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A Well-Defined STM Image Resulting From Current-Induced Defect Fluctuations: The Butterfly On Si(001):H and Ge(001):H[1] DANIEL SANCHEZ-PORTAL, MADS ENGELUND, Centro de Fisica de Materiales CSIC-UPV/EHU and DIPC, THOMAS FREDERIKSEN, DIPC and IKERBASQUE, Basque Foundation for Science, Bilbao, Spain, SZYMON GODLEWSKI, MAREK KOLMER, RAFAL ZUZAK, BARTOSZ SUCH, MAREK SZYMONSKI, Centre for Nanometer-Scale Science and Advanced Materials (NANOSAM), Jagiellonian Univ., Krakow, Poland — Dangling bond (DB) arrays on Si(001):H and Ge(001):H surfaces can be patterned with atomic precision and exhibit complex and rich physics. Scanning tunneling microscopy (STM) images of DB arrays are often difficult to interpret and simulate. Recently it was shown that low-temperature imaging of unoccupied states of an unpassivated dimer on Ge(001):H results in a symmetric "butterfly"-like STM pattern, despite that the equilibrium dimer configuration is expected to be a bistable, buckled geometry. Here, based on a thorough characterization of the low-bias switching, we propose a new imaging model featuring a dynamical two-state rate equation.[1] On both Si(001):H and Ge(001):H, we can reproduce the observed features, which strongly corroborates that the patterns arise from fast switching events and provides insight into the relation between the tunneling current and switching rates. We envision that our imaging model can be applied to simulate other bistable systems. [1] M. Engelund et al., Phys. Chem. Chem. Phys. 18, 19309-17 (2016) doi: 10.1039/c6cp04031d.

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