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The Open University

dMata.co.uk



# dBSD

## EBSD ANALYSIS OF STEEL ALLOYS



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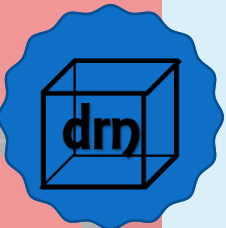
# OVERVIEW

## Installation>>

- Install MTEX
- Unzip dbbsd file
- Open Matlab
- Double Click on dBSDsteel.fig

## Capabilities>>

- General EBSD plots
- Calculate martensite variants using KS relationship
- Calculations using Taylor and Schmid
- Compare two maps of same area after deformation or phase change
- DIC and Trends, in next upgrade



# OVERVIEW 2

- **General>>**

- The code is slow. Don't press loads of buttons, there may be stuff calculating. Look for Calculating in top right or check Matlab command window (hit retrain and see if it says 'busy')
- The code is still in development and has not been fully debugged
- Additional functions to extract the data need implementation. Some exist as external functions which will be added when ready.

- **Using>>**

- Use 'Load ebsd' to load EBSD files
- Use 'Calc grains' to clean data and calculate grains
- Use 'Calc Taylor' to calculate Taylor model & Schmid factors
- Use 'Calc Variant' to calculate details about martensite variants
- Use 'Calc Steps' if have two maps of the same area after some change, e.g. deformation. Will need to load the saved RES files
- When calculated, use 'Save RES' to save time later
- Go to different tabs for different plots



# GRAPHICAL USER INTERFACE (GUI)

The screenshot shows the dBSDsteel GUI interface. The window title is "dBSDsteel" and the current sample is "After\_Au\_removal\_cln.cpr". The interface is divided into several sections:

- Sample Details:** Fields for EBSD FileName, Res FileName, and Easy Load (radio button).
- Phase Selection:** Dropdown menus for Phase 1 and Phase 2.
- Calculations:** Buttons for Calc Grains, Calc Variant, Calc DIC, Calc Taylor, and Calc Steps, each with a checkbox.
- Save/Load:** Buttons for Load ebsd, Load RES, RES Folder, and Save RES.
- Menu:** A menu bar with options: Sample, EBSD, Variants, DIC, Steps, Trends.
- Figure:** A large window displaying a colorful EBSD map.

Four numbered callouts with arrows point to specific GUI elements:

- 1. Load ebsd data here**  
*Unselect 'Easy Load' to use MTEX load GUI*
- 2. Do calculations here depending on what you want to do**
- 3. Save RES file**  
*Calcs are slow so if save can return quicker next time, using Load RES above*
- 4. Load ebsd data here**  
*Unselect 'Easy Load' to use MTEX load GUI*



# EBSD TAB

The screenshot displays the dBSDsteel software interface. At the top, the window title is 'dBSDsteel' and the file name is 'H5\_end.mat'. The interface is divided into several sections:

- One Plotting:** A menu on the left lists options: IPF, Phases, BC, Boundaries, Grain Size, Mis Theta3, Mis, and Mis. A 'Plot EBSD' button is located below the menu. A 3D cube icon with 'drn' is shown to the right.
- Plots:** This section contains several controls:
  - 'Grain No. by size' with a value of '0' and a 'Figure No.' field.
  - 'Find Grain' with a list of numbers 1-7.
  - 'C-axis' with two input boxes (0, 0) and an 'Auto' radio button.
  - 'Save Plot' radio button.
  - 'Select Grain' with a value of '10' and 'Line Length'.
  - 'Centre / Pointer' radio button.
  - 'Line Profile' button.
  - 'Position of Figure' with input boxes for 300, 50, 900, 600 and a 'getIPF' button.
  - 'Input manually' dropdown menu.
- menu:** A row of buttons: Sample, EBSD, Variants, DIC, Steps, Trends.

On the right side, a 'Figure' window displays a color-coded EBSD map. Three blue arrows point from text boxes to specific features in the software interface:

- Arrow 1 points to the 'One Plotting' menu.
- Arrow 2 points to the 'C-axis' input boxes.
- Arrow 3 points to the 'Line Profile' button.

