

Example of topographic profile analysis: exercise with Gwyddion

Guidelines

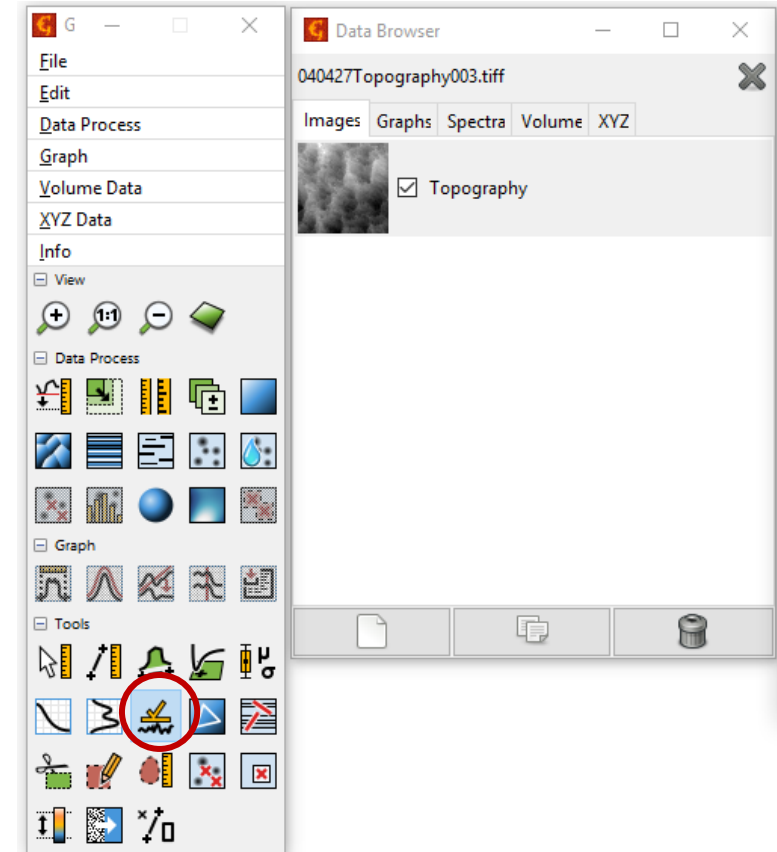
Introduction to Gwyddion

Gwyddion is an open-source software to analyze a broad array of topological data such as:

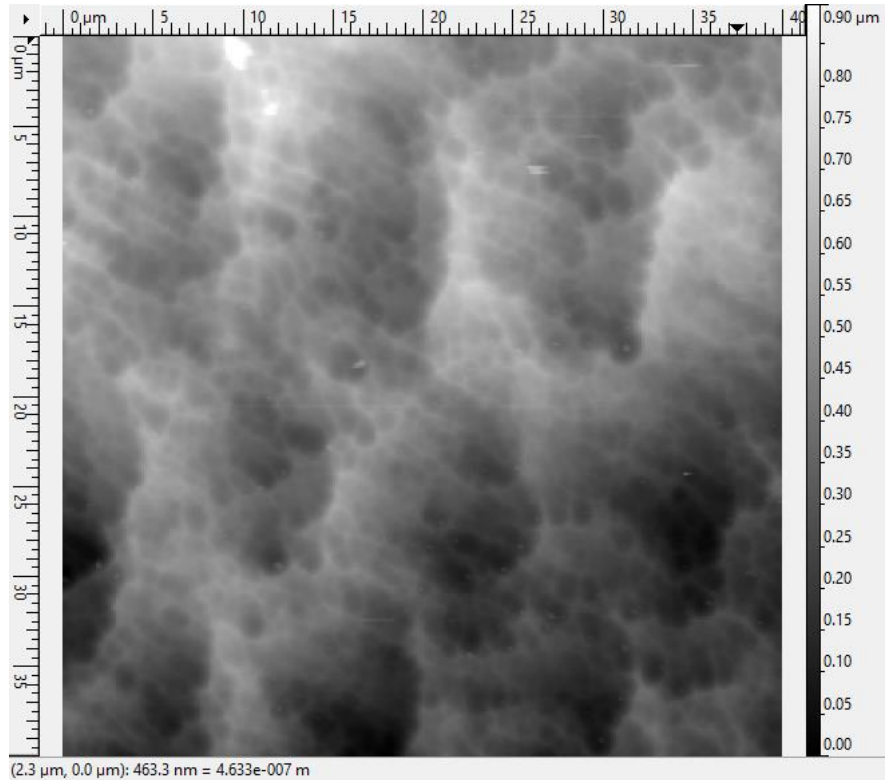
- Roughness,
- Waviness,
- Texture, and much more!

From 3D profile images, coming from instruments such as atomic force microscopes or phase-shift interferometers.

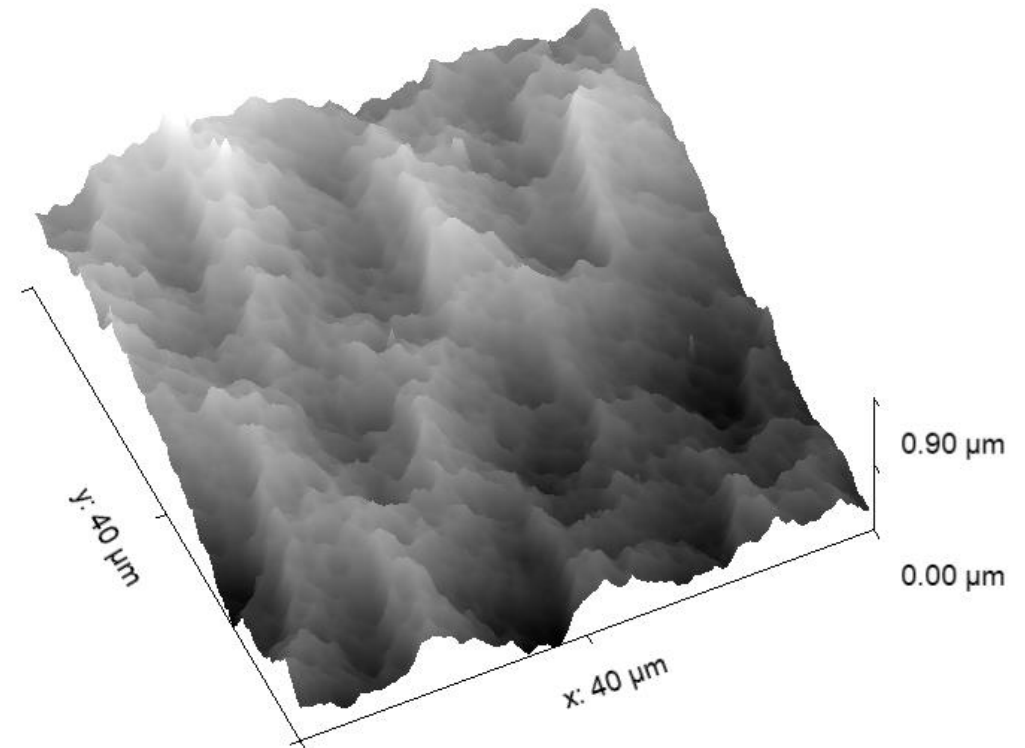
It offers many features for processing 3D images of complex surface textures. Here we will use basic tools such as roughness and FFT filtering tools.



Example 1: 3D topography



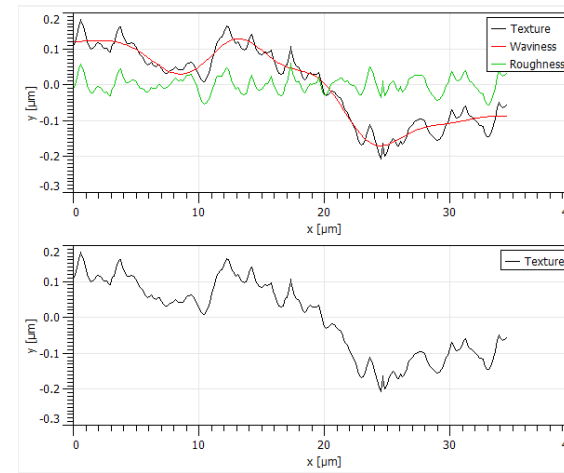
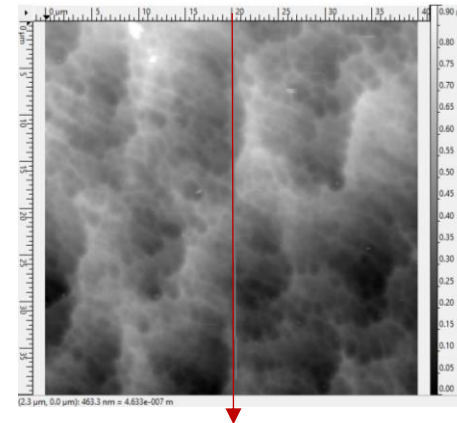
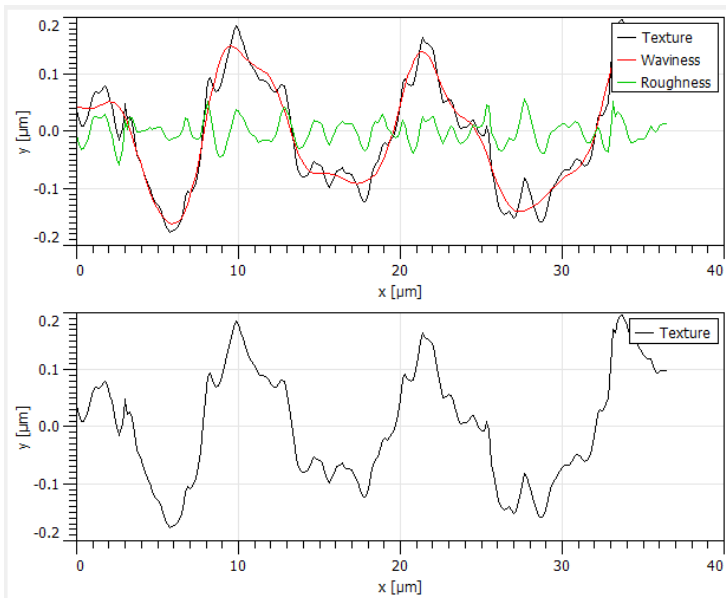
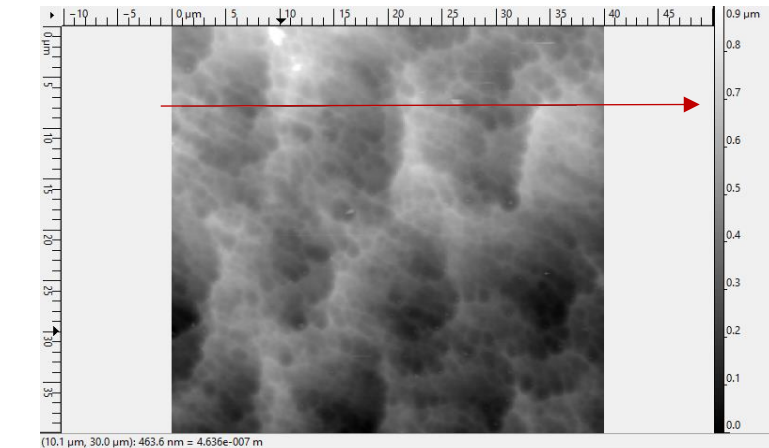
AFM image



