

Electronic Supplementary Information

Mapping mechanical properties of living cells at nanoscale using intrinsic nanopipette-sample force interaction

Vasilii S. Kolmogorov^{*a,b}, Alexandr S. Erofeev^{a,b}, Emily Woodcock^{d,h}, Yuri M. Efremov^c, Aleksei P. Iakovlev^a, Nikita A. Savin^a, Anna V. Alova^b, Svetlana V. Lavrushkina^b, Igor I. Kireev^b, Alexandra O. Prelovskaya^a, Elena V. Sviderskaya^h, Denis Scaini^d, Natalya L. Klyachko^b, Peter S. Timashev^{c,b,f,g}, Yasufumi Takahashiⁱ, Sergey V. Salikhov^a, Yuri N. Parkhomenko^a, Alexander G. Majouga^{a,b,e}, Christopher R.W. Edwards^d, Pavel Novak^{a,d}, Yuri E. Korchev^{a,d}, Petr V. Gorelkin^{*a,b}

a. National University of Science and Technology “MISiS”, 4 Leninskiy prospekt Moscow, 119049, Russian Federation. E-mail: vskolmogorov@misis.ru, erofeev.as@misis.ru, gorelkin.pv@misis.ru

b. Lomonosov Moscow State University, GSP-1, Leninskie Gory, Moscow, 119991, Russian Federation

c. Sechenov University, 8-2 Trubetskaya str., Moscow, 119992, Russian Federation

d. Imperial College London Department of Medicine, London W12 0NN, United Kingdom. E-mail: y.korchev@imperial.ac.uk

e. D. Mendeleev University of Chemical Technology of Russia, Miusskaya pl., Moscow, 125047, Russian Federation

f. FSRCentre “Crystallography and Photonics” of RAS, 59 Leninskiy prospect, 119333, Russian Federation

g. Semenov Institute of Chemical Physics, Kosygina st., 4, Moscow, 117977, Russian Federation

h. St George's, University of London, University Centre, Grenada, West Indies, United Kingdom

i. Nano Life Science Institute (WPI- NanoLSI), Kanazawa University, Kanazawa 920-1192, Japan