Different plot options in the menu. Select one then press 'Plot EBSD'

If want to plot in GUI give value in Figure No. '0'  
Else will be plotted in a figure of given number.  
The color axis values can be changed with C-axis boxes

Select grain to show orientation & slip systems-  
lines indicate Schmid factor  
Use table on right to select grains by size

Do a line profile across a grain



# SELECT GRAIN

The screenshot shows the dBSDsteel software interface. The main window displays a color-coded EBSD map of a grain structure. A 'Schmid/Taylor' dialog box is open, showing a list of grain orientations and their slip activities. A 'Figure 101' window shows a 3D plot of the selected grain's orientation.

**Schmid/Taylor Dialog:**

Plane/direction	Slip activity
1: 1 1 1, 0 1 -1	1: -0.0019
2: 1 1 1, -1 0	2: 0.031
3: 1 1 1, 1 -1 0	3: -0.03
4: 1 1 1, 0 -1 1	4: 0.0019
5: 1 1 1, 1 0 -1	5: -0.031
6: 1 1 1, -1 1	6: 0.03
7: 1 1 -1, 1 -1 0	7: 0.42
8: 1 1 -1, 1 -1 1	8: 0.12

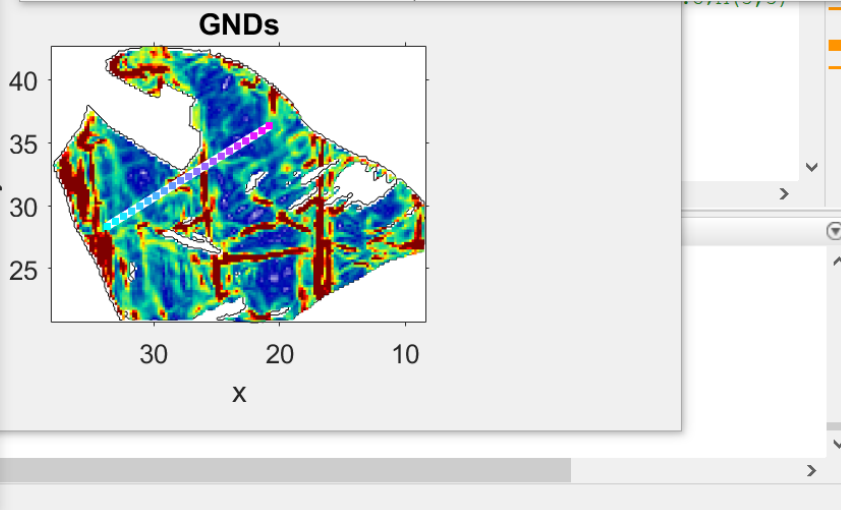
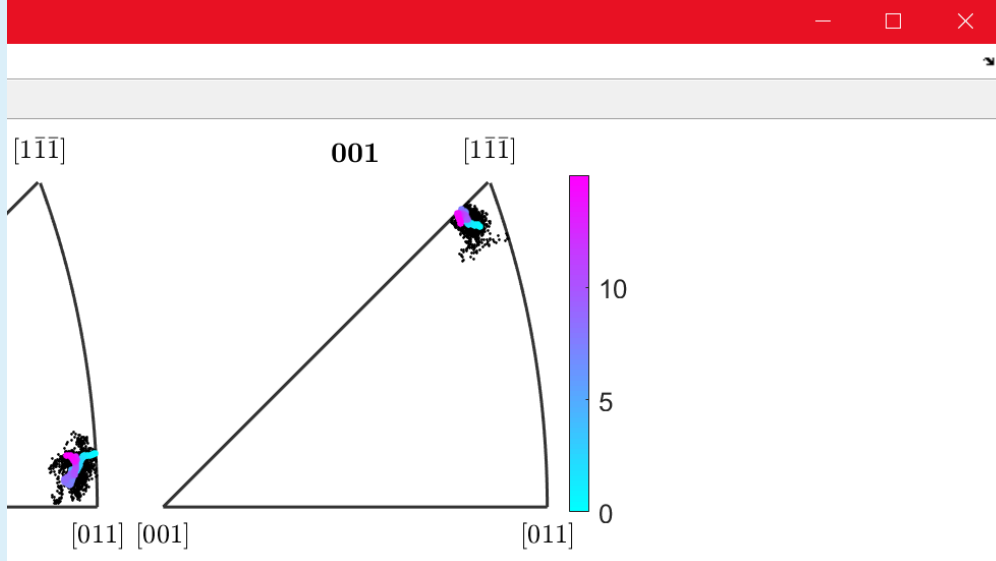
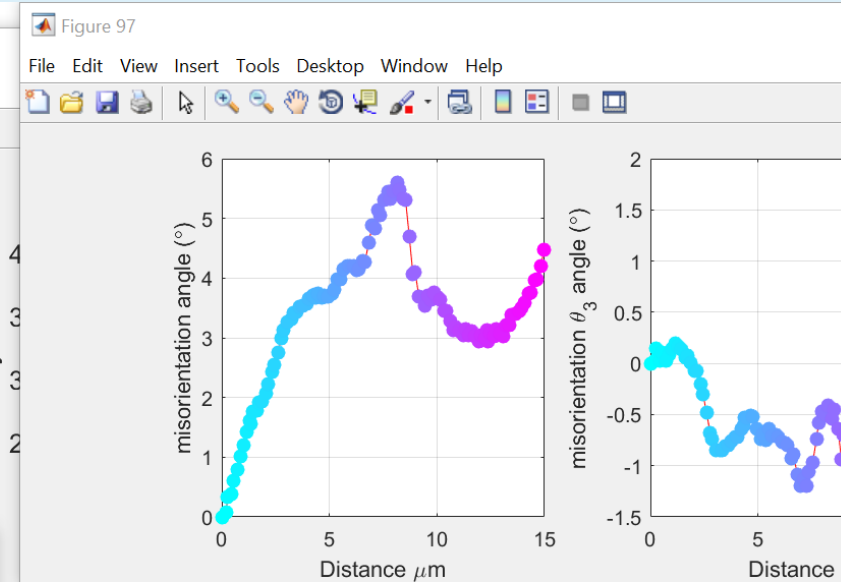
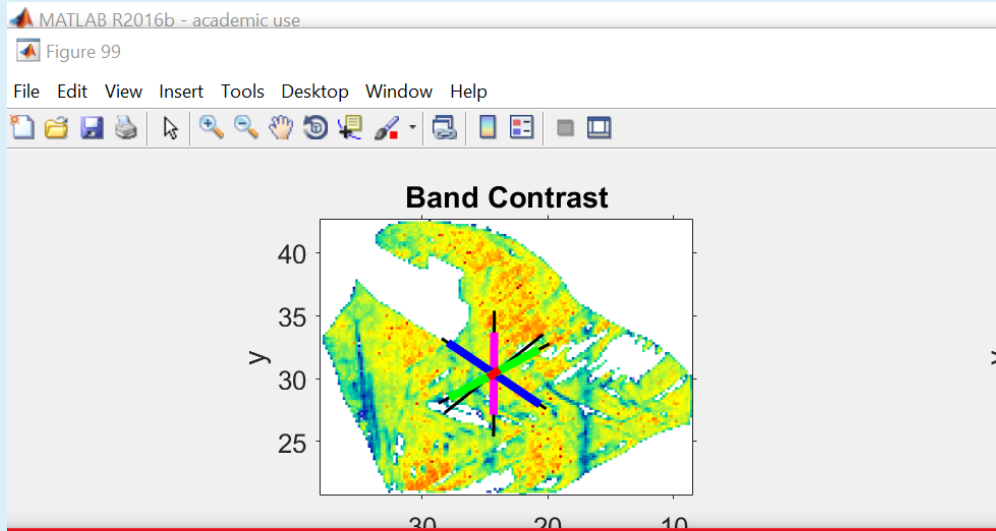
**Figure 101:** A 3D plot showing the orientation of the selected grain. The plot is a diamond-shaped structure with a red shaded region, plotted on a 3D coordinate system with axes labeled x, y, and z.

