Background:

- Atomic Force Microscopy was used to identify the surface features.
- Rectangular features were observed with changing lateral size.
- Gwyddion, R-Studio, and ImageJ were used to explore the 3D films were 60 unit cell size thick (above t_{(Nd,Li)TiO_3}).
- Critical thickness is a function of cooling rate.
- Films were smooth on the surface up to above a critical thickness (t_c).

Motivation:

- Associated with lattice and thermal expansion mismatch.
- Control of such self-assembly in epitaxial films by using the strain system forms checkerboard structures by self assembly in thin films deposited by Pulsed Laser Deposition were cooled at different rates following deposition ranging from 2°C/min to 14°C/min.
- Different height levels in order to determine possible mechanisms and kinetics of feature formation as a function of cooling rate.

Results of Second Peak Analysis:

- Histograms generated in R-Studio indicate bimodal height distribution at all cooling rates.
- Background indicated by first bin removed from further processing.
- Pixel intensity represents height in the AFM images.
- Further analysis examines each “peak” of histogram separately.
- Second peak analysis is focused on “islands” identified as highest part of image.

Objectives:

- Determine trends in size, shape, and distribution of surface features at different height levels in order to determine possible mechanisms and kinetics of feature formation as a function of cooling rate.

Future Work:

- Quantification of effect of segmenting versus not segmenting images.
- Analysis of more images.

Conclusions:

- 6 °C/min cooling rate maximizes area, aspect ratio, and average Voronoi distance of second peak islands and has fewer islands.
- Longer cooling rates results in increased number of small, more closely packed islands.
- First peak is mix of new features and of sloping from highest islands.