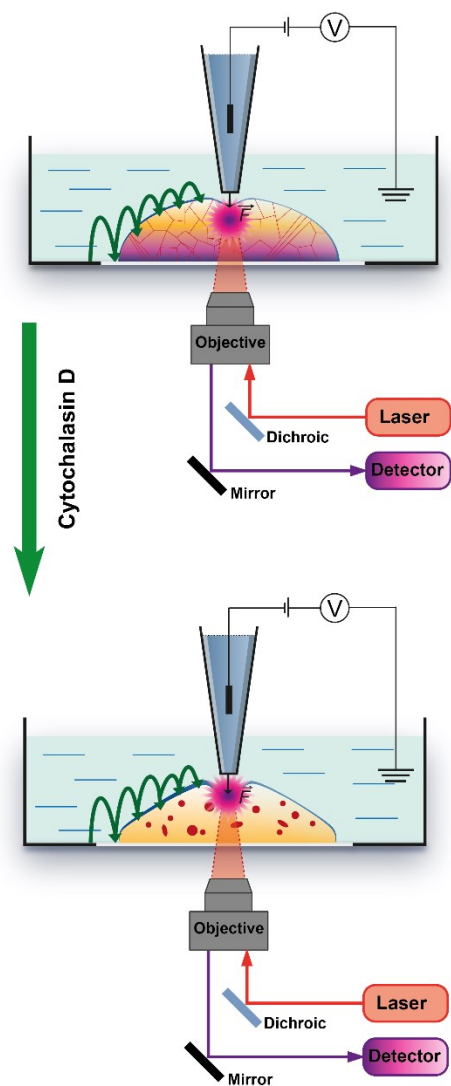


Figure 1S. Experimental setup of correlative QNM and confocal microscopy

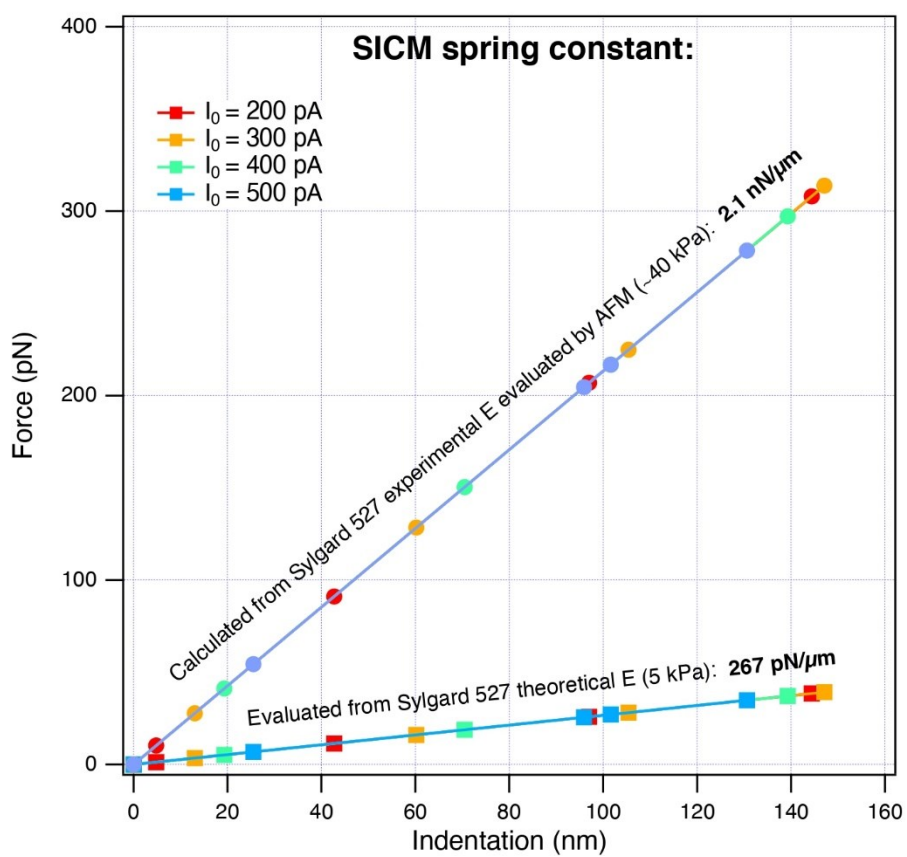


Figure 2S. Force - Indentation curves on Sylgard – 527 polymer for SICM and AFM

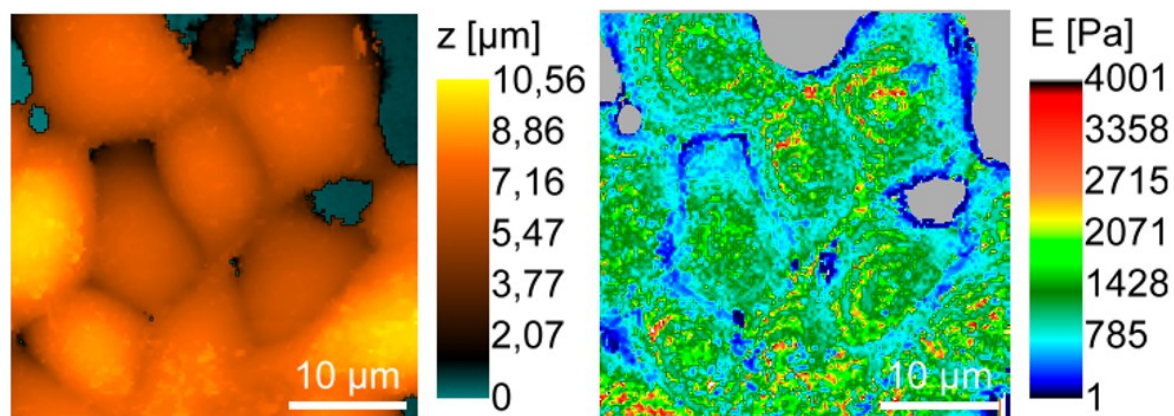


Figure 3S. left - SICM topography image of living cell (22Rv1), right – QNM map of living cell (22Rv1)

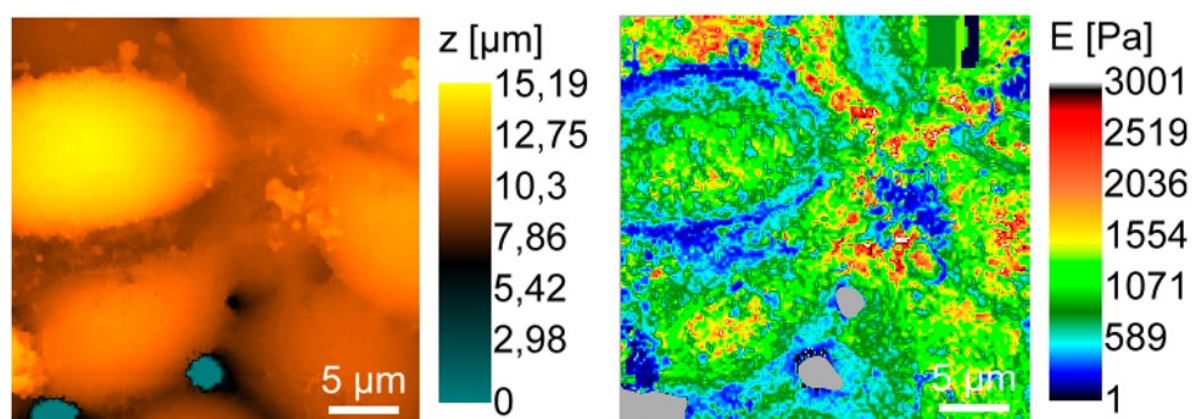


Figure 4S. left - SICM topography image of living cell (LNCap), right – QNM map of living cell (LNCap)

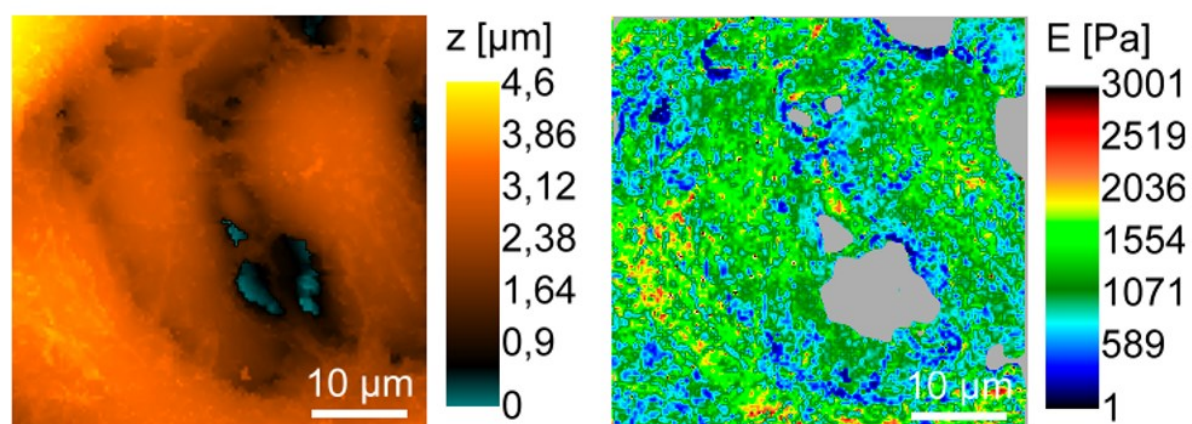


Figure 5S. left - SICM topography image of living cell (4T1), right – QNM map of living cell (4T1).