3D topography

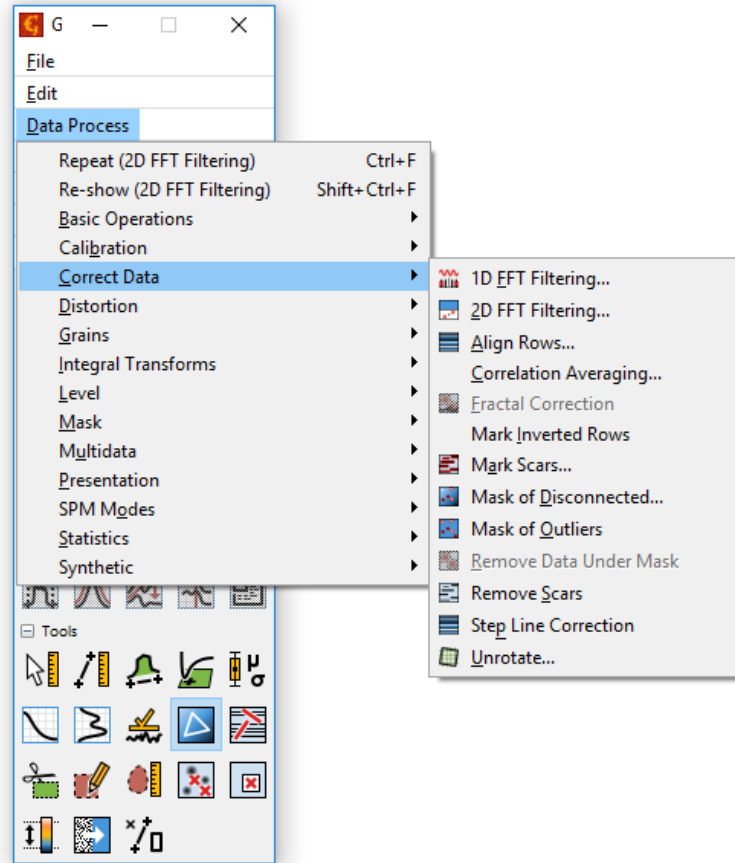
Example 1: Roughness parameters extractions

