Oscillation-induced Static Deflection in SFM

Oscillation-induced Static Deflection in SFM: L.-O. Heim and D. Johannsmann from the Max Planck Institute for Polymer research, Mainz and the Clausthal University of Technology, Clausthal-Zellerfeld, Germany, employed an atomic force microscope (AFM) in conjunction with a quartz crystal microbalance in order to investigate how a high-frequency lateral oscillation of the substrate influences the imaging process of the AFM. After characterization of the effects they demonstrated a mode of imaging based on it. The oscillation was periodically interrupted at a rate of 73 Hz and the corresponding periodic modulation of the deflection was filtered and amplified using lock-in amplifiers. Slowly scanning the sample and displaying the outputs of the lock-in amplifiers versus x and y produced an image of the oscillation-induced static (OIS) deflection. They show that the vertical OIS deflection scaled linearly with amplitude and that the OIS deflection was stronger on the sloped portions than on the flat ones, suggesting a geometric interpretation that they termed "cobble stone effect". Experiments in liquids lead them to rule out hydrodynamic forces as dominating factors.