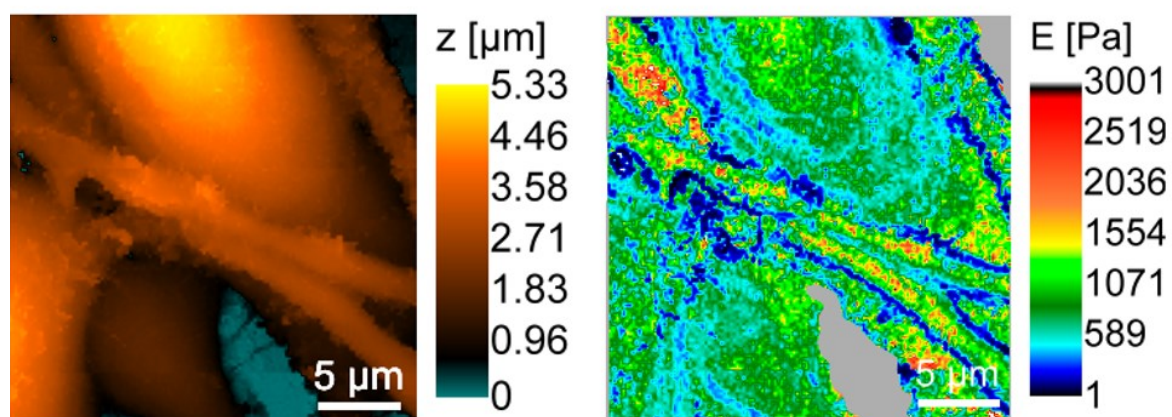


Figure 6S. left - SICM topography image of living cell (B16), right – QNM map of living cell (B16)

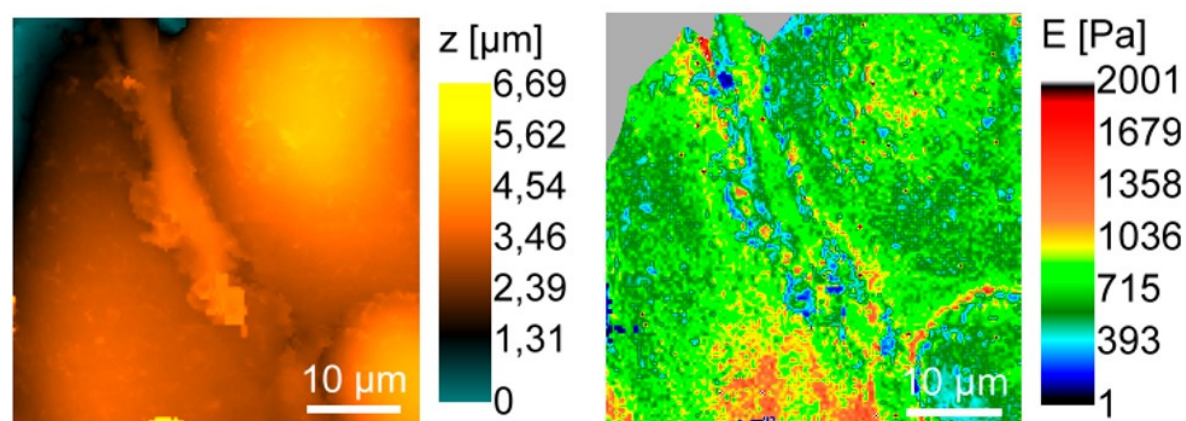


Figure 7S. left - SICM topography image of living cell (CT26), right – QNM map of living cell (CT26)

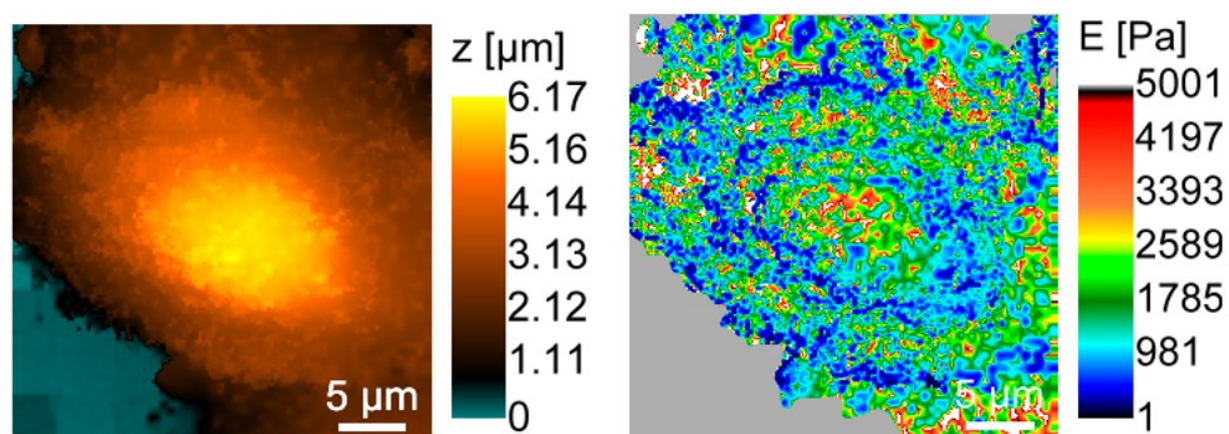


Figure 8S. left - SICM topography image of living cell (HT1080), right – QNM map of living cell (HT1080)

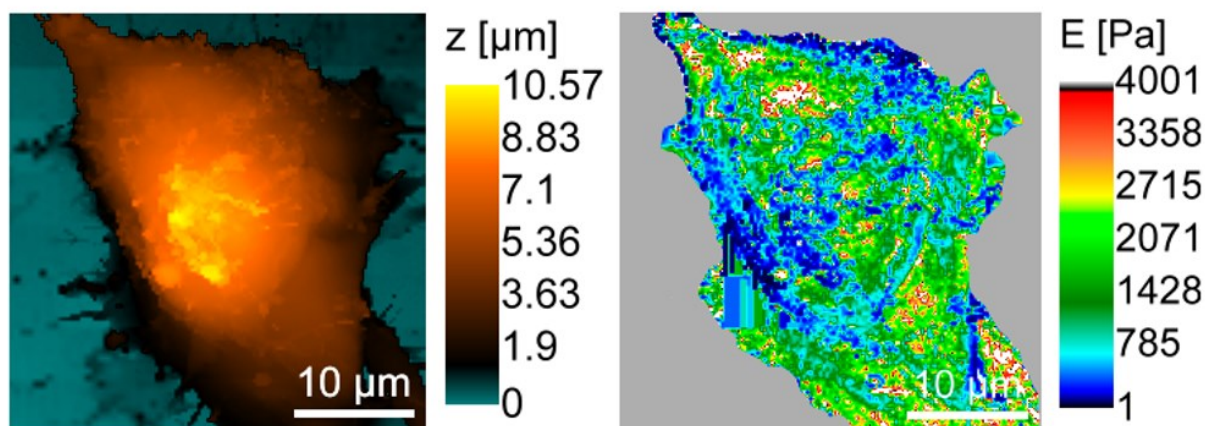


Figure 9S. left - SICM topography image of living cell (SH-SY5Y), right – QNM map of living cell (SH-SY5Y).

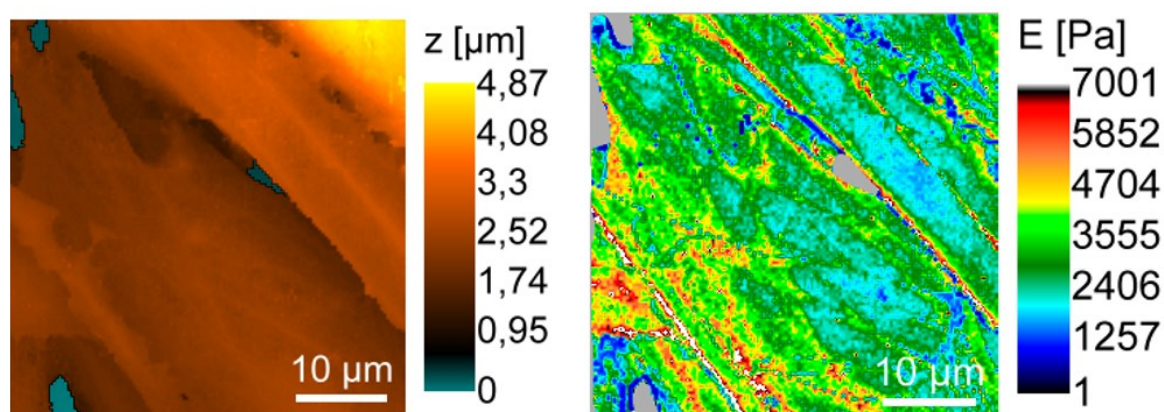


Figure 10S. left - SICM topography image of living cell (SC-1), right – QNM map of living cell (SC-1).

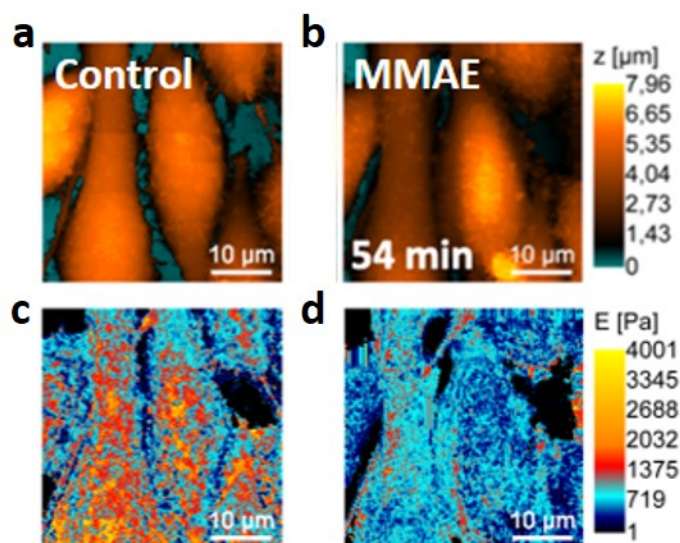


Figure 11S. a - SICM topography image of control PC-3 cell, b - SICM topography image of PC-3 cell after MMAE treatment, c - SICM QNM image of control PC-3 cell right, d - SICM QNM image of PC-3 cell after MMAE treatment

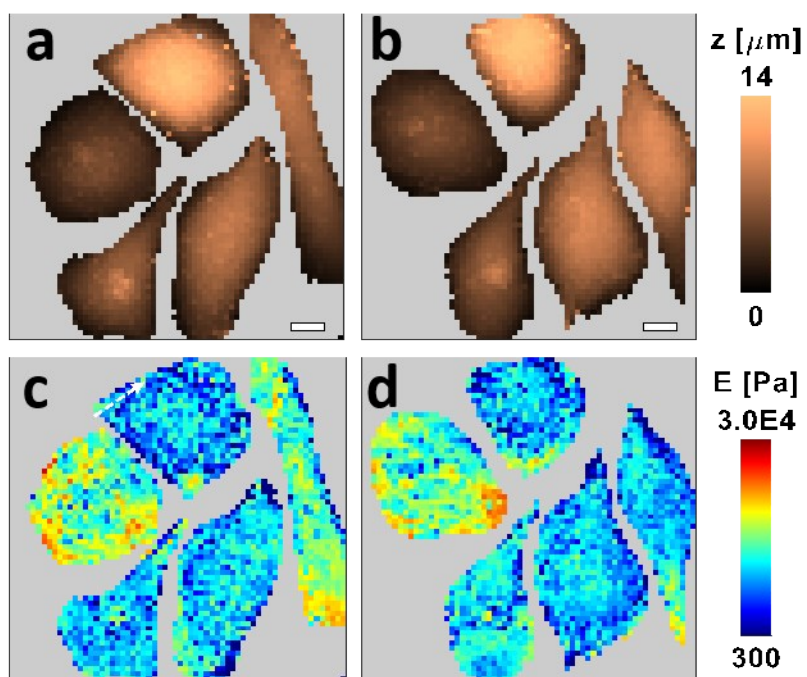


Figure 12S. a - AFM topography image of control PC-3 cell, b - AFM topography image of PC-3 cell after MMAE treatment, c - AFM QNM image of control PC-3 cell right, d - AFM QNM image of PC-3 cell after MMAE treatment

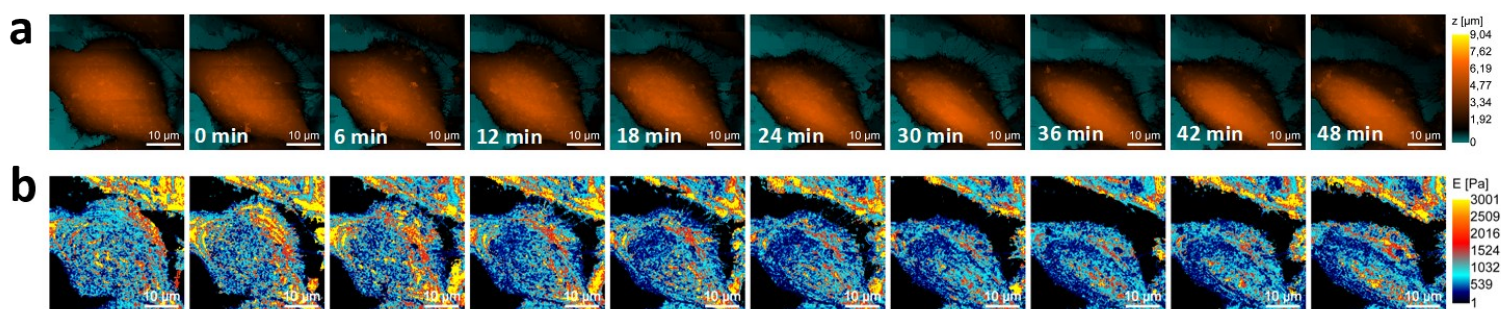


Figure 13S. a- continuous SICM mapping of topography of PC3 cells after Cytochalasin-D (Cyto-D) ($1\ \mu\text{M}$) treatment obtained with SICM, b - continuous mapping QNM of PC3 cells after Cyto-D

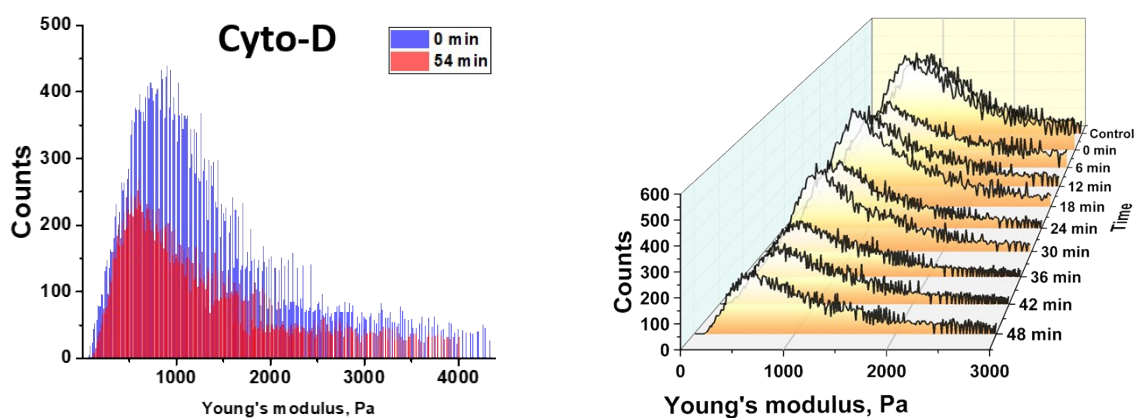


Figure 14S. left - Young's modulus distribution obtained from whole cell mapping of PC-3 cell treated by Cyto-D, right – full Young's modulus distribution obtained from whole cell mapping of PC-3 cell treated by Cyto-D

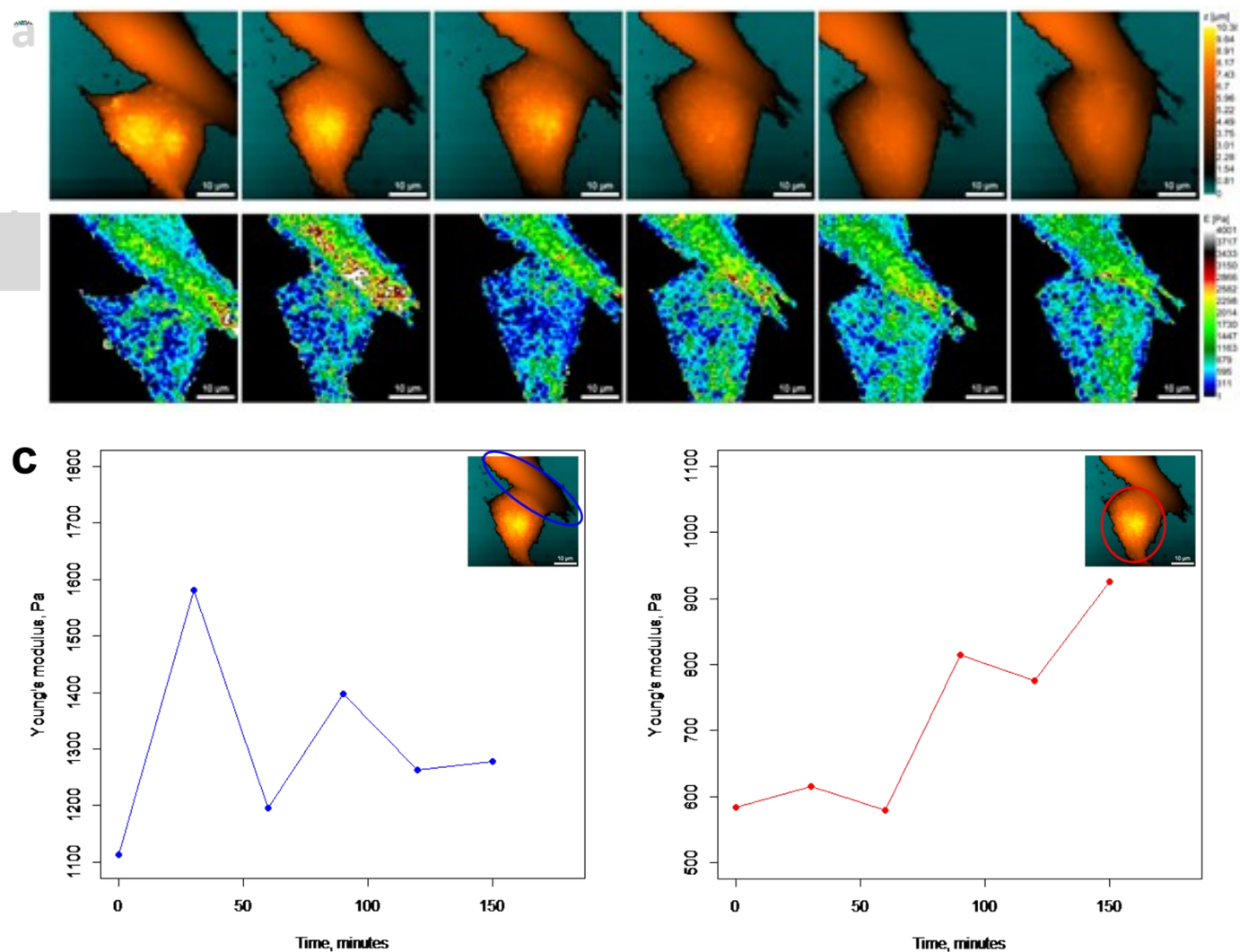


Figure 15S. a- continuous SICM mapping of topography of A375M cells after Paclitaxel (Taxol) (10 nM) treatment obtained with SICM. Taxol was added after the second scan. Scans are approximately 30 minutes apart. b- corresponding continuous mapping QNM of A375M cells following Taxol treatment. c- average cell stiffness (pa) plotted over time to show the effect of Taxol treatment on A375M cell stiffness.