Horizontal profile

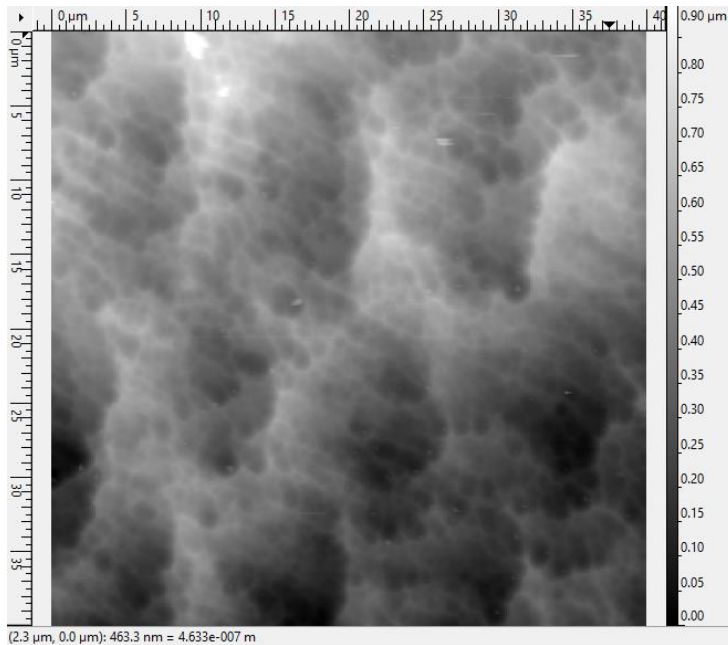


Vertical texture

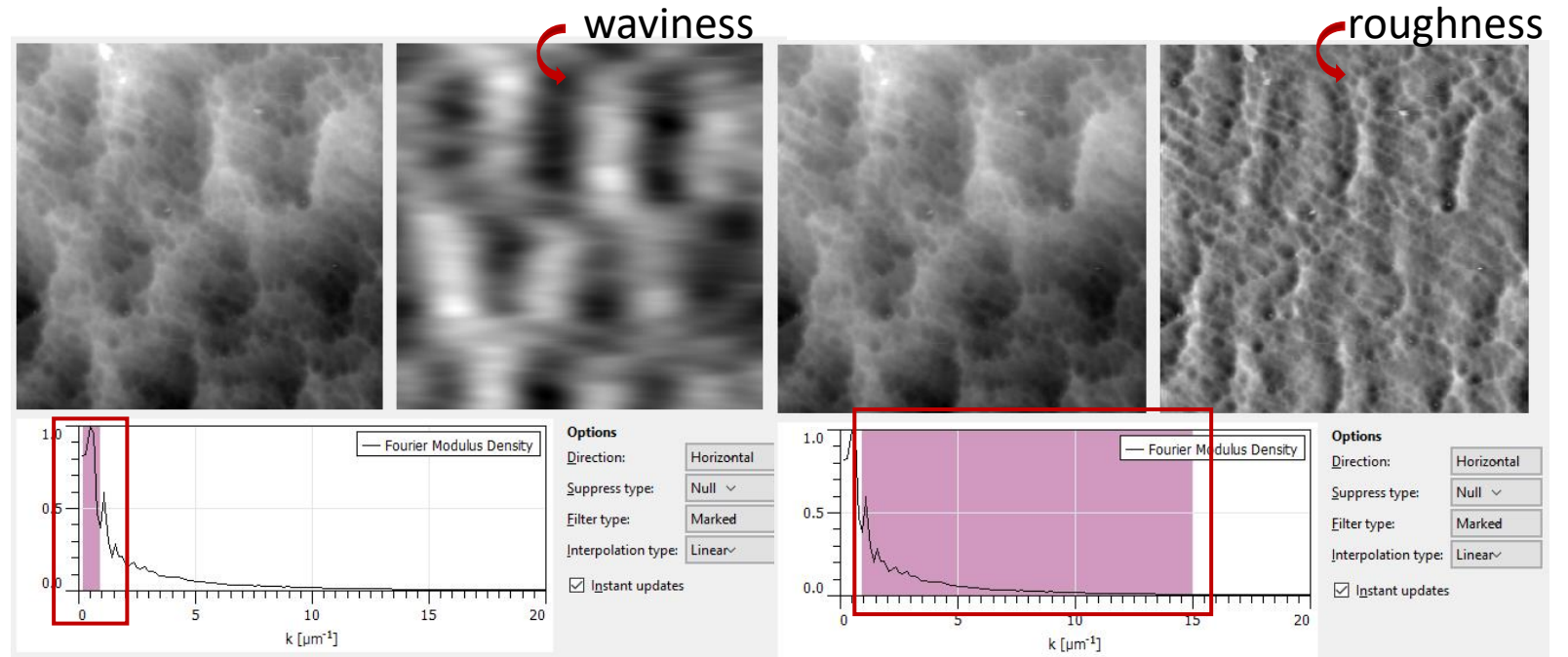
FFT filtering



Example 1: 1D FFT filtering (horizontal)



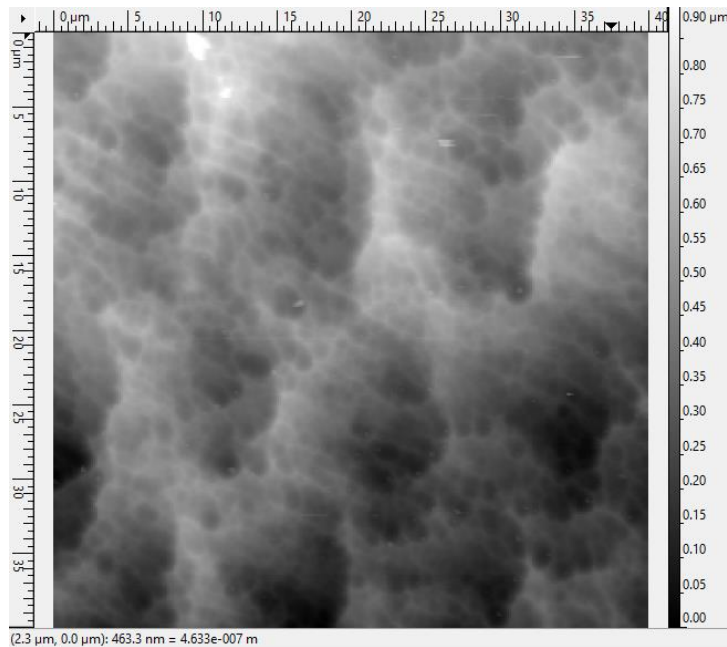
AFM image



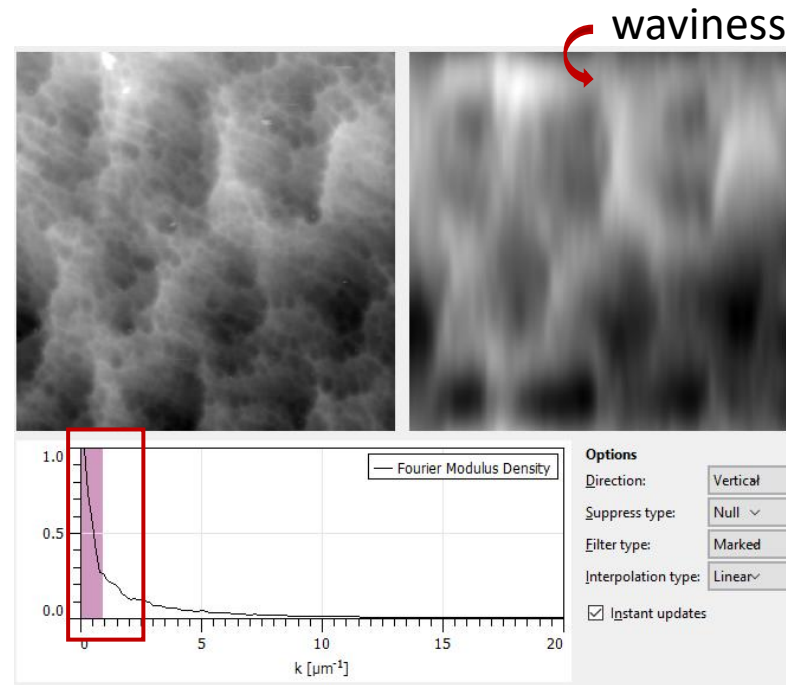
Low frequency

High frequency

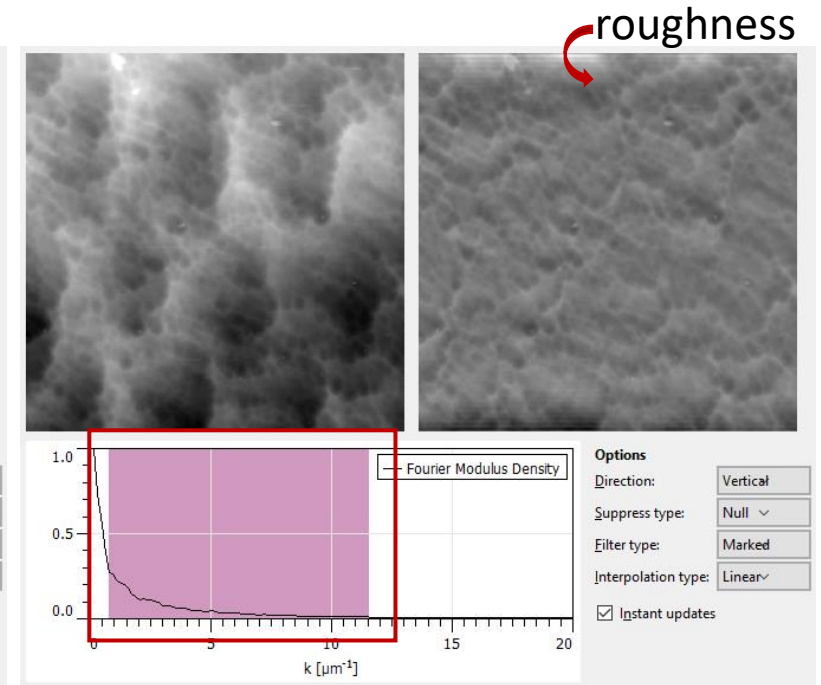
Example 1: 1D FFT filtering (vertical)



AFM image

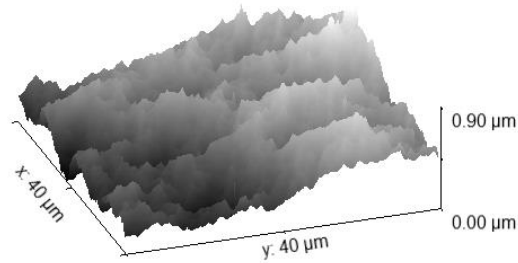


Low frequency



High frequency

Example 1: 2D FFT filtering



3D topography before FFT masking

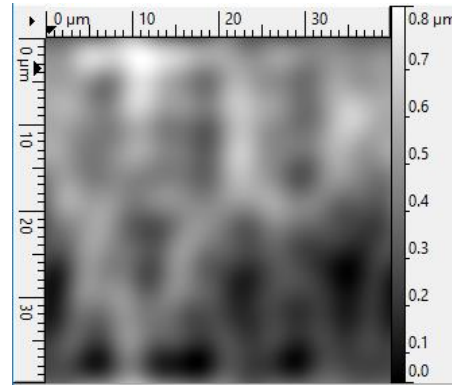
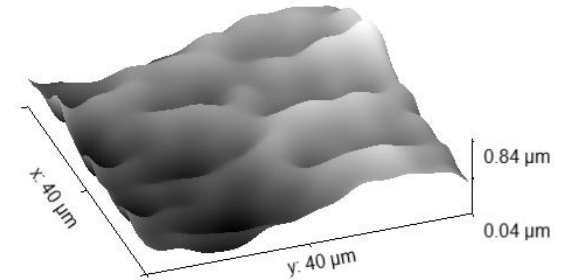
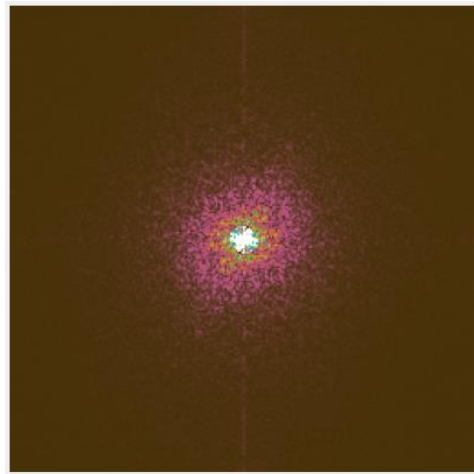


