

Worked Example 1

Rough surfaces in point contact

The engineering question

A spherical steel body is pressed against a nominally flat steel counterbody. A deterministic self-affine rough surface is superimposed on the macrogeometry. The calculation resolves the individual pressure-carrying asperity patches while maintaining the prescribed total normal load.

What the model represents

This example uses the production model selected by the supplied input. The governing theory and assumptions are described in the TriboSolver Manual; here the emphasis is on setting up, reproducing and interpreting one complete calculation.

Input or control	Reproducible value
Simulation type	Dry Contact
Normal load	1 N
Materials	Steel / Steel; E = 210 GPa, $\nu = 0.30$
Macrogeometry	Point Contact; body-1 radii 5 mm; body 2 flat
Domain and grid	100 x 100 μm ; 128 x 128
Microgeometry	Generated PSD surface; Sq = 6.3 nm; H = 0.8; seed 314159

Supplied input: `rough-point-contact.tribo.json`

SHA-256: 470e63302edbf7c9754a112f8e5da938e9903b5826e93fe7366136204e525047

Set up and run the story

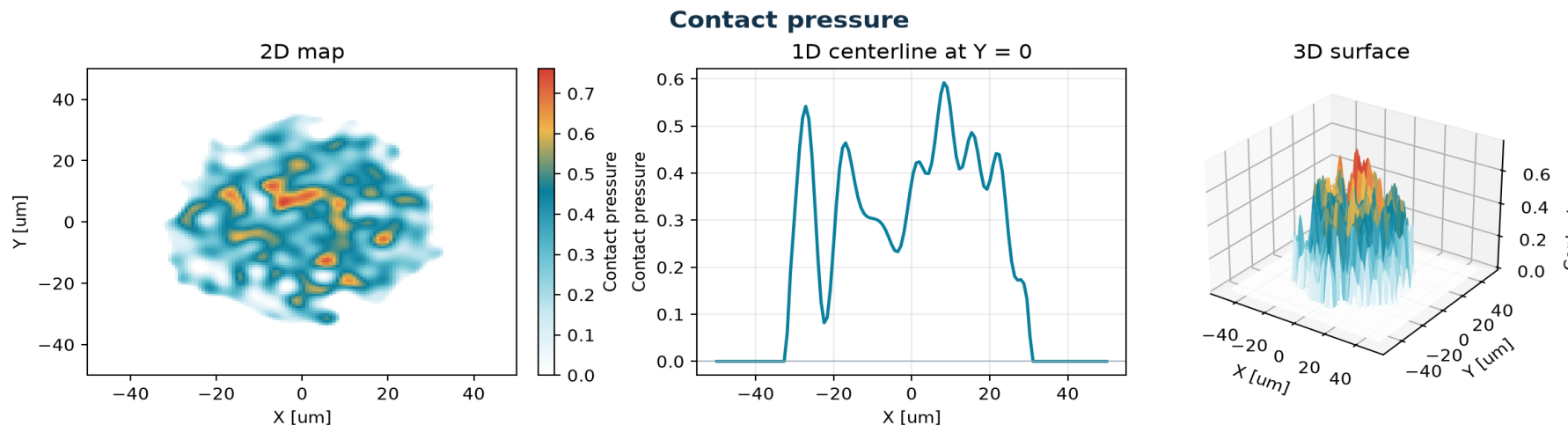
Step	Tab	What to do and why
1	Simulation Type	Choose Dry Contact. Leave both subsurface-stress boxes clear.
2	Solid Material Model	Set both bodies to steel. Do not enable coatings.
3	Contact Conditions	Set Load to 1 N. Leave Include Friction clear.
4	Contact Grid	Set X = 128, Y = 128, Step X = Step Y = 0.78125 μm .
5	Macro Geometry	Choose Point Contact. Set body-1 X/Y radii to 5 mm and use a flat counterbody.
6	Micro Geometry	Check Micro Geometry, choose Generate a PSD surface, enter Sq/H/cutoffs/seed, then press Generate. Confirm the preview is populated.
7	Run	Press Run Calculation and wait for a converged status and recovered load close to 1 N.

Run checkpoint

Do not interpret a field until the status reports success. Compare the summary below with your run; it was read from the retained result set created from this exact input.

iterations 37 | residual 9.11473e-07 | recovered load 1 N

Calculated result



Reproduced calculation: iterations 37 | residual 9.11473e-07 | recovered load 1 N

The pressure field is discontinuous because only the tallest roughness summits carry load. The 1D trace shows the local peaks crossed by the selected line; the 3D view makes their relative magnitudes and spatial separation easier to inspect. Use the run checkpoint for the exact iteration, residual and recovered-load values from this build.

Selected calculated scalar outputs

Output	Value	Unit
Calculated contact load	1	N
Contact area	3.109e-09	m^2
Rigid body motion	0.2078	μm
Average contact pressure	0.3216	GPa
Nominal contact area	1.000e-08	m^2
Applied nominal pressure	0.1	GPa

How to explore and explain the result

In 1D, start with the default center cross-section. Choose X or Y only when the engineering question requires a different direction, then move the location control. The grid and cursor readout give the plotted value and its unit. In 2D, use the colorbar to locate high and low regions and read the numerical X/Y axes. In 3D, rotate the same matrix to understand peak prominence and orientation; the X, Y and Z directions are references, not a different calculation.

View	Question it answers	Reading rule
1D	What happens along one selected line?	Start at the center; use the grid and cursor value to quantify peaks, widths and gradients.
2D	Where are high, low or active regions?	Read the colorbar and X/Y units; compare runs only with their numerical scales visible.
3D	How prominent and oriented are the features?	Rotate for shape and orientation; use 1D/2D or export for exact values.

What to report

State the input filename and hash, simulation type, material and geometry, grid and surface definition, prescribed load, solver status, iteration or balance measure, selected output name and unit, and the engineering meaning of the plotted pattern.

A useful engineering explanation states the prescribed load and geometry, identifies the active physical mechanism, checks convergence or force balance, and only then interprets the spatial field. Keep the supplied input and retained result together so a colleague can reproduce every number and plot.

Retained result: rough-point-contact-results.tribo-results.json
SHA-256: 7279325751fc16682721032eaabb0a8f0ea24c2fb17a1bf58108ac6aa36022e5