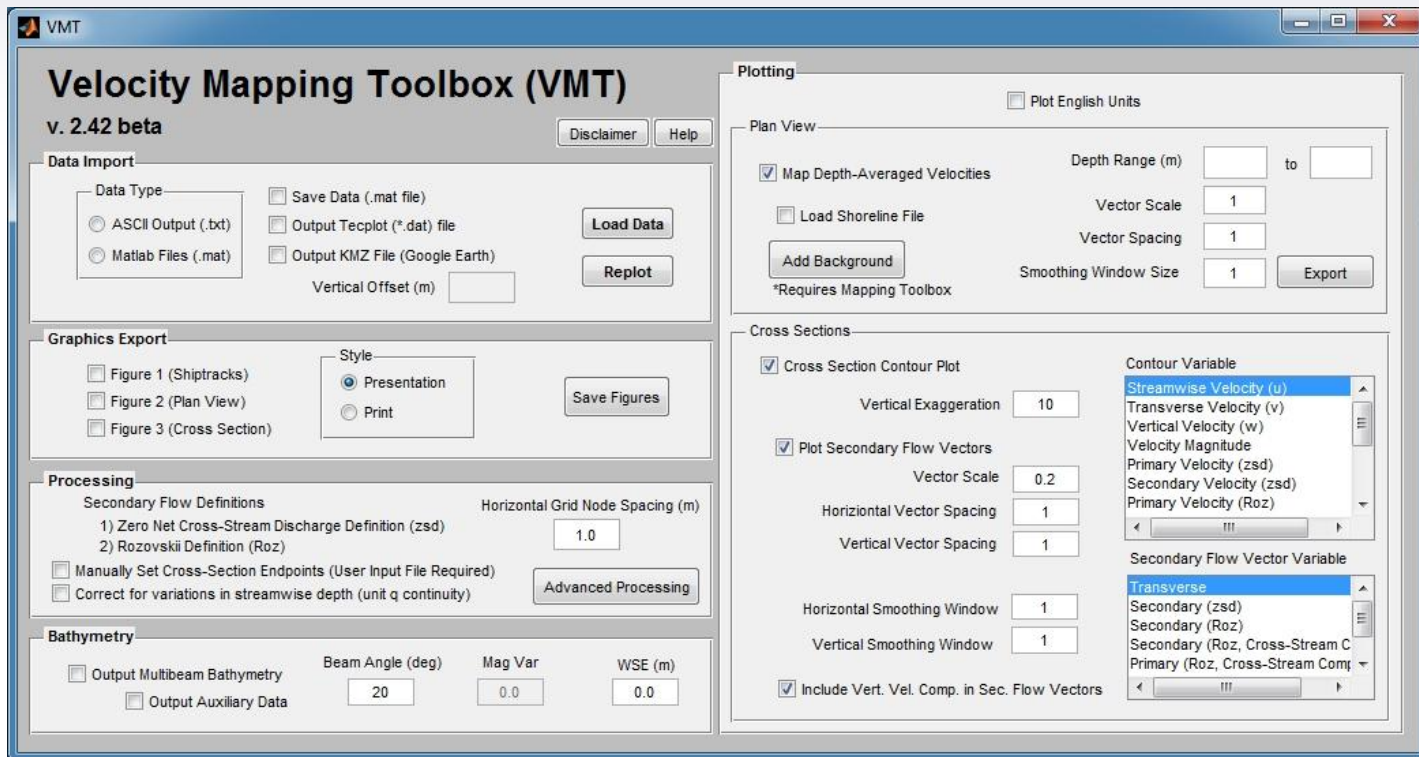
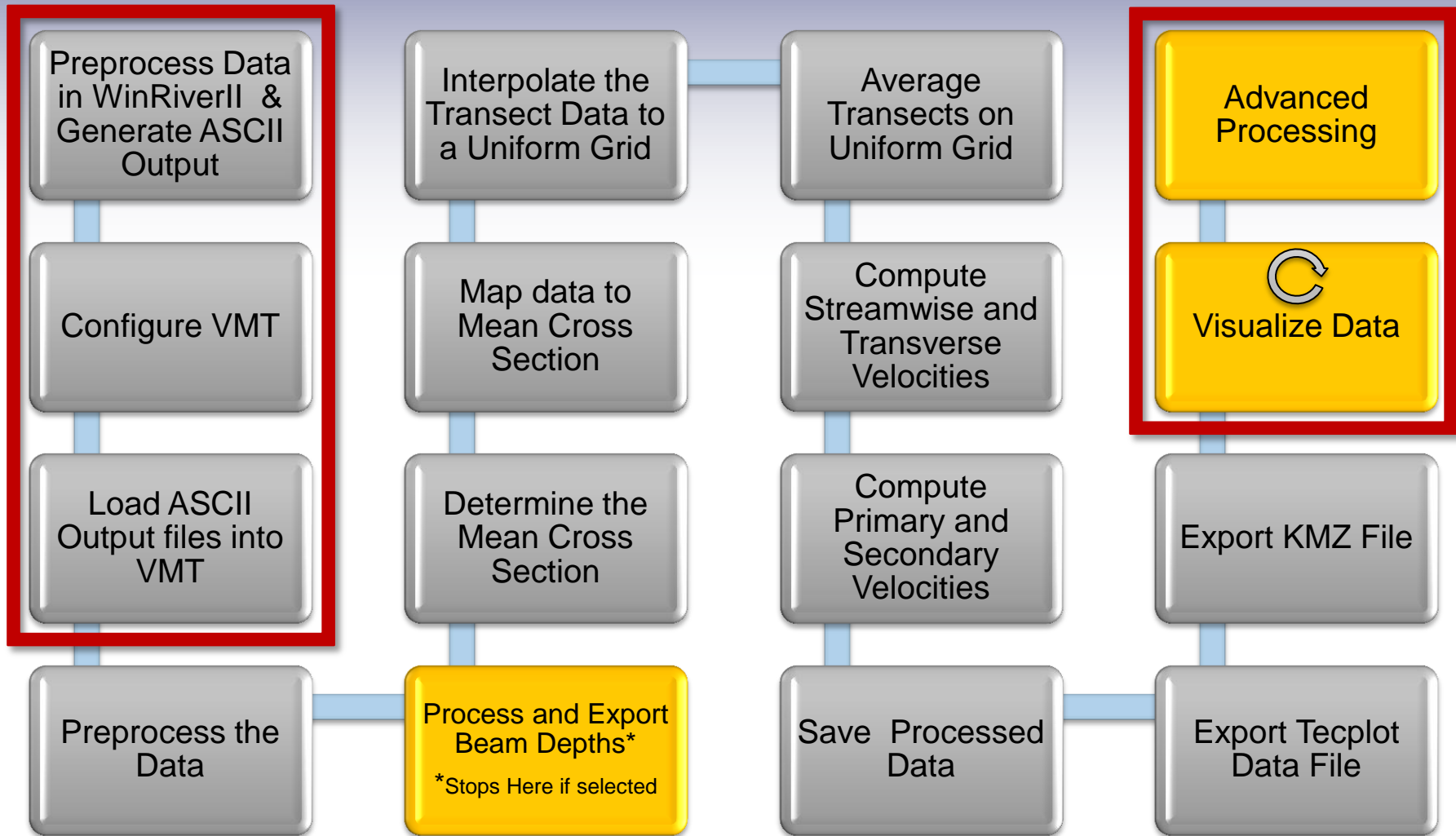


VMT Interface & Key Concepts



Overview of Data Processing



Preprocessing in WRII

Preprocess Data
in WinRiverII &
Generate ASCII
Output

- The user is responsible for QA/QC of their data in WRII prior to exporting ASCII Output files
- VMT currently does not include any major QA/QC routines (possible future addition)
- Pay particular attention to
 - Outliers
 - Near-shore velocity spikes
 - Missing data
 - GPS quality
 - Velocity reference

Preprocessing in WR11

Preprocess Data
in WinRiverII &
Generate ASCII
Output

Export ASCII Output files in **SI (metric)** units
with Backscatter data

VMT can plot in
English units, but
assumes all input
data is in SI units

```
SaintClair_0_000_ASC.TXT - Notepad
File Edit Format View Help
  25      25      31      96      1      9      1
8 7 22 9 20 35 18 683 1 3.00 0.00 0.970 5.320 21.410
-11.51 19.85 -1.00 3.00 0.00 142.00 0.00 12.08 2.55 2.92 2.73 2.73
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
43.00393655 -82.42191465 -32768 -32768 0.0 0.0 21.0 -0.0 17.0 0.93 2.18
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
96 cm BT db 0.43 0.319
0.93 77.95 187.31 -9.9 -77.3 -3.5 -9.7 83.3 85.5 83.8 82.9 100 2147483647
1.18 54.11 158.28 20.0 -50.3 -9.3 -14.6 85.0 85.0 85.9 83.7 100 2147483647
1.43 47.41 183.99 -3.3 -47.3 -7.1 3.6 86.2 88.8 87.0 86.2 100 2147483647
1.68 69.18 194.97 -17.9 -66.8 -5.3 5.6 86.6 87.9 87.9 82.3 100 2147483647
1.93 61.44 217.15 -37.1 -49.0 -3.2 2.4 87.6 88.5 88.1 84.2 100 2147483647
2.18 53.01 186.51 -6.0 -52.7 3.7 3.5 86.3 91.5 87.2 85.9 100 2147483647
2.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
2.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
2.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
3.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
3.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
3.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
3.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
4.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
4.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
4.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
4.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
5.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
5.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
5.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
5.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
6.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
6.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
6.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
6.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
7.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
7.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
7.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
7.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
8.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
8.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
8.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
8.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
9.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
9.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
9.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
9.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
10.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
10.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
10.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
10.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
11.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
11.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
11.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
11.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
12.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
12.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
12.68 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
12.93 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
13.18 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
13.43 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647
```

ASCII Output

Preprocess Data
in WinRiverII &
Generate ASCII
Output

First two rows are notes

Palmer Rapid

WS WF Draft WN WP TPE WM

25 25 13 32 1 20 1

Yymmddhhmmssss en #en Picth Roll Heading TW

1 11 16 12 29 53 69 125 1 0.720 0.770 300.550 7.090

Ew ns ud BTerr dpth Elv Delv Hdop/#Sat D1 D2 D3 D4

0.29 5.40 -0.20 0.00 0.00 275.67 0.00 12.06 1.41 1.63 1.54 1.41

TEDist TETime TDTravelN TDTravelE TDMadeGood

0.00 0.00 0.00 0.00 0.00

Latitude Longitude NavBTew NavBTns TDT_en

45.3274678 -77.5151289 -1.50 -17.40 0.0

Qmiddle Qtop Qbottom QStShore DistStShore QEndShore DistEndShore EndDTL StDBL

0.0 0.0 0.0 0.0 10.0 0.0 3.8 0.68 0.93

#B unit ref int scl absr

18 cm BT dB 0.45 0.511

BDpth Velmag Veldir Velew Velns Vud Verr [Backscatter 1 2 3 4] %Good Qm^3

0.68 86.50 163.82 24.1 -83.1 3.6 -28.8 66.4 66.9 63.7 66.4 100 0.00

0.93 118.65 136.85 81.1 -86.6 3.5 -24.1 72.6 70.8 66.7 80.8 100 0.00

1.18 -32768 -32768 -32768 -32768 -32768 -32768 102.4 83.8 74.7 104.2 0 2147483647