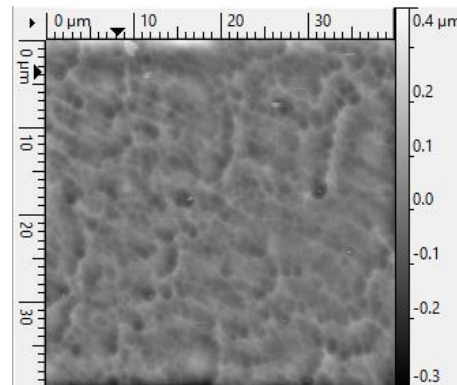
Image differences



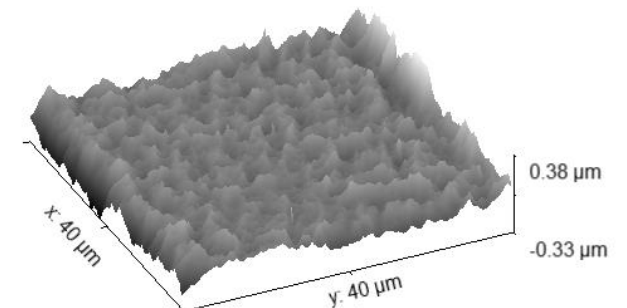
3D topography of image differences



FFT masking

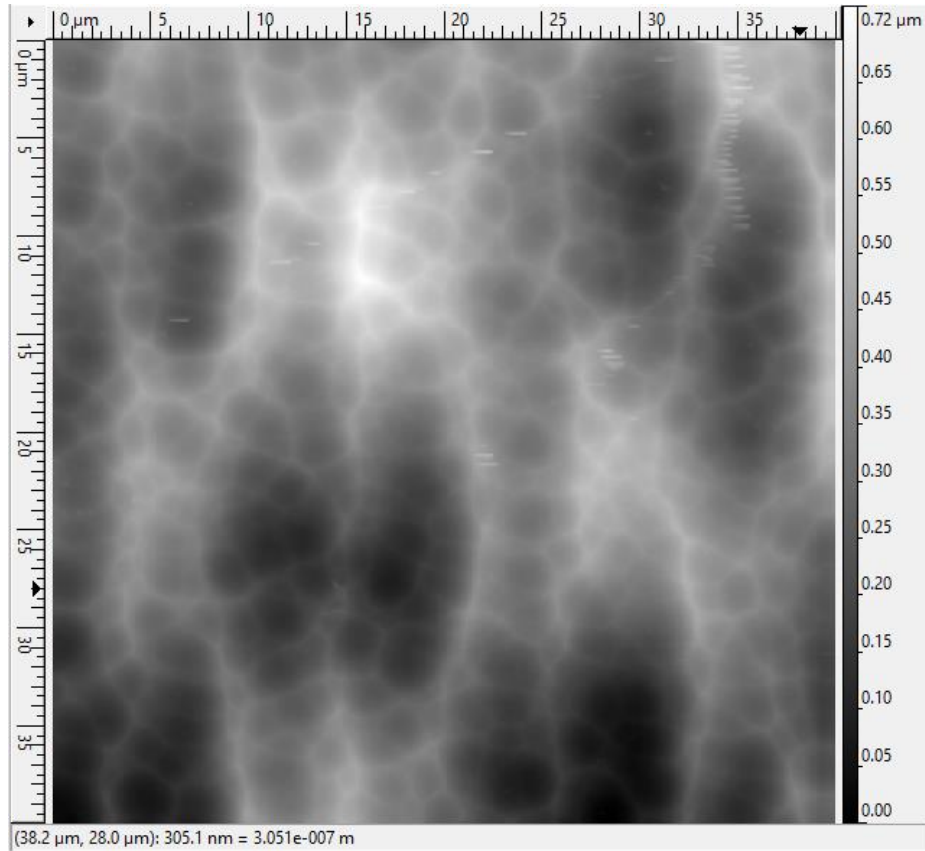


Filtered image

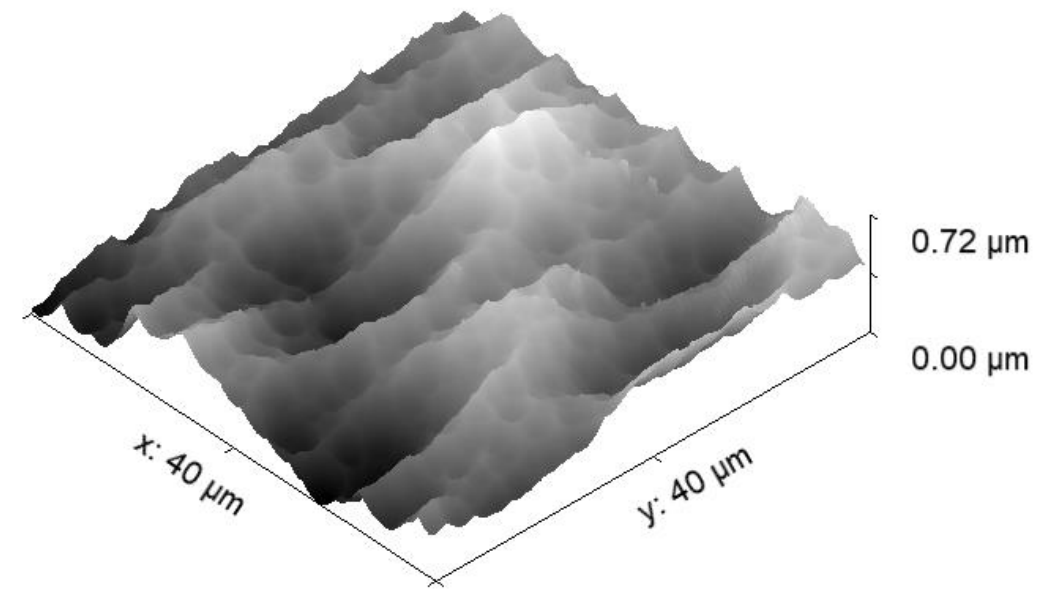


3D topography after masking

Example 2: 3D topography



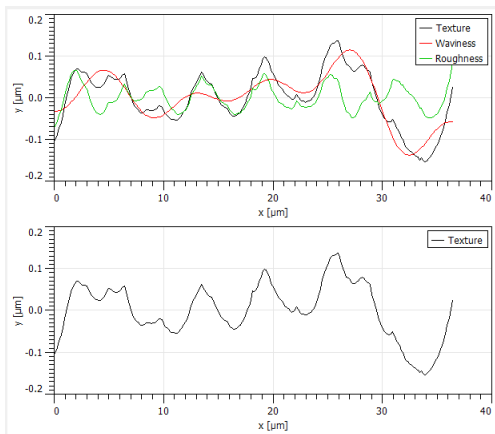
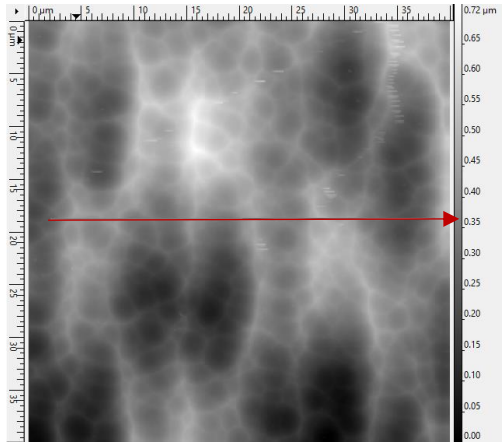
AFM image