**Software Interface Elements:**

- One Plotting:** A list of plotting options including Mis, Mis Spread, Schmid Factor, Taylor Factor, Taylor Rotation, KAM, and Mis. Angle Dist.
- Plots:** Controls for Grain No. by size, Figure No., Find Grain, C-axis, Save Plot, Select Grain, Line Length, Centre / Pointer, Line Profile, and Input manually.
- Menu:** A menu bar with options: Sample, EBSD, Variants, DIC, Steps, Trends.



# LINE PROFILES






# VARIANTS TAB

dBSDsteel  
dMata.co.uk H5\_end.mat dbsd

**Variants**

- Boundaries
- Var\_Area %
- Var\_var
- Var\_Number
- Transformed grain
- Var % info
- Area PC transform

Plot Variant



**Plots**

Grain No. by size: 0 Figure No. Select Grain

Find Grain: 1, 2, 3, 4, 5, 6, 7

C-axis: 0, 0, Auto

Line Length: 10

Save Plot:  Centre / Pointer:

Iron bcc

Line Profile

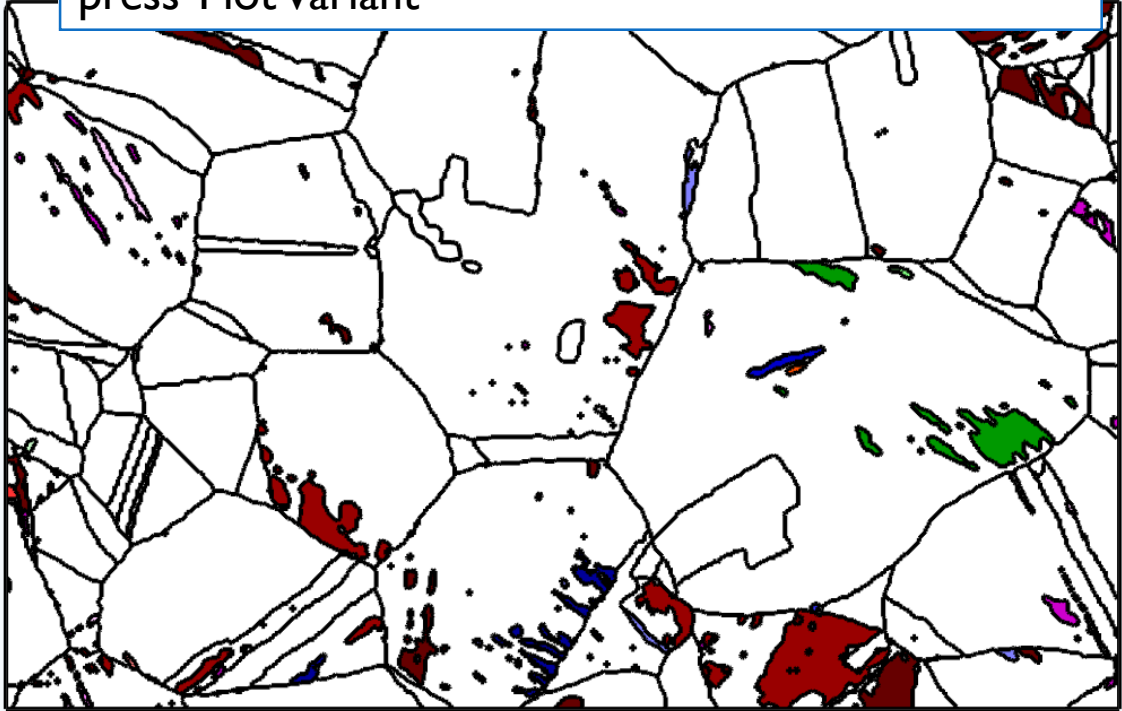
Position of Figure: 300 50 900 600 getIPF Input manually

**Menu**

Sample EBSD Variants DIC Steps Trends

Figure

Different plot options in the menu. Select one then press 'Plot Variant'



X



# CREATING STEPS: MAP GRAINS

dBSDsteel

dMata.co.uk *dbsd*

Sample Details

Figure

Figure 1

Figure 2

Easy Lo

Phase 1

Phase 2

Calc Steps

LoadSteps

Calc Gra

Calc Tay

Crop EBSD

Save RES

Menu

Sample EBSD Variants DIC Steps Trends

The image shows a screenshot of the dBSDsteel software interface. The main window displays two side-by-side grain maps, labeled Figure 1 and Figure 2. Both maps show a complex grain structure with regions numbered 1 through 20. Figure 1 has an X-axis from 120 to 60 and a Y-axis from 40 to 100. Figure 2 has an X-axis from 70 to 10 and a Y-axis from 10 to 40. The interface includes a menu bar at the top with 'File', 'MTEX', 'Edit', 'View', 'Insert', 'Tools', 'Desktop', 'Window', and 'Help'. A toolbar with various icons is located below the menu bar. On the left side, there is a sidebar with several sections: 'Easy Lo', 'Phase 1', 'Phase 2', 'Calc Steps', 'LoadSteps', 'Calc Gra', and 'Calc Tay'. At the bottom of the sidebar, there are buttons for 'Crop EBSD' and 'Save RES'. Below the sidebar is a 'Menu' bar with tabs for 'Sample', 'EBSD', 'Variants', 'DIC', 'Steps', and 'Trends'. The 'Steps' tab is currently selected.



# STEPS TAB