1.43 -32768 -32768 -32768 -32768 -32768 -32768 255 115.8 255 255 0 2147483647

1.68 -32768 -32768 -32768 -32768 -32768 -32768 255 255 255 255 0 2147483647

Configure VMT Settings

Configure VMT

Velocity Mapping Toolbox (VMT)
v. 2.42 beta

Disclaimer Help

Data Import

Data Type: ASCII Output (.txt) Matlab Files (.mat)

Save Data (.mat file) Output Tecplot (*.dat) file Output KMZ File (Google Earth)

Vertical Offset (m)

Load Data Replot

Graphics Export

Figure 1 (Shiptracks) Figure 2 (Plan View) Figure 3 (Cross Section)

Style: Presentation Print

Save Figures

Processing

Secondary Flow Definitions: 1) Zero Net Cross-Stream Discharge Definition (zsd) 2) Rozovskii Definition (Roz)

Horizontal Grid Node Spacing (m)

Manually Set Cross-Section Endpoints (User Input File Required) Correct for variations in streamwise depth (unit q continuity)

Advanced Processing

Bathymetry

Output Multibeam Bathymetry Output Auxiliary Data

Beam Angle (deg) Mag Var WSE (m)

Plotting

Plot English Units

Plan View

Map Depth-Averaged Velocities Depth Range (m) to

Load Shoreline File

Vector Scale Vector Spacing Smoothing Window Size Export

Add Background *Requires Mapping Toolbox

Cross Sections

Cross Section Contour Plot

Vertical Exaggeration

Plot Secondary Flow Vectors

Vector Scale Horizontal Vector Spacing Vertical Vector Spacing

Horizontal Smoothing Window Vertical Smoothing Window

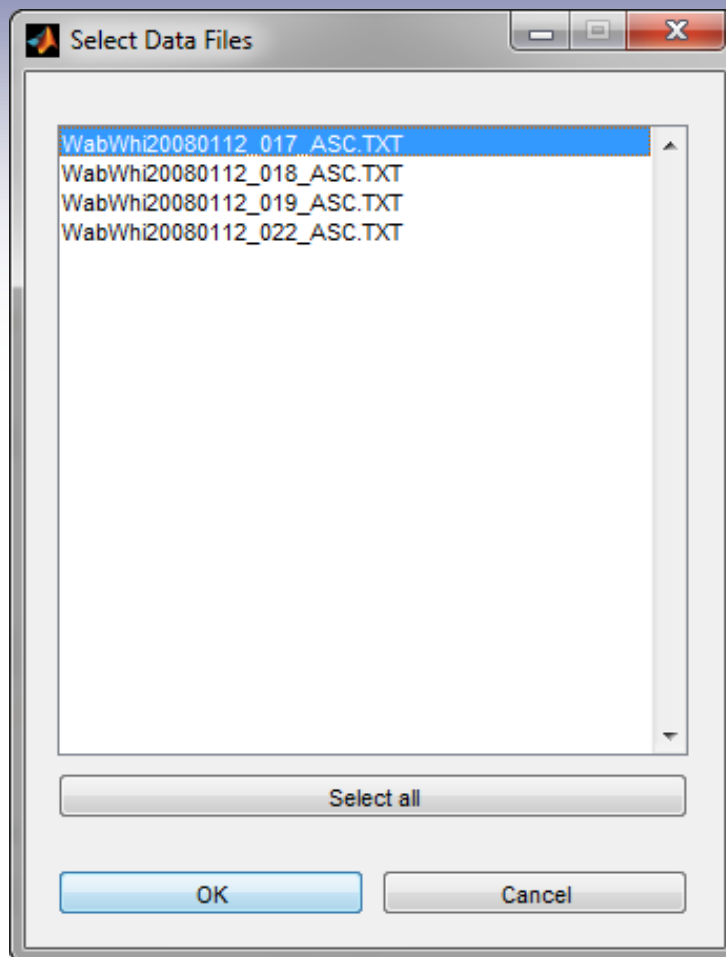
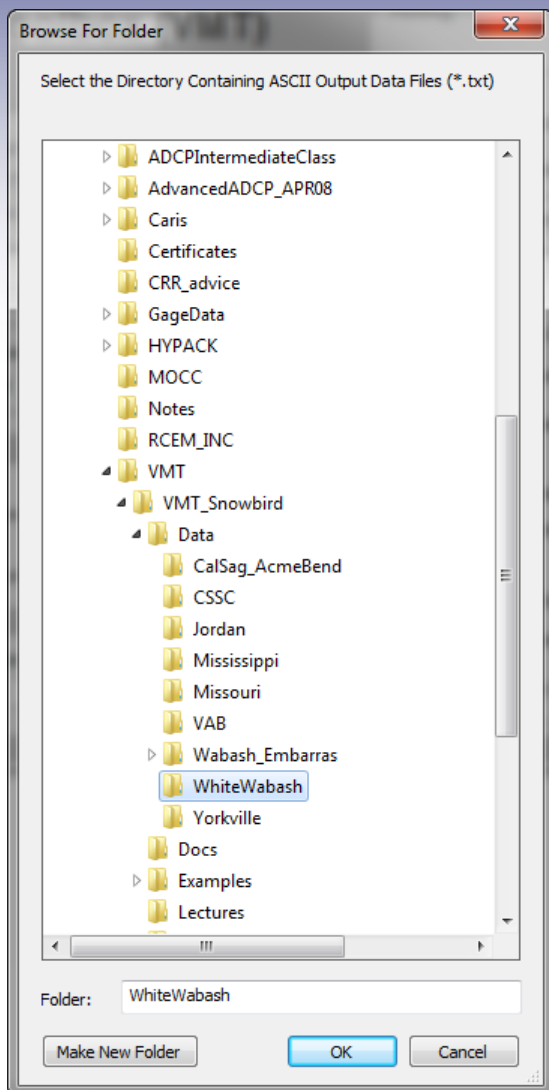
Include Vert. Vel. Comp. in Sec. Flow Vectors

Contour Variable: Streamwise Velocity (u), Transverse Velocity (v), Vertical Velocity (w), Velocity Magnitude, Primary Velocity (zsd), Secondary Velocity (zsd), Primary Velocity (Roz)

Secondary Flow Vector Variable: Transverse, Secondary (zsd), Secondary (Roz), Secondary (Roz, Cross-Stream C), Primary (Roz, Cross-Stream Com)

Load ASCII Data

Load ASCII
Output files into
VMT



VMT will group and average the selected transects
(unless exporting bathymetry)

VMT Preprocessing

Preprocess the
Data

- Omit missing or bad velocity data
(ASCII value = -32768)
- Filter out bad backscatter data
(ASCII value = 255)
- Replace bad GPS with bottom track data
 - Missing GPS data is replaced with BT using last known position
 - Errors in moving bed conditions—Be Careful

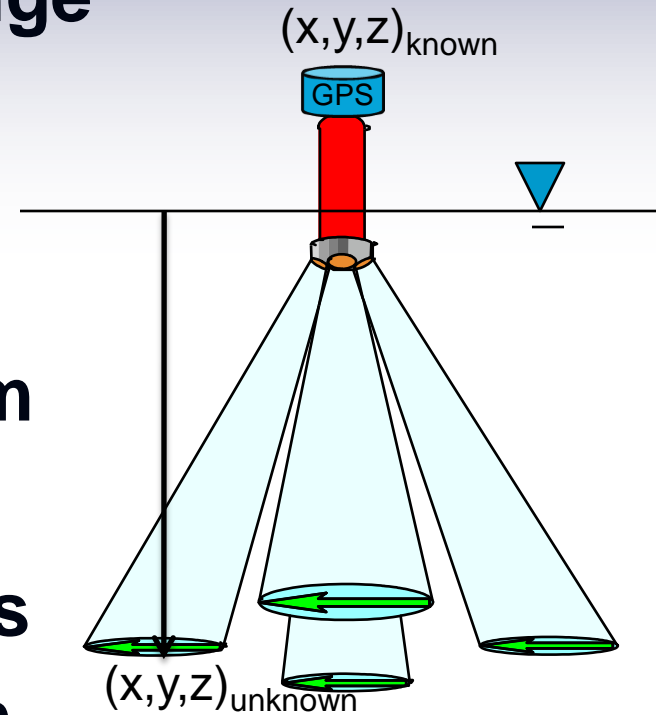
Future addition: QA/QC data

Beam Depth Computations

Process and Export
Beam Depths*

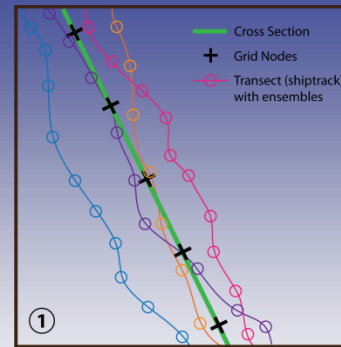
*Stops Here if selected

- Convert back to raw slant range
 - Remove draft from depth
 - Divide by $\cos(\text{beam angle})$
- Apply pitch, roll, heading
- Compute x, y, z for each beam
- Account for draft
- Translate to earth coordinates
- Apply water surface elevation (WSE)
- See enclosed paper from Gary Murdock

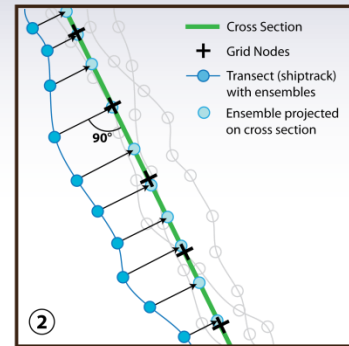


Averaging Multiple Transects

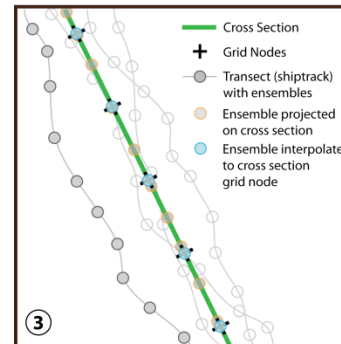
- Data mapped to a mean, linear cross section (required for secondary flow computations)
- If data along a curvilinear path is required, use ASCII2GIS utility



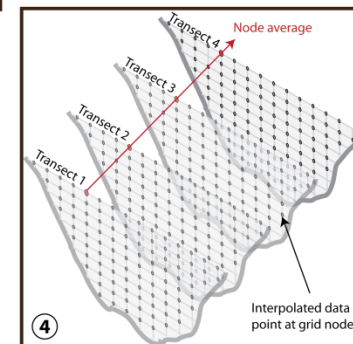
Step 2. Project transect data to the cross section plane using an orthogonal translation



Step 3. Interpolate projected data to the cross section grid for each transect (no interpolation in vertical is required when using a vertical grid defined by the bin size)



