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High-resolution imaging of interfacial water by noncontact atomic force microscopy.[1] JINBO PENG, Peking University, JING GUO, School of Physics, Peking University, PROKOP HAPALA, In stitute of Physics, Academy of Scie nces of the Czech Republic, DUANYUN CAO, School of Physics, Peking University, PAVEL JELNEