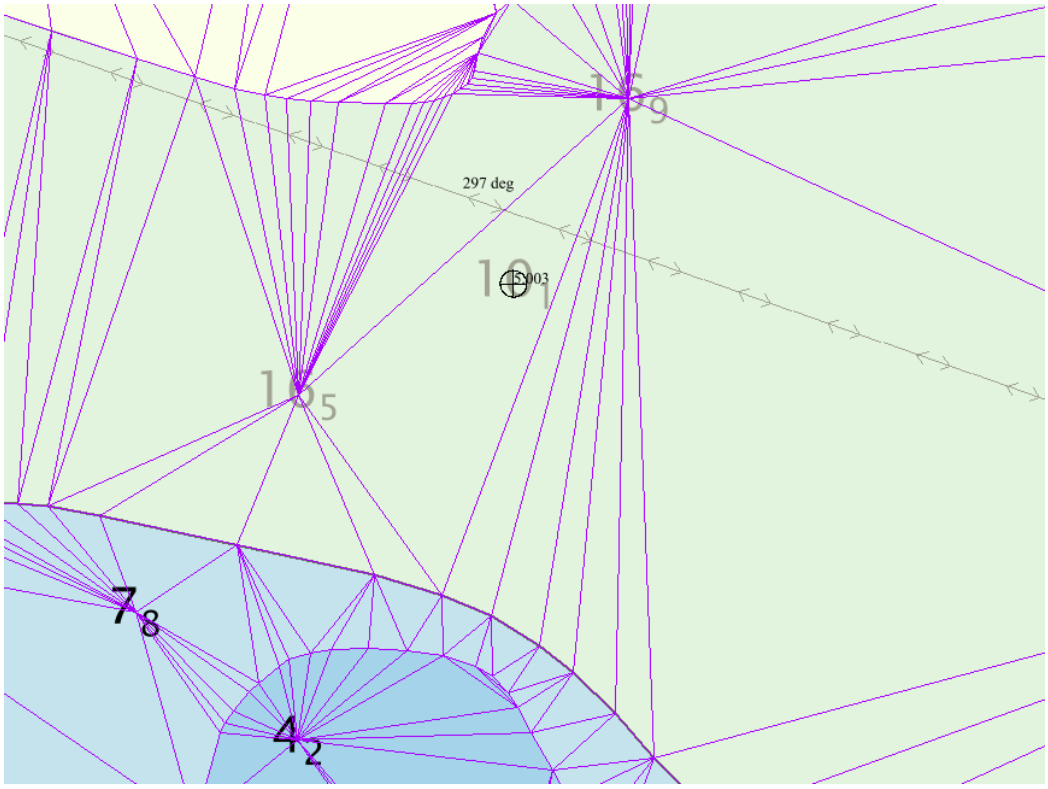
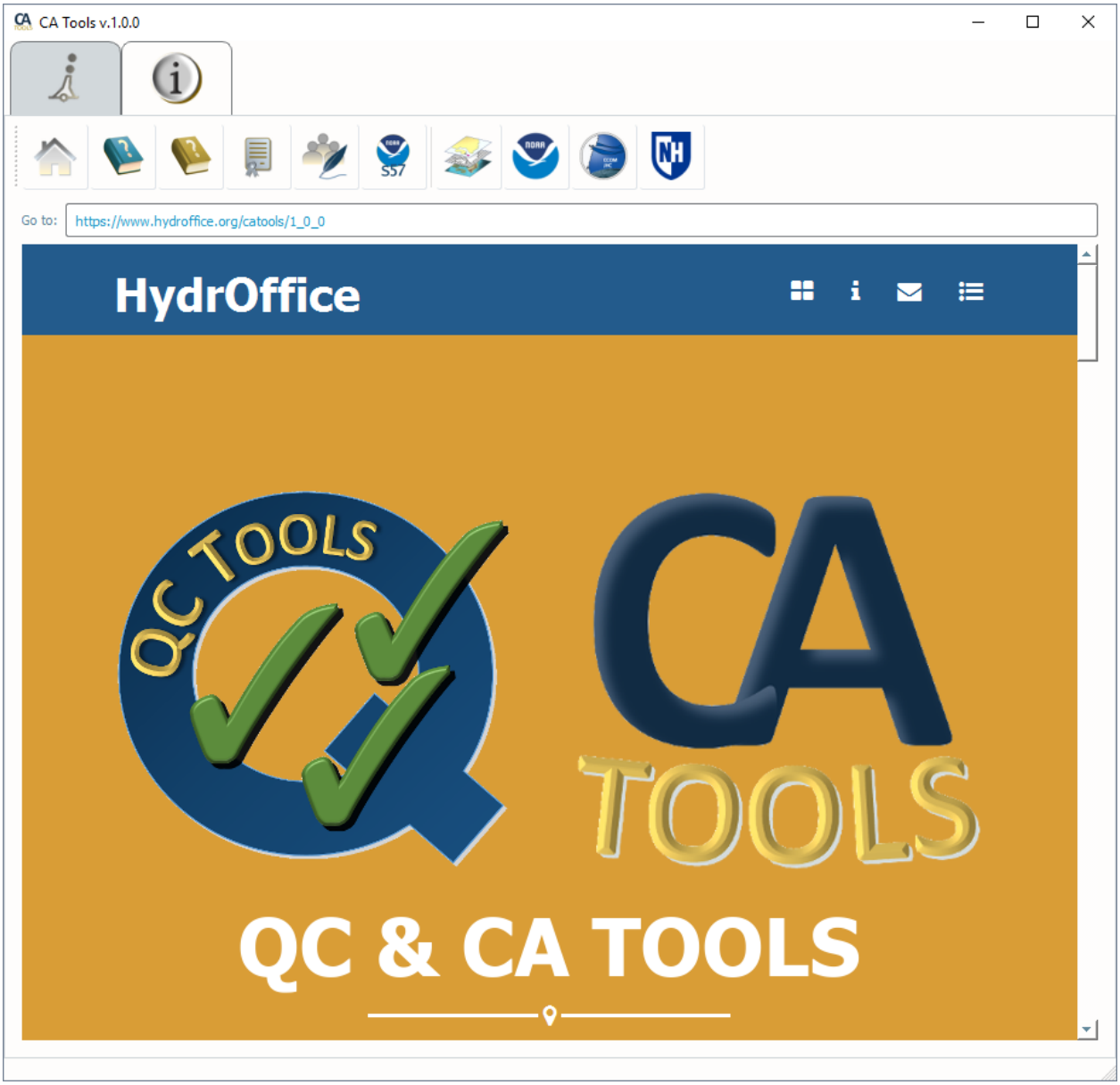


Fig. 2.7: Example of DtoN identification.

2.3 Info Tab

The Info Tab contains numerous helpful links and utilities:

- The HydrOffice Quality Control Tools website
- The Online User Manual
- The Offline User Manual (PDF)
- License Information
- QC Tools Change List
- Authors List
- NOAA S-57 Support Files for CARIS
- The HydrOffice Main Page
- The Center for Coastal and Ocean Mapping Main Page
- The University of New Hampshire Main Page

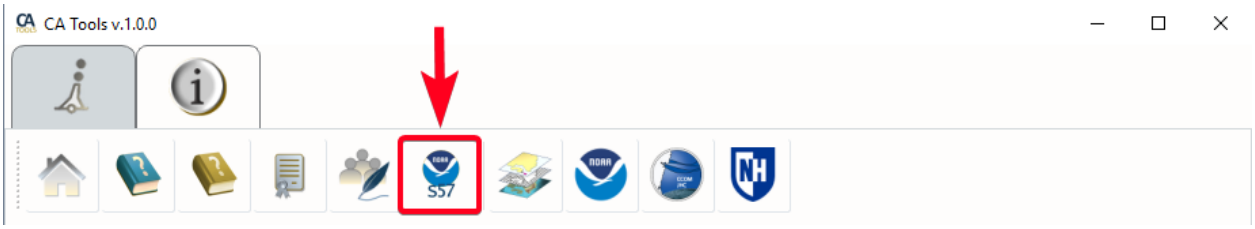


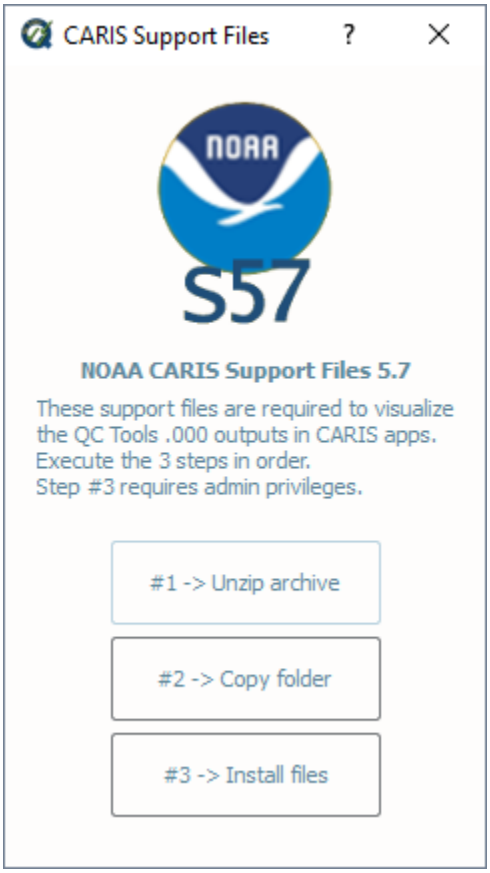
2.3.1 NOAA S-57 Support Files for CARIS

These allow for use of customized S-57 attributes in CARIS software and are required in order to visualize many of the CA Tools S-57 (.000) output.

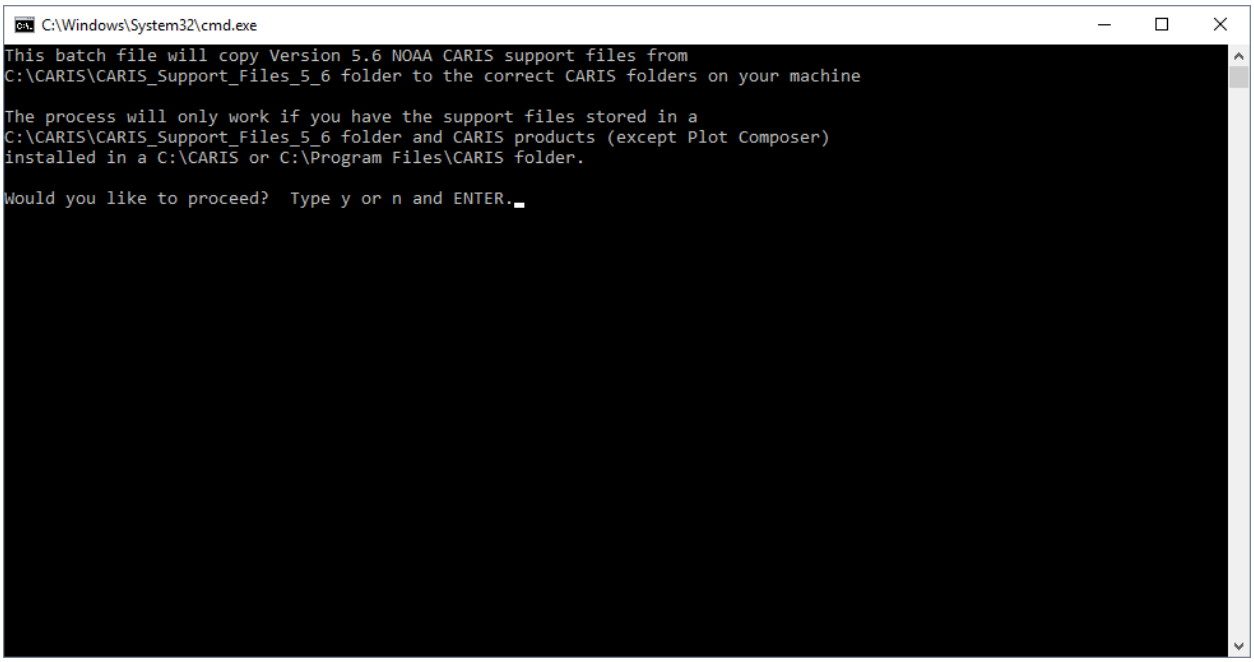
To install them, follow these instructions:

- Click the button on the Info Tab for the **NOAA CARIS Support Files**.





- Click the button to unzip the archive.
- Click the button to copy the folder. If the folder is already found, you will be prompted whether or not you wish to force a re-copy.
- Click the button to install the files. Note this step requires Administrator privileges.
- Follow the prompts in the Windows command to complete the installation.



2.4 Supported Formats

Format	Read	Write
Bathymetric Attributed Grid (.bag)	X	
Caris CSAR (.csar)	X	
S-57 (.000)	X	X
Shapefile (.shp)		X
KML (.kml)		X

2.5 List of references

- Masetti, G.; Faulkes, T.; Kastrisios, C. Automated Identification of Discrepancies between Nautical Charts and Survey Soundings. *ISPRS Int. J. Geo-Inf.* **2018**, 7, 392.

CHAPTER

THREE

DEVELOPER'S GUIDE

3.1 How to contribute

Every open source project lives from the generous help by contributors that sacrifice their time and this is no different.

To make participation as pleasant as possible, this project adheres to the Code of Conduct by the Python Software Foundation.

Here are a few hints and rules to get you started:

- Add yourself to the AUTHORS.txt file in an alphabetical fashion. Every contribution is valuable and shall be credited.
- If your change is noteworthy, add an entry to the changelog.
- No contribution is too small; please submit as many fixes for typos and grammar bloopers as you can!
- Don't *ever* break backward compatibility.
- *Always* add tests and docs for your code. This is a hard rule; patches with missing tests or documentation won't be merged. If a feature is not tested or documented, it does not exist.
- Obey PEP 8 and PEP 257.
- Write good commit messages.
- Ideally, collapse your commits, i.e. make your pull requests just one commit.

Note: If you have something great but aren't sure whether it adheres – or even can adhere – to the rules above: **please submit a pull request anyway**! In the best case, we can mold it into something, in the worst case the pull request gets politely closed. There's absolutely nothing to fear.

Thank you for considering to contribute! If you have any question or concerns, feel free to reach out to us (see *Credits*).

3.2 How to build the documentation

3.2.1 Requirements

The documentation is built using `sphinx`, so you neeed to have it:

- `pip install sphinx sphinx-autobuild`

3.2.2 First-time creation of documentation template

Just once for each project, you can create the documentation template as follows:

- `mkdir docs`
- `cd docs`
- `sphinx-quickstart`

3.2.3 Generate the documentation

To create the html:

- `make html`

To create the pdf, you first need to install a latex distribution, then:

- `make latexpdf`

CHAPTER

FOUR

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Version 3, 29 June 2007

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CHAPTER

FIVE

CREDITS

CA Tools is based on an ongoing joint development between the NOAA's Ocean of Coastal Survey and UNH's Center for Coastal and Ocean Mapping.

For bugs and feature requests: catools@hydroffice.org

Feel free to contact us for comments and suggestions:

- Giuseppe Masetti
- Tyanne Faulkes