Step 4. Compute arithmetic average of all transects at each grid node for basic variables (e.g. velocity components)



Step 1. Define the average cross section orientation and grid

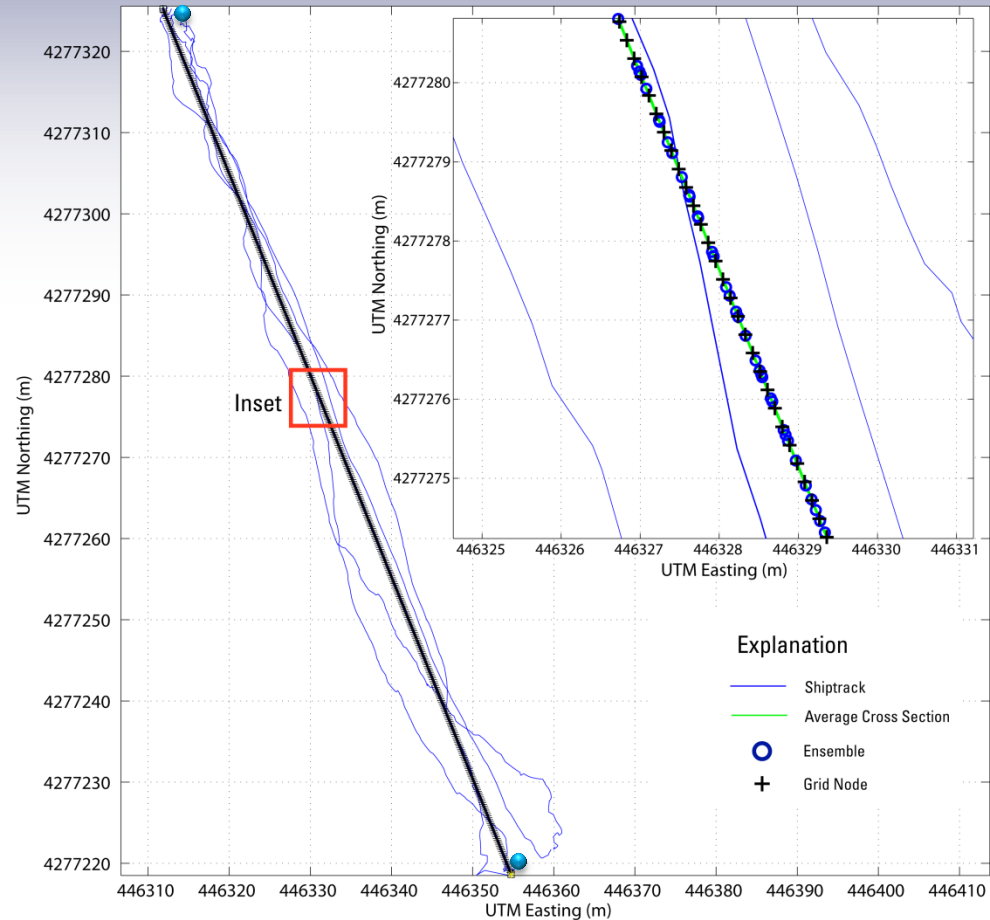
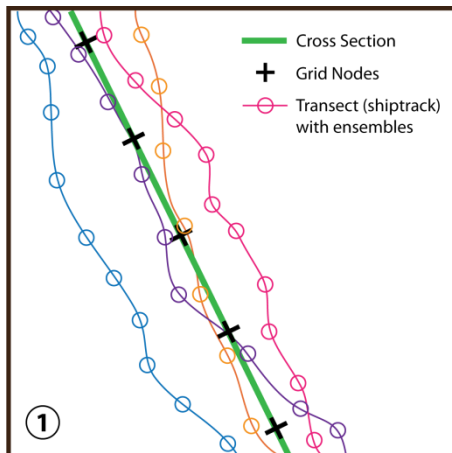
Options:

1. Least-squares fit of data cloud
2. User-defined end points

Mean Cross Section

Determine the Mean Cross Section

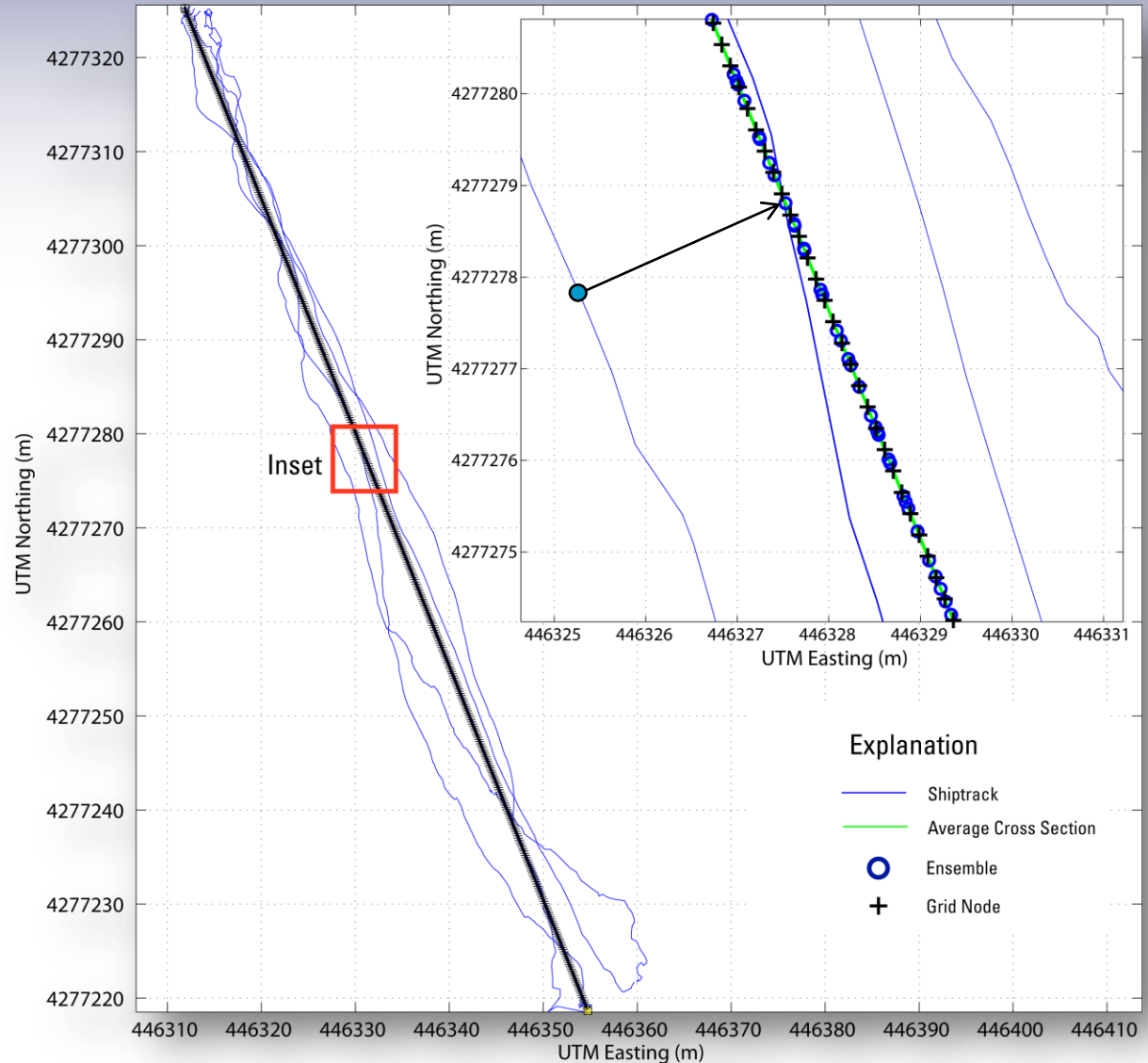
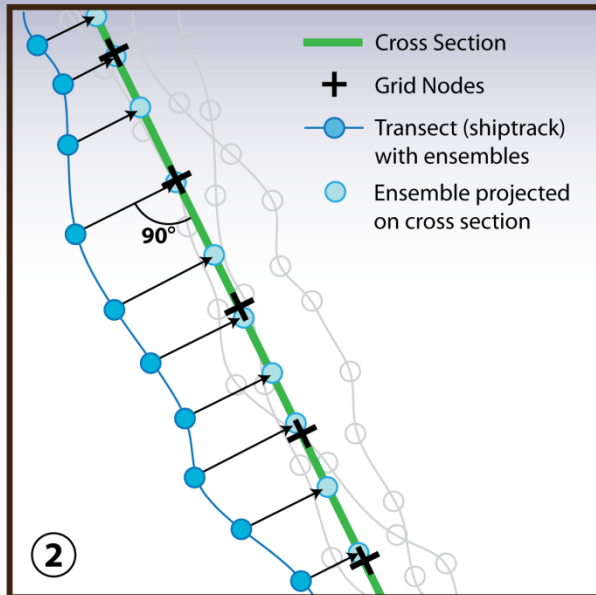
- Fits a line to all GPS points
- User can override with endpoint file



Manually Set Cross-Section Endpoints (User Input File Required)