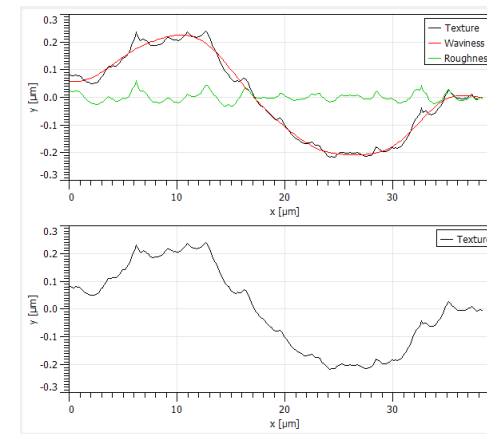
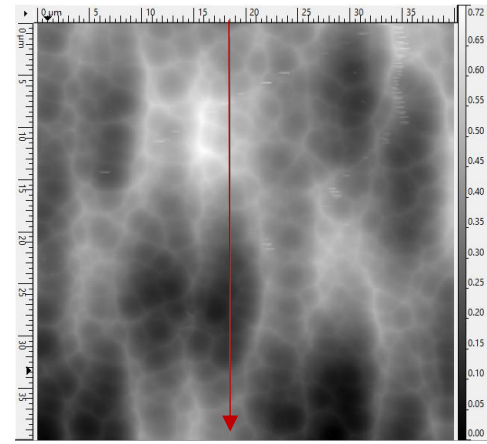
3D topography

(Case study 1)

Example 2: Roughness parameter calculations

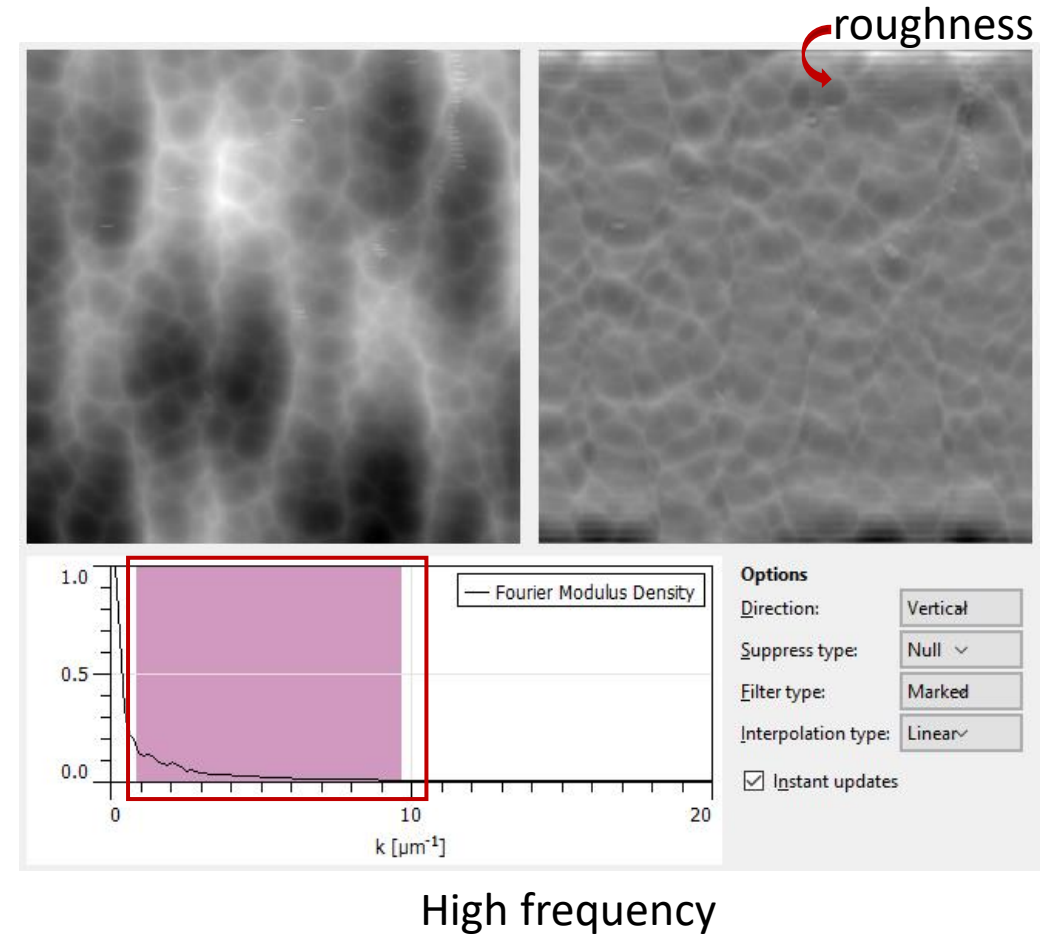
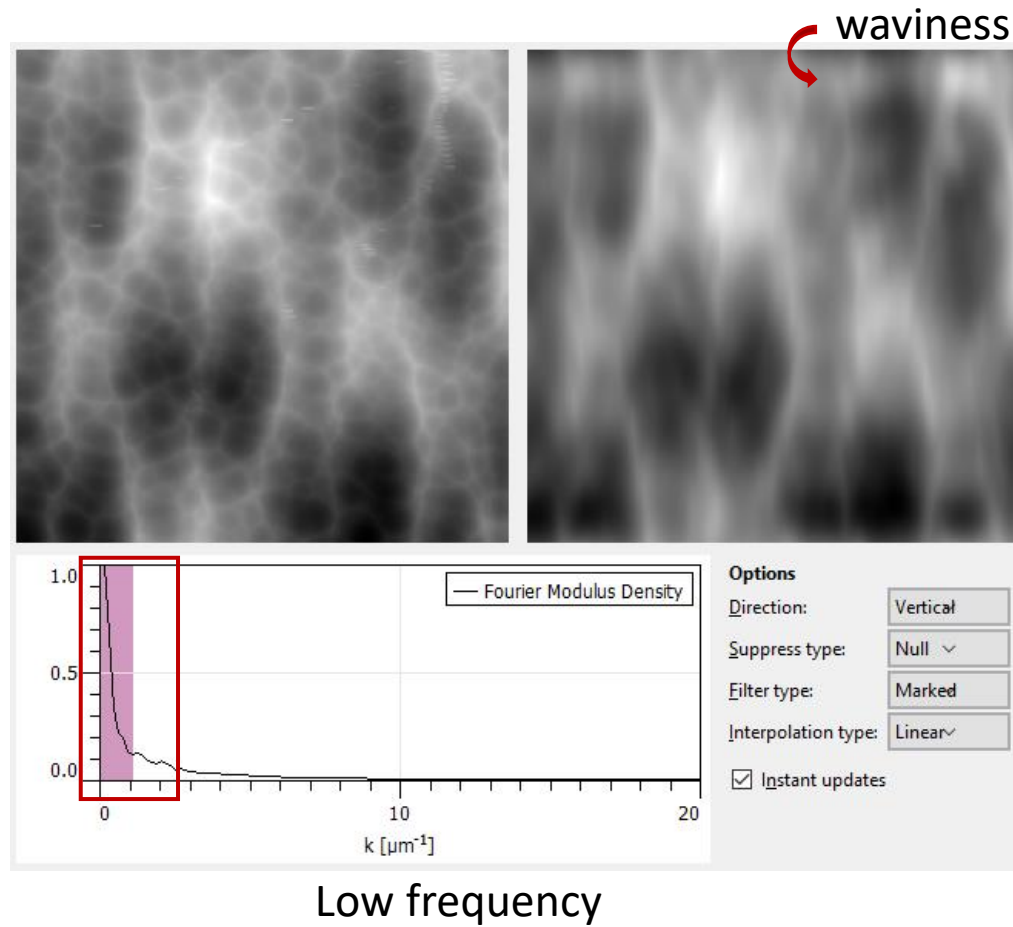


Horizontal texture

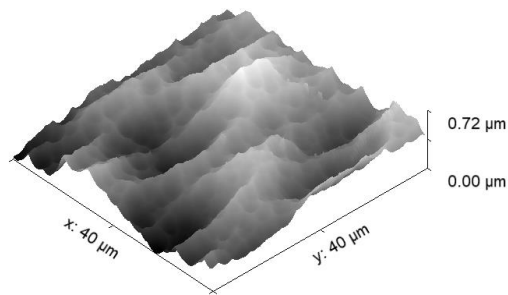


Vertical texture

Example 2: 1D FFT filtering (vertical)



Example 2: 2D FFT filtering



3D topography before FFT masking

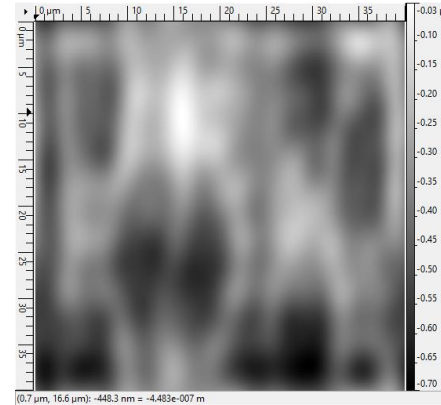
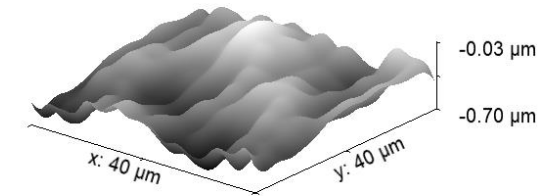
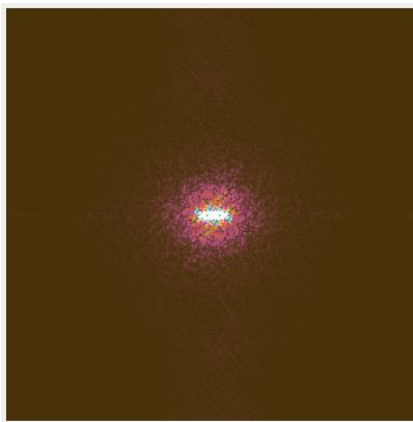


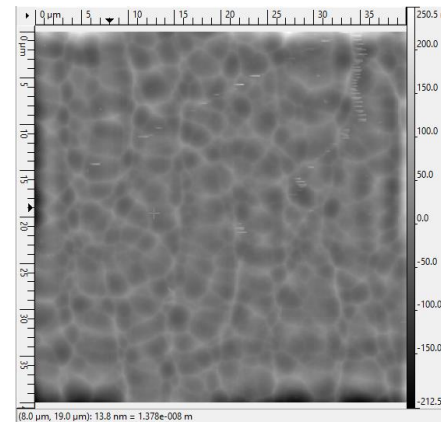
Image differences



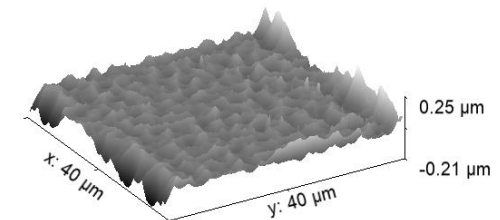
3D topography of image differences



FFT masking



Filtered image



3D topography after masking