Project Data to Mean XS

Map data to Mean Cross Section



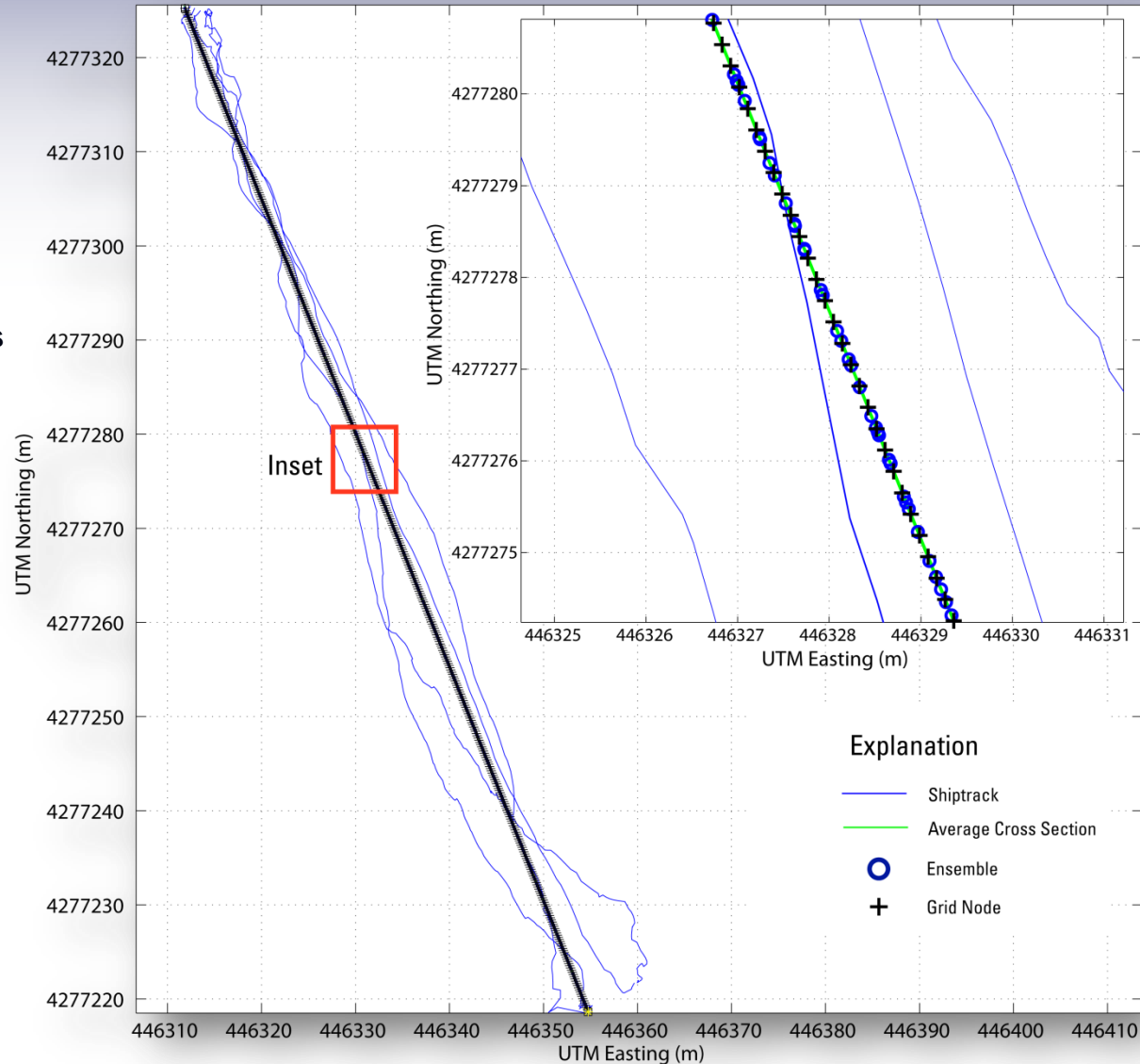
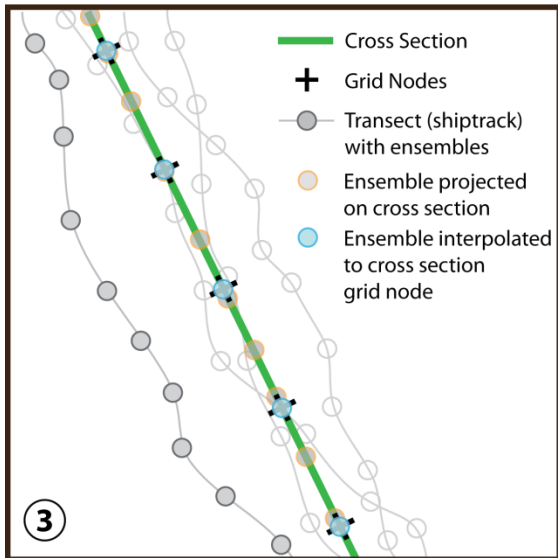
Interpolate to Uniform Grid

Interpolate the
Transect Data to
a Uniform Grid

Horizontal Grid Node Spacing (m)
1.0

Interpolates data to user
specified grid

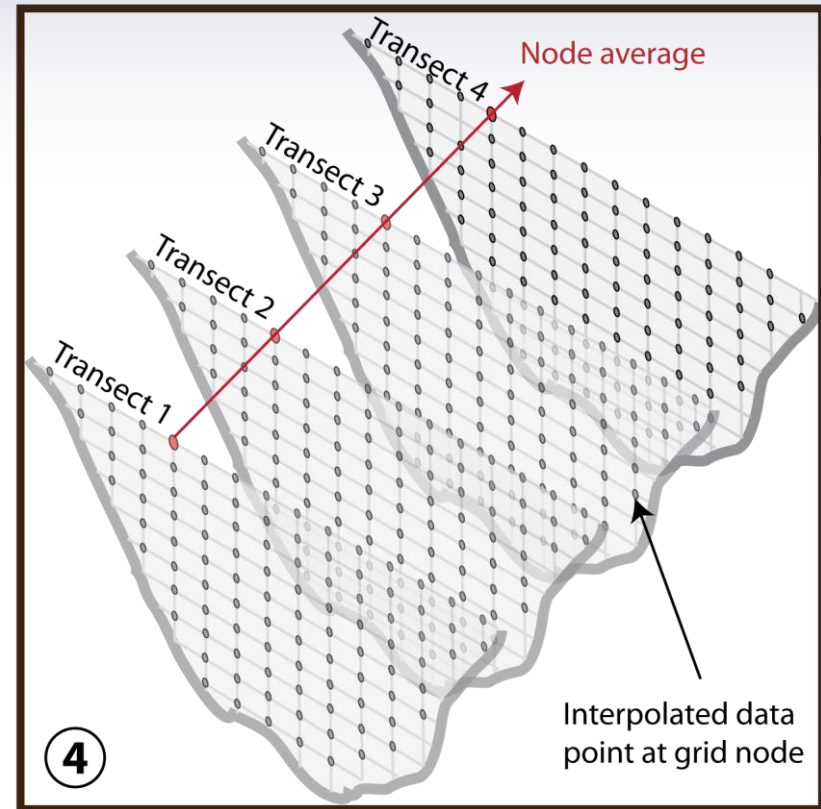
X grid node spacing user defined
Z grid node spacing set by ADCP bins



Average Multiple Transects

Average
Transects on
Uniform Grid

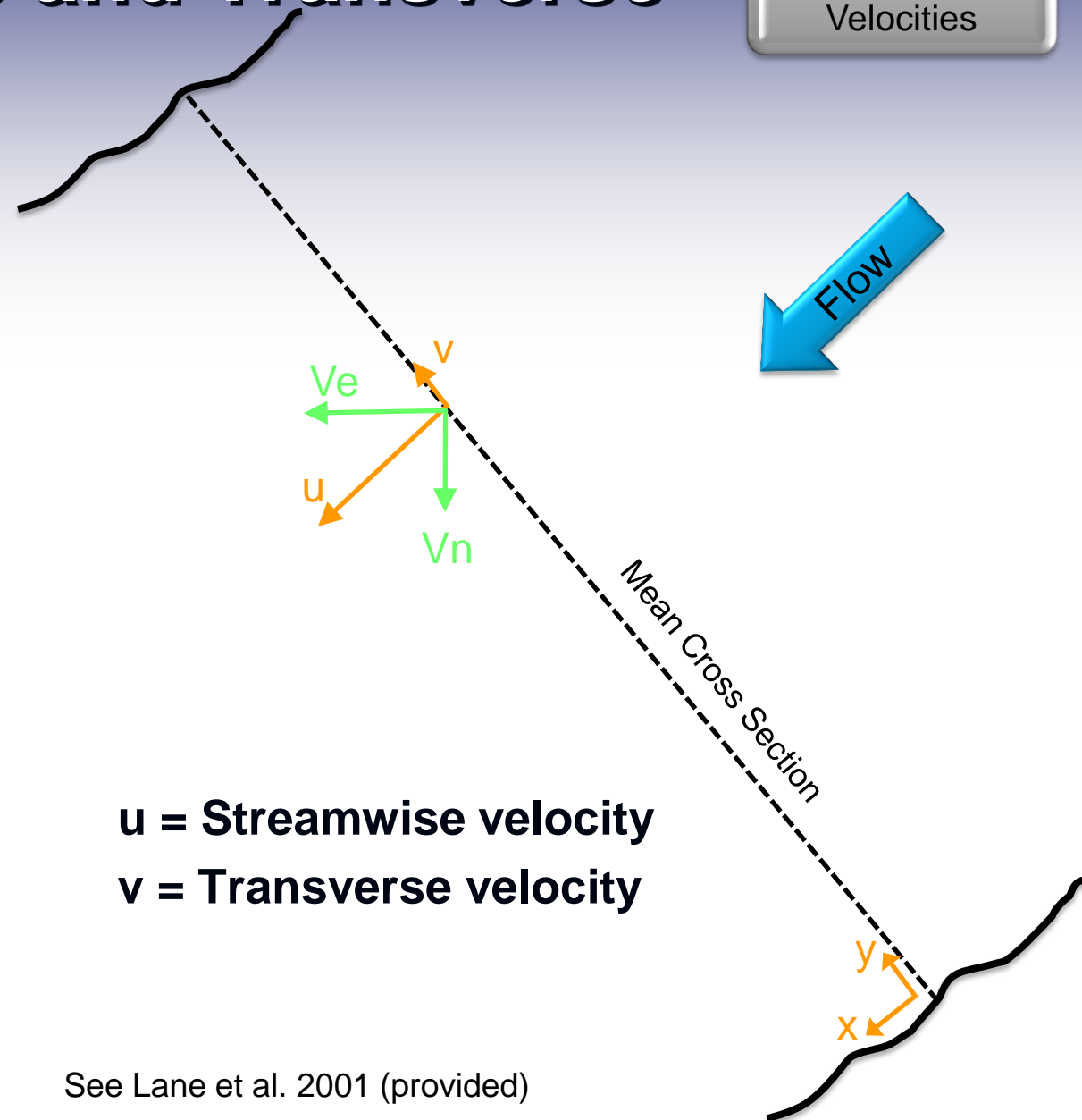
- Averages basic variables at each node
 - Velocity Components (East, North, Vertical)
 - Backscatter & Depth
 - Velocity magnitude & direction are recomputed from averaged components



Compute Streamwise and Transverse Velocities

Streamwise and Transverse

- Streamwise defined perpendicular to mean cross section
- Transverse is parallel to mean cross section



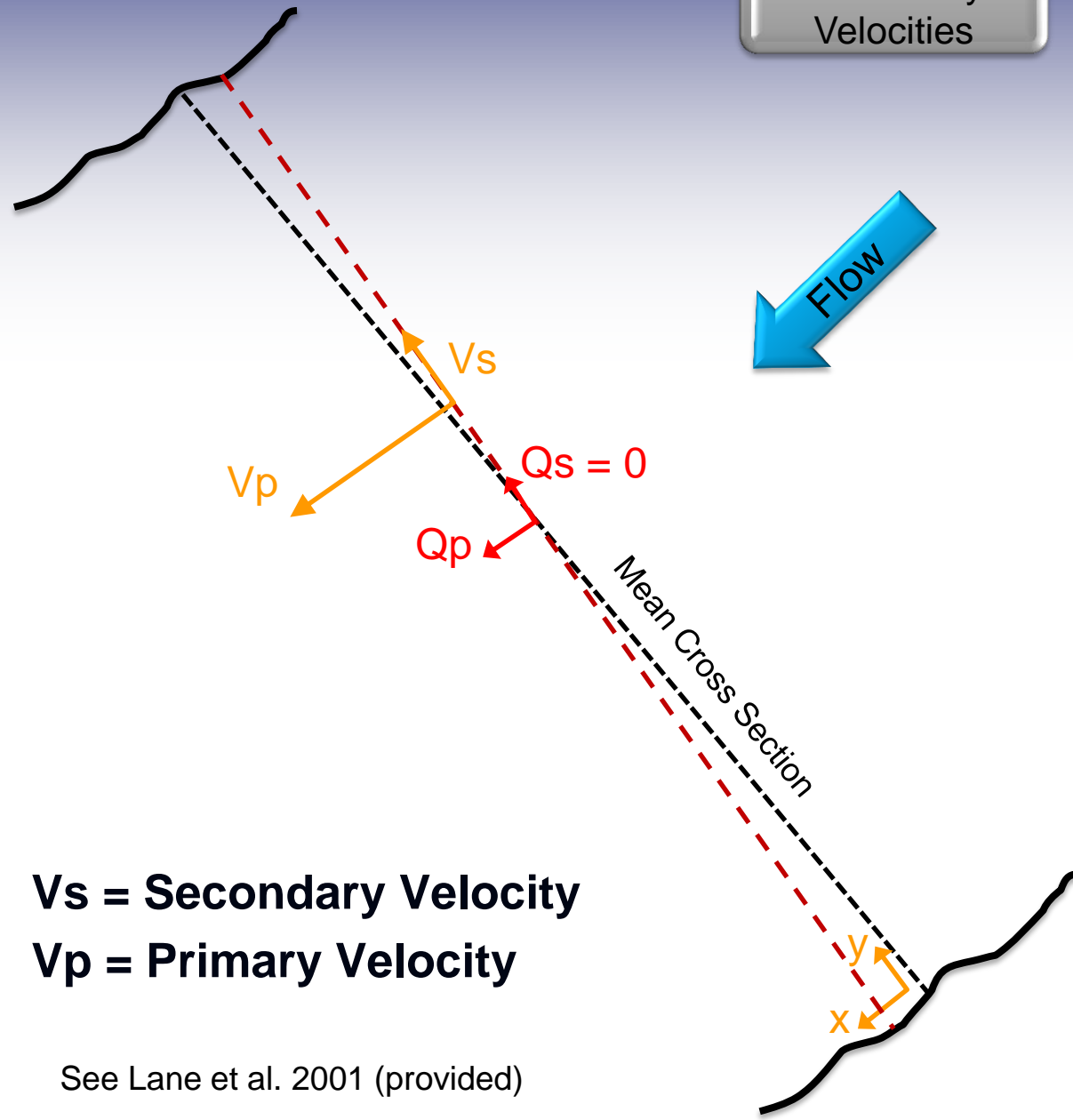
u = Streamwise velocity
 v = Transverse velocity

Primary and Secondary (ZSD)

Compute
Primary and
Secondary
Velocities

Zero Net Cross Stream Discharge Definition (ZSD)

- No net secondary discharge for entire cross section
- Finds components of velocity perpendicular (V_p) and parallel (V_s) to rotated cross section
- Better for bends (in general)



V_s = Secondary Velocity
 V_p = Primary Velocity

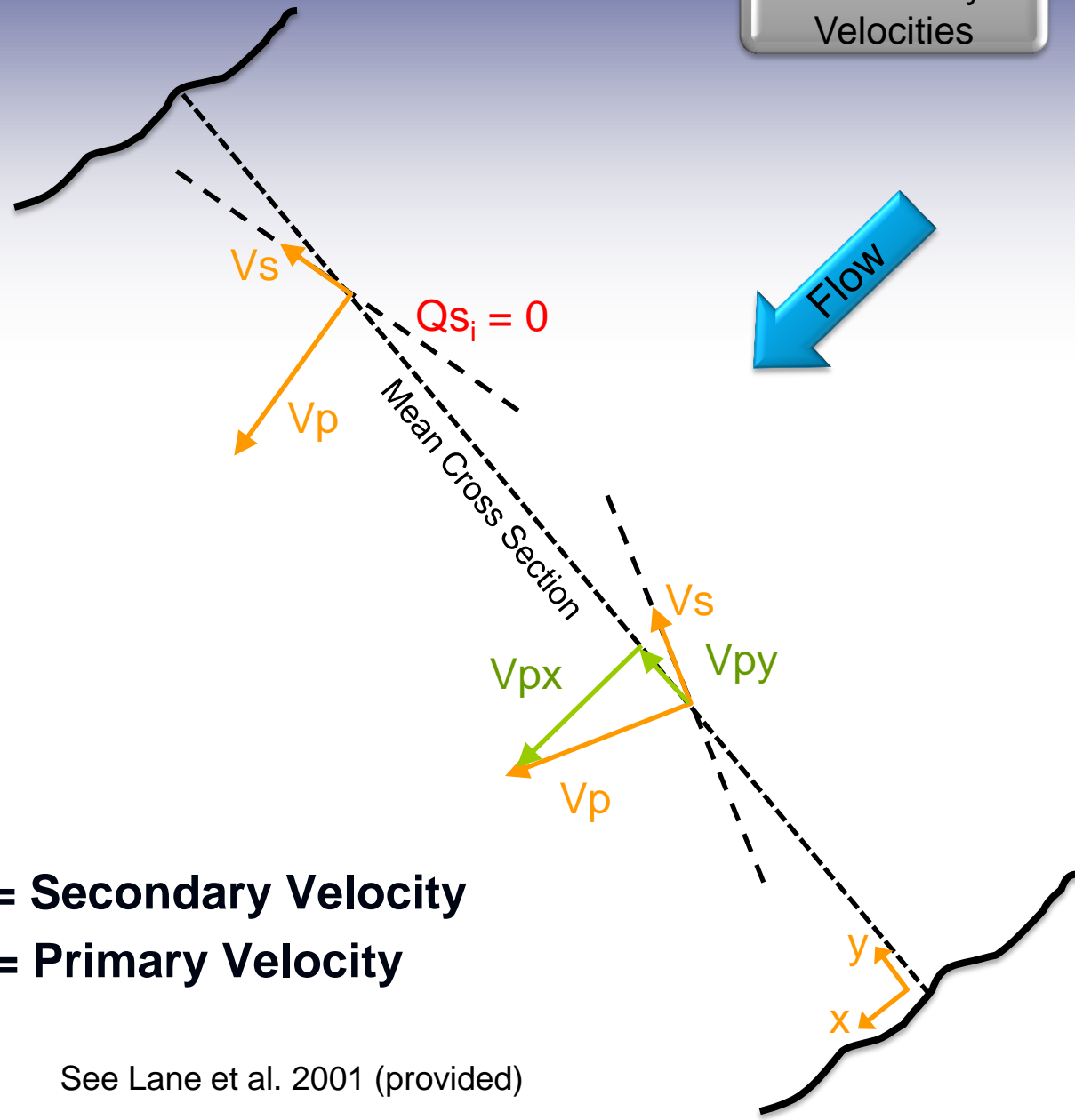
See Lane et al. 2001 (provided)

Primary and Secondary (ROZ)

Compute
Primary and
Secondary
Velocities

Rozovskii Definition (ROZ)

- No net secondary discharge for each profile (ensemble)
- V_s and V_p differ for each ensemble
- Recompute X and Y components of V_p and V_s
- Generally better for confluences and bifurcations

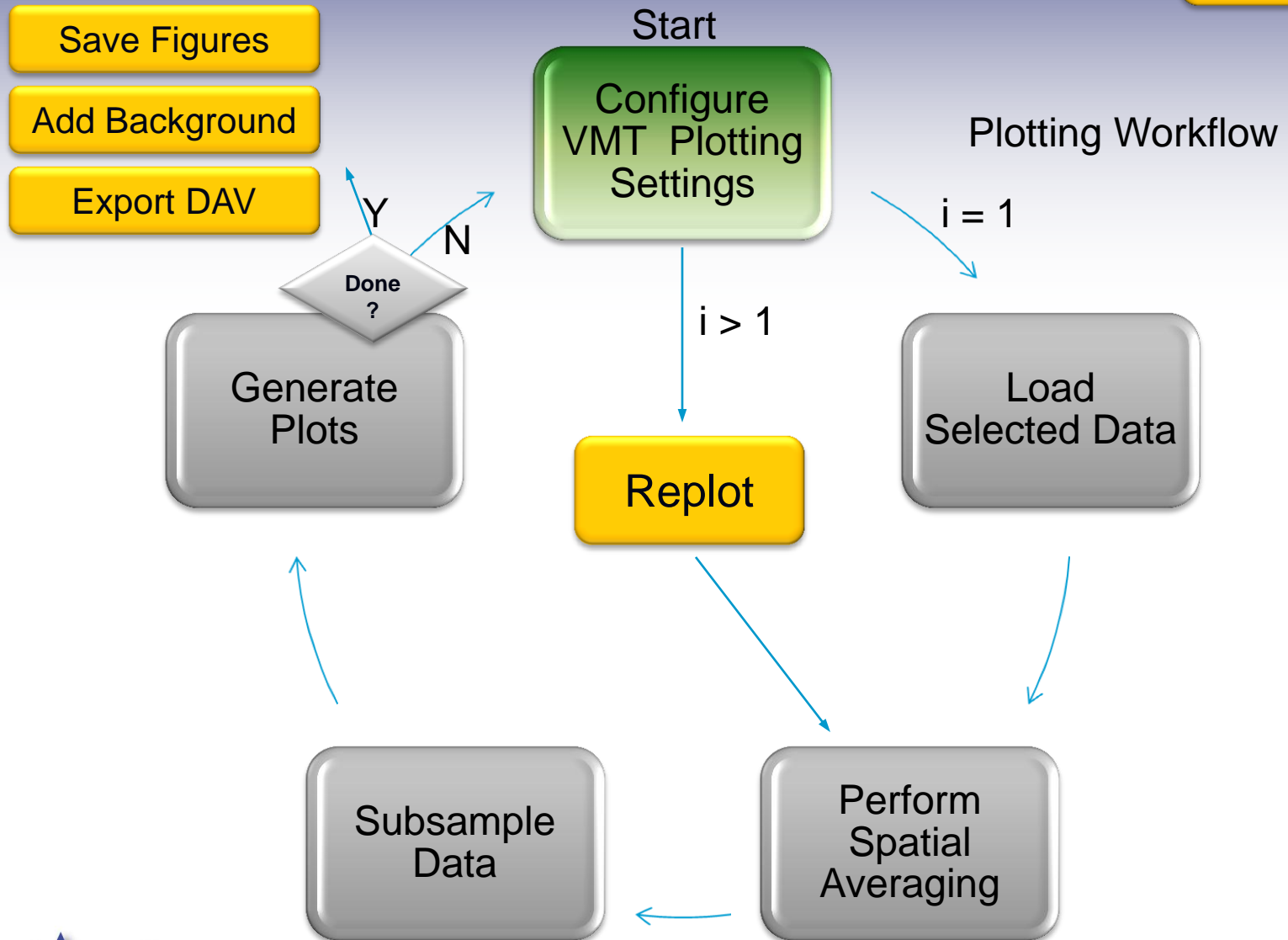


V_s = Secondary Velocity
 V_p = Primary Velocity

See Lane et al. 2001 (provided)

Data Visualization

Visualize Data



Plotting Interface

Configure
VMT Plotting
Settings

The screenshot displays the Velocity Mapping Toolbox (VMT) software interface, version 2.42 beta. The interface is divided into several sections: Data Import, Graphics Export, Processing, Bathymetry, and Plotting. The Plotting section is currently active and shows settings for Plan View and Cross Sections.

Velocity Mapping Toolbox (VMT) v. 2.42 beta

Data Import

- Data Type: ASCII Output (.txt) Matlab Files (.mat)
- Save Data (.mat file)
- Output Tecplot (*.dat) file
- Output KMZ File (Google Earth)
- Vertical Offset (m):
- Buttons: Load Data, Replot

Graphics Export

- Figure 1 (Shiptracks)
- Figure 2 (Plan View)
- Figure 3 (Cross Section)
- Style: Presentation Print
- Button: Save Figures

Processing

- Secondary Flow Definitions: 1) Zero Net Cross-Stream Discharge Definition (zsd) 2) Rozovskii Definition (Roz)
- Horizontal Grid Node Spacing (m):
- Manually Set Cross-Section Endpoints (User Input File Required)
- Correct for variations in streamwise depth (unit q continuity)
- Button: Advanced Processing

Bathymetry

- Output Multibeam Bathymetry
- Output Auxiliary Data
- Beam Angle (deg):
- Mag Var:
- WSE (m):

Plotting

- Plot English Units
- Plan View**
 - Map Depth-Averaged Velocities
 - Depth Range (m): to
 - Load Shoreline File
 - Vector Scale:
 - Vector Spacing:
 - Smoothing Window Size:
 - Buttons: Add Background, Export
 - *Requires Mapping Toolbox
- Cross Sections**
 - Cross Section Contour Plot
 - Vertical Exaggeration:
 - Plot Secondary Flow Vectors
 - Vector Scale:
 - Horizontal Vector Spacing:
 - Vertical Vector Spacing:
 - Horizontal Smoothing Window:
 - Vertical Smoothing Window:
 - Include Vert. Vel. Comp. in Sec. Flow Vectors
- Contour Variable**
 - Streamwise Velocity (u)
 - Transverse Velocity (v)
 - Vertical Velocity (w)
 - Velocity Magnitude
 - Primary Velocity (zsd)
 - Secondary Velocity (zsd)
 - Primary Velocity (Roz)
- Secondary Flow Vector Variable**
 - Transverse
 - Secondary (zsd)
 - Secondary (Roz)
 - Secondary (Roz, Cross-Stream C)
 - Primary (Roz, Cross-Stream Com)

Configure VMT Plotting

Configure
VMT

- Plan view data can plot depth- or layer-averaged velocities

$$V_{LA} = \frac{1}{d_2 - d_1} \int_{d_1}^{d_2} V dz$$

- Contour variables & secondary flow variables from listboxes
- Can choose to include vertical velocity component in vectors
- Can plot in English units

Plotting

Plot English Units

Plan View

Map Depth-Averaged Velocities

Depth Range (m) to

Load Shoreline File

Vector Scale

Vector Spacing

Smoothing Window Size

*Requires Mapping Toolbox

Cross Sections

Cross Section Contour Plot

Vertical Exaggeration

Plot Secondary Flow Vectors

Vector Scale

Horizontal Vector Spacing

Vertical Vector Spacing

Horizontal Smoothing Window

Vertical Smoothing Window

Include Vert. Vel. Comp. in Sec. Flow Vectors

Contour Variable

- Streamwise Velocity (u)
- Transverse Velocity (v)
- Vertical Velocity (w)
- Velocity Magnitude
- Primary Velocity (zsd)
- Secondary Velocity (zsd)
- Primary Velocity (Roz)

Secondary Flow Vector Variable

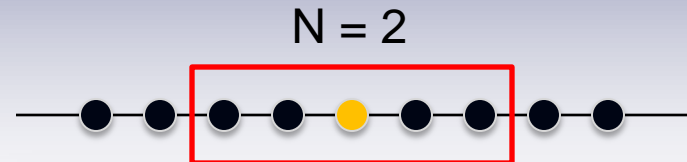
- Transverse
- Secondary (zsd)
- Secondary (Roz)
- Secondary (Roz, Cross-Stream C
- Primary (Roz, Cross-Stream Comp

Spatial Averaging

Perform
Spatial
Averaging

■ Plan View

- 1-D Moving average
- Window size
 $2*N + 1$
- Ignores missing data



Plan View

Map Depth-Averaged Velocities Depth Range (m) to

Plot Shoreline Vector Scale

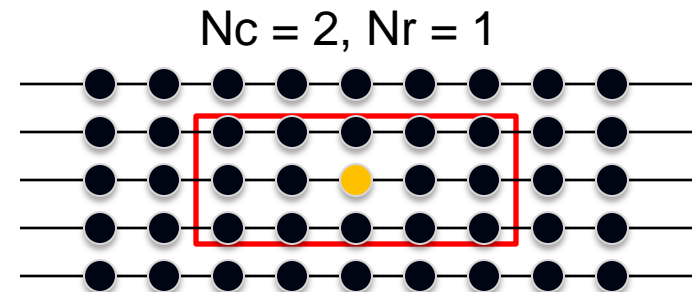
Vector Spacing

 Smoothing Window Size N

*Requires Mapping Toolbox

■ 2-D contour plots

- 2-D moving average
- Window Size
 $(2*N_r+1)$ -by- $(2*N_c+1)$
- Ignores missing data



Horizontal Smoothing Window N_c

Vertical Smoothing Window N_r

Units = HGNS & Bin Size

Subsample for Plotting

Subsample
Data

- Use to improve clarity of plots
- Subsampling done after spatial averaging
- User-defined grid node spacing is $HVS = 1$ (i.e. plot all nodes)



Plan View

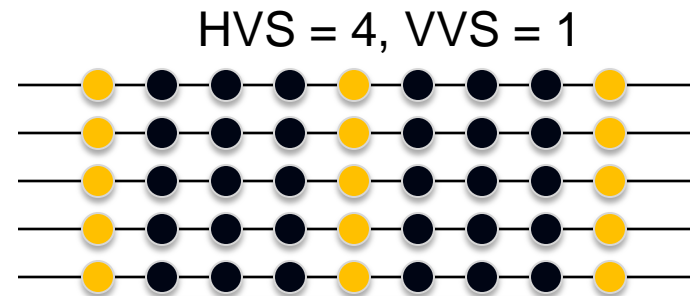
Map Depth-Averaged Velocities Depth Range (m) to

Plot Shoreline Vector Scale

 Vector Spacing VS

Smoothing Window Size

*Requires Mapping Toolbox



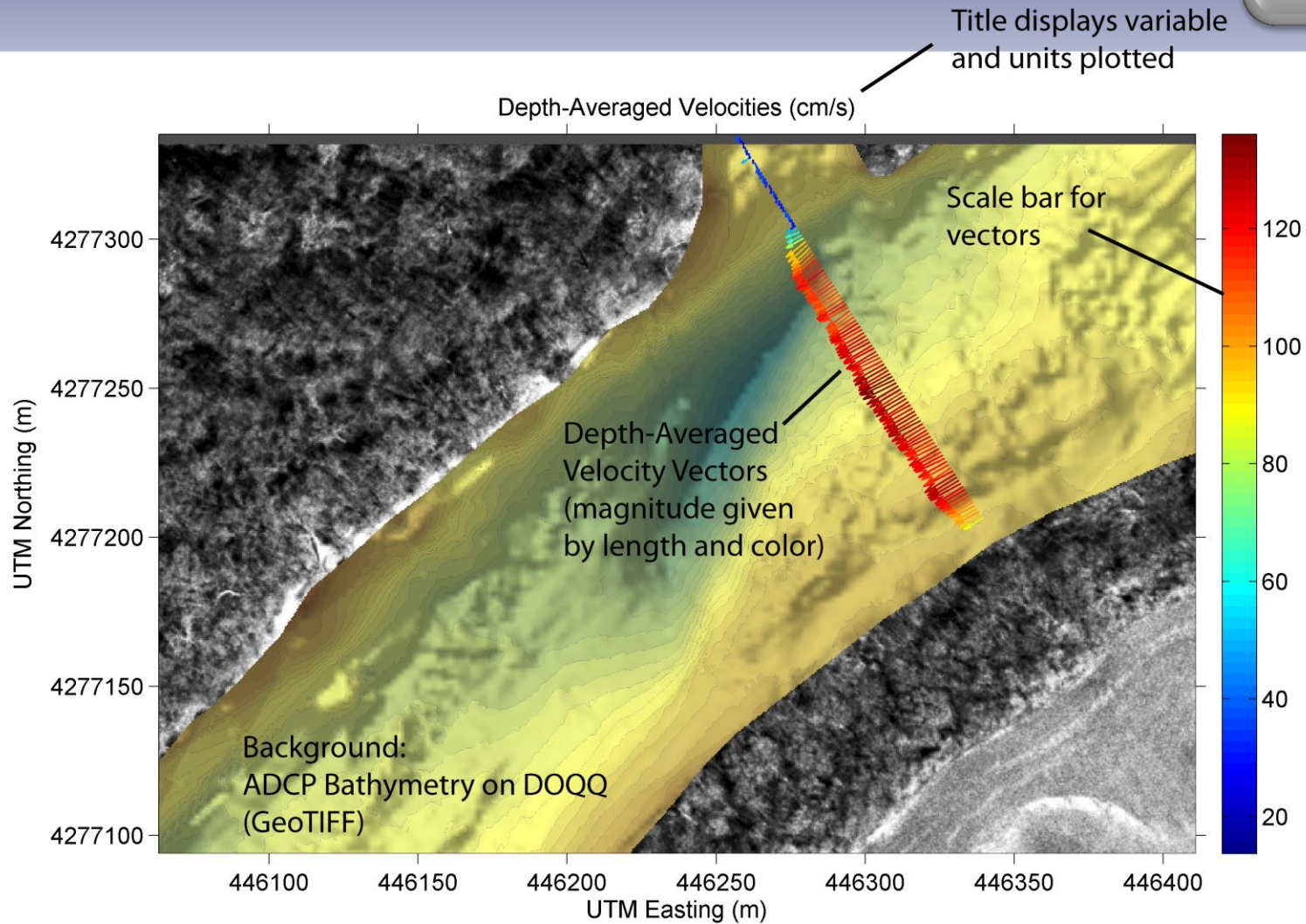
Vector Scale

Horizontal Vector Spacing HVS

Vertical Vector Spacing VVS

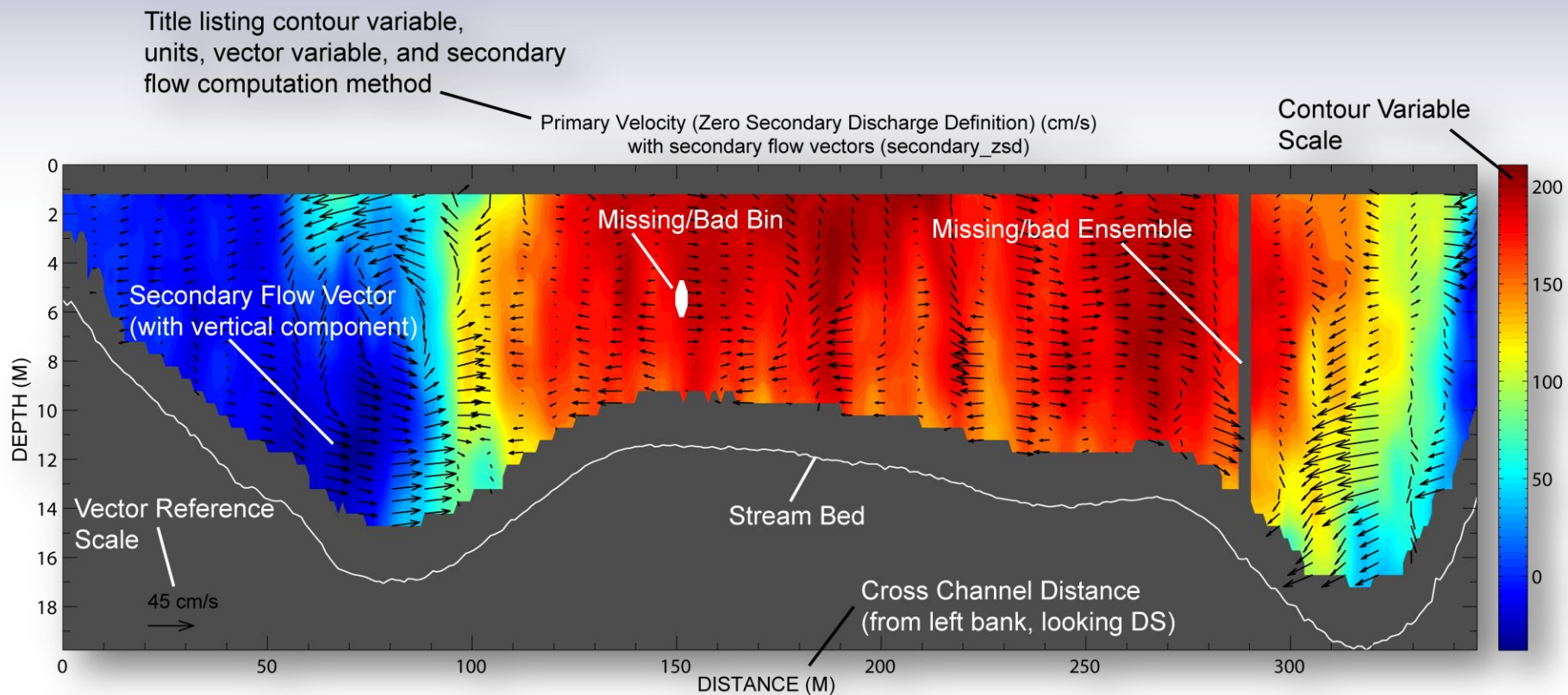
Generate
Plots

Figure 2: Plan View Plot



Generate
Plots

Figure 3: Contour Cross Section Plot



Plotting Interface

Replot

Configure
VMT Plotting
Settings

Velocity Mapping Toolbox (VMT)
v. 2.42 beta

Disclaimer Help

Data Import

Data Type

- ASCII Output (.txt)
- Matlab Files (.mat)

Save Data (.mat file)

Output Tecplot (*.dat) file

Output KMZ File (Google Earth)

Vertical Offset (m)

Load Data

Replot

Graphics Export

- Figure 1 (Shiptracks)
- Figure 2 (Plan View)
- Figure 3 (Cross Section)

Style

- Presentation
- Print

Save Figures

Processing

Secondary Flow Definitions

- 1) Zero Net Cross-Stream Discharge Definition (zsd)
- 2) Rozovskii Definition (Roz)

Horizontal Grid Node Spacing (m)

Manually Set Cross-Section Endpoints (User Input File Required)

Correct for variations in streamwise depth (unit q continuity)

Advanced Processing

Bathymetry

Output Multibeam Bathymetry

Output Auxiliary Data

Beam Angle (deg)

Mag Var

WSE (m)

Plotting

Plot English Units

Plan View

- Map Depth-Averaged Velocities
- Load Shoreline File

Depth Range (m) to

Vector Scale

Vector Spacing

Smoothing Window Size

Add Background

*Requires Mapping Toolbox

Export

Cross Sections

- Cross Section Contour Plot
- Plot Secondary Flow Vectors

Vertical Exaggeration

Vector Scale

Horizontal Vector Spacing

Vertical Vector Spacing

Horizontal Smoothing Window

Vertical Smoothing Window

Include Vert. Vel. Comp. in Sec. Flow Vectors

Contour Variable

- Streamwise Velocity (u)
- Transverse Velocity (v)
- Vertical Velocity (w)
- Velocity Magnitude
- Primary Velocity (zsd)
- Secondary Velocity (zsd)
- Primary Velocity (Roz)

Secondary Flow Vector Variable

- Transverse
- Secondary (zsd)
- Secondary (Roz)
- Secondary (Roz, Cross-Stream C
- Primary (Roz, Cross-Stream Com

Plotting Interface

Add Background

Configure
VMT Plotting
Settings

Velocity Mapping Toolbox (VMT)
v. 2.42 beta

Data Import

Data Type: ASCII Output (.txt) Matlab Files (.mat)

Save Data (.mat file) Output Tecplot (*.dat) file Output KMZ File (Google Earth)

Vertical Offset (m)

Graphics Export

Figure 1 (Shiptracks) Figure 2 (Plan View) Figure 3 (Cross Section)

Style: Presentation Print

Processing

Secondary Flow Definitions: 1) Zero Net Cross-Stream Discharge Definition (zsd) 2) Rozovskii Definition (Roz)

Horizontal Grid Node Spacing (m)

Manually Set Cross-Section Endpoints (User Input File Required) Correct for variations in streamwise depth (unit q continuity)

Bathymetry

Output Multibeam Bathymetry Output Auxiliary Data

Beam Angle (deg) Mag Var WSE (m)

Plotting

Plot English Units

Plan View

Map Depth-Averaged Velocities Load Shoreline File

Depth Range (m) to

Vector Scale Vector Spacing Smoothing Window Size

Cross Sections

Cross Section Contour Plot Plot Secondary Flow Vectors

Vertical Exaggeration Vector Scale

Horizontal Vector Spacing Vertical Vector Spacing

Horizontal Smoothing Window Vertical Smoothing Window

Include Vert. Vel. Comp. in Sec. Flow Vectors

Contour Variable:

Secondary Flow Vector Variable:

Background Requirements:

- Coordinate system: UTM (WGS84; in meters)
- GeoTIFF, Shapefile, TIFF/JPEG/PNG (with a world file), ARC ASCII GRID, or SDTS raster.
- Mapping toolbox required for Matlab version

Plotting Interface

Export DAV

Configure
VMT Plotting
Settings

The screenshot shows the Velocity Mapping Toolbox (VMT) v. 2.42 beta interface. The 'Plotting' tab is active, displaying various configuration options for data import, graphics export, processing, bathymetry, and plotting. The 'Export' button in the 'Plotting' section is highlighted with a red box.

Velocity Mapping Toolbox (VMT) v. 2.42 beta

Data Import

- Data Type: ASCII Output (.txt) Matlab Files (.mat)
- Save Data (.mat file)
- Output Tecplot (*.dat) file
- Output KMZ File (Google Earth)
- Vertical Offset (m):
- Buttons: **Load Data**, **Replot**

Graphics Export

- Figure 1 (Shiptracks)
- Figure 2 (Plan View)
- Figure 3 (Cross Section)
- Style: Presentation Print
- Button: **Save Figures**

Processing

- Secondary Flow Definitions: 1) Zero Net Cross-Stream Discharge Definition (zsd) 2) Rozovskii Definition (Roz)
- Horizontal Grid Node Spacing (m):
- Manually Set Cross-Section Endpoints (User Input File Required)
- Correct for variations in streamwise depth (unit q continuity)
- Button: **Advanced Processing**

Bathymetry

- Output Multibeam Bathymetry
- Output Auxiliary Data
- Beam Angle (deg):
- Mag Var:
- WSE (m):

Plotting

- Plot English Units
- Plan View:
 - Map Depth-Averaged Velocities
 - Depth Range (m): to
 - Load Shoreline File
 - Vector Scale:
 - Vector Spacing:
 - Smoothing Window Size:
 - Buttons: **Add Background**, **Export** (highlighted)
 - *Requires Mapping Toolbox
- Cross Sections:
 - Cross Section Contour Plot
 - Vertical Exaggeration:
 - Plot Secondary Flow Vectors
 - Vector Scale:
 - Horizontal Vector Spacing:
 - Vertical Vector Spacing:
 - Horizontal Smoothing Window:
 - Vertical Smoothing Window:
 - Include Vert. Vel. Comp. in Sec. Flow Vectors

Contour Variable

- Streamwise Velocity (u)
- Transverse Velocity (v)
- Vertical Velocity (w)
- Velocity Magnitude
- Primary Velocity (zsd)
- Secondary Velocity (zsd)
- Primary Velocity (Roz)

Secondary Flow Vector Variable

- Transverse
- Secondary (zsd)
- Secondary (Roz)
- Secondary (Roz, Cross-Stream C
- Primary (Roz, Cross-Stream Com

Currently only exports *.ANV vector file

Plotting Interface

Save Figures

Configure
VMT Plotting
Settings

Velocity Mapping Toolbox (VMT)
v. 2.42 beta

Data Import

Data Type

- ASCII Output (.txt)
- Matlab Files (.mat)

Save Data (.mat file)

Output Tecplot (*.dat) file

Output KMZ File (Google Earth)

Vertical Offset (m)

Load Data

Replot

Graphics Export

- Figure 1 (Shiptracks)
- Figure 2 (Plan View)
- Figure 3 (Cross Section)

Style

- Presentation
- Print

Save Figures

Processing

Secondary Flow Definitions

- 1) Zero Net Cross-Stream Discharge Definition (zsd)
- 2) Rozovskii Definition (Roz)

Manually Set Cross-Section Endpoints (User Input File Required)

Correct for variations in streamwise depth (unit q continuity)

Horizontal Grid Node Spacing (m)

Advanced Processing

Bathymetry

Output Multibeam Bathymetry

Output Auxiliary Data

Beam Angle (deg)

Mag Var

WSE (m)

Plotting

Plot English Units

Plan View

Map Depth-Averaged Velocities

Depth Range (m) to

Load Shoreline File

Add Background

*Requires Mapping Toolbox

Vector Scale

Vector Spacing

Smoothing Window Size **Export**

Cross Sections

Cross Section Contour Plot

Vertical Exaggeration

Plot Secondary Flow Vectors

Vector Scale

Horizontal Vector Spacing

Vertical Vector Spacing

Horizontal Smoothing Window

Vertical Smoothing Window

Include Vert. Vel. Comp. in Sec. Flow Vectors

Contour Variable

- Streamwise Velocity (u)
- Transverse Velocity (v)
- Vertical Velocity (w)
- Velocity Magnitude
- Primary Velocity (zsd)
- Secondary Velocity (zsd)
- Primary Velocity (Roz)

Secondary Flow Vector Variable

- Transverse
- Secondary (zsd)
- Secondary (Roz)
- Secondary (Roz, Cross-Stream C
- Primary (Roz, Cross-Stream Com

Prompts user for choice of EPS or PNG format

Important Tips

- **Wait until you are completely satisfied with your plots (vectors, contours, etc.) before:**
 - Adding a background
 - Exporting vectors
 - Saving figures
- **Resize your figures appropriately before saving**
- **Users can also export figures in the figure window using a variety of settings and options**

Overview of Output Files

■ Matlab data files (*.mat):

- Files contain Matlab data structures with the raw ADCP data, intermediate variables used in computations, and final processed and averaged data.

■ Tecplot Data files (*_TECOUT.dat):

- Files contain processed and averaged ADCP data formatted for direct import into Tecplot.
- Average XS bathymetry data are also exported into the *_TECOUT_XSBathy.dat file.

■ iRIC Vector Data Files (*.anv):

- Vector files for input into the iRIC modeling suite.
- The vector files contain x, y, z, vx, and vy values in each line and separated by spaces. Units are MKS, UTM WGS84.

■ Multibeam XYZ Bathymetry Files (*_mbxyz.csv):

- These files contain the bathymetry data from the four individual beams of the ADCP, corrected for heading, pitch, and roll
- CSV format for easy import into ArcGIS
- Can include ancillary data (time stamp, heading, pitch, roll, etc.)

■ Google Earth files (*.KML and *.KMZ):

- These files are generated to allow the user to display the transect shiptracks (*.kml) and mean cross sections (*.kmz) in Google Earth
- Shiptrack KMLs are generated using ASCII2KML utility

■ GIS Compatible ASCII Files (*_GIS.csv):

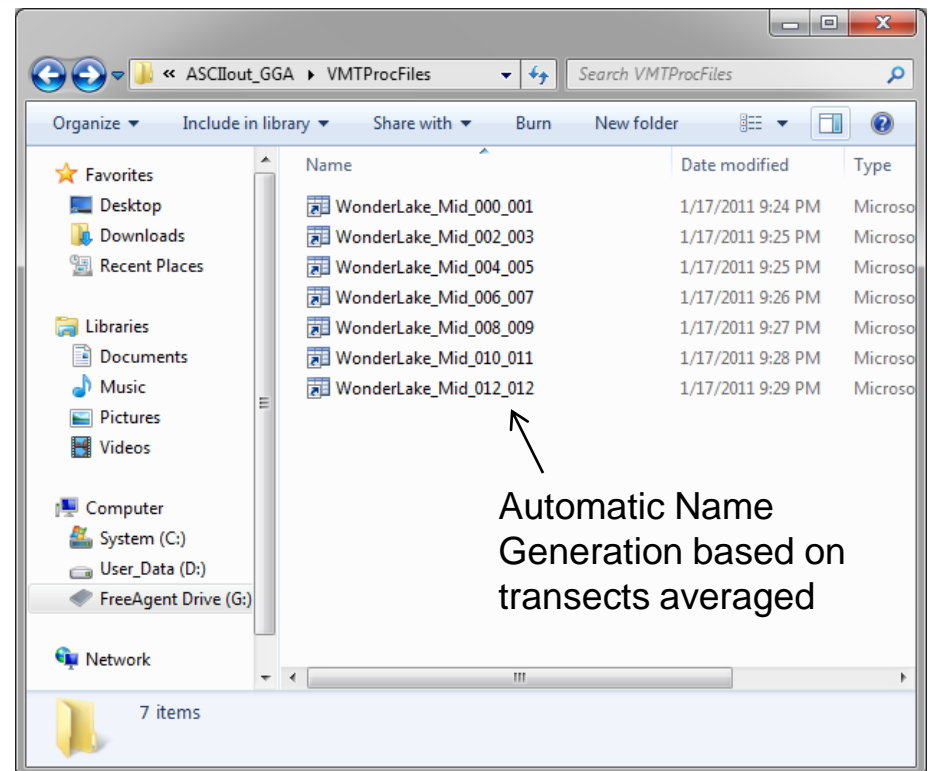
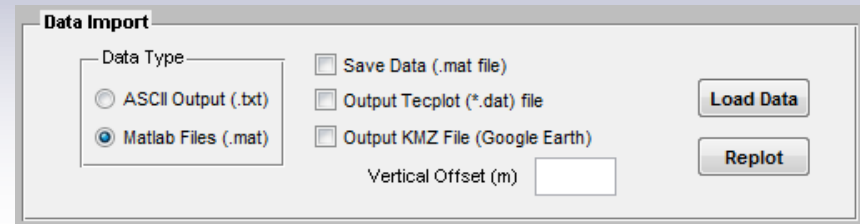
- These files contain georeferenced depth- or layer-averaged data for every ensemble along the curvilinear shiptrack
- Exported using ASCII2GIS utility

See VMT user guide for more detailed information

Save/Export Processed Data

Save Processed Data

- Will save *.mat (Matlab data file) if selected
- Creates 'VMTProcFiles' directory in measurement directory
- User can reload processed file at a later time (faster)



Tecplot Export Option

Export Tecplot
Data File

- Processed data saved to *.dat file
- Saves all plot variables (velocity components, backscatter, flow angles, etc.) and bathymetry of MCS
- Saved before any spatial averaging
 - Smoothing in plot routines
- Saved to 'VMTProcFiles' directory

Data Import

Data Type

ASCII Output (.txt)

Matlab Files (.mat)

Save Data (.mat file)

Output Tecplot (*.dat) file

Output KMZ File (Google Earth)

Vertical Offset (m)

Load Data

Replot

*_TECOUT.dat

NAME	DESCRIPTION
X	UTM Easting (m)
Y	UTM Northing (m)
Depth	depth (m)
Dist	dist across XS, oriented looking u/s (m)
u	stream-wise velocity magnitude per bin (cm/s)
v	cross-stream velocity magnitude per bin (cm/s)
w	vertical velocity magnitude per bin (cm/s)
vp	primary vel. component-0 discharge meth. (cm/s)
vs	secondary vel. comp.-0 discharge meth. (cm/s)
U (Rotated)	depth-avg. stream-wise magnitude (cm/s)
V (Rotated)	depth-avg. cross-stream magnitude (cm/s)
ux (Rotated)	component of vel. in X dir., rotated (cm/s)
uy (Rotated)	component of vel. in Y dir., rotated (cm/s)
uz (Rotated)	component of vel. in Z dir., rotated (cm/s)
Mag	vel magnitude (need better desc.) (cm/s)
Bscat	backscatter (dB)
Dir	direction deviation (degrees)
vp (Roz)	primary vel. per bin using Rozovskii (cm/s)
vs (Roz)	secondary vel. per bin using Rozovskii (cm/s)
vpy (Roz)	cross-stream comp. of primary vel. (cm/s)
vsy(Roz)	cross-stream comp. of secondary vel. (cm/s)
phi_deg (Roz)	depth-avg. vel. vector angle (degrees)
theta_deg (Roz)	individual bin vel. vector angle (degrees)

*_TECOUT_XSBathy.dat

NAME	DESCRIPTION
X	UTM Easting (m)
Y	UTM Northing (m)
BedDepth	Bed depth (m)
Dist	dist across XS, oriented looking u/s (m)
BedElev	Bed Elevation (m) (Only accurate if user entered value in VMT GUI)

KMZ Export Option

Export KMZ File

- Saves mean cross section bathymetry to Google Earth KMZ file
- 3-D 'slice' through river bed elevated above the image plane
- Elevated above plane by 'vertical offset'
- Saved to 'VMTProcFiles' directory

Data Import

Data Type

ASCII Output (.txt)

Matlab Files (.mat)

Save Data (.mat file)

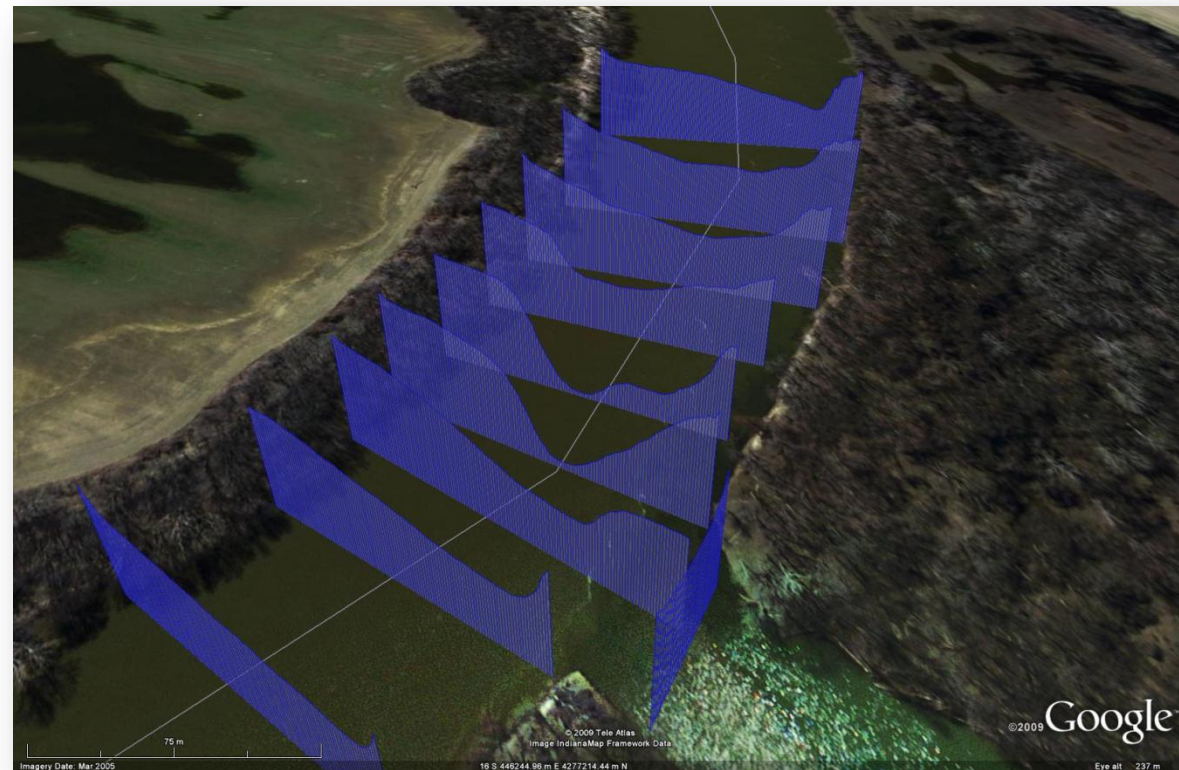
Output Tecplot (*.dat) file

Output KMZ File (Google Earth)

Vertical Offset (m)

Load Data

Replot



Advanced Processing

Currently under development/evaluation:

- Computation of shear velocity and bed shear stress
- Estimation of the longitudinal dispersion coefficient from transverse velocity profile
- Vorticity computation
- Interpolation between transects
- Stationary (at-a-point) processing
- SSC calibration/computation tool
 - see Boldt et al. in HMEM proceedings (2.2.2 ADCPs and Sediment)
 - Several talks are included in references

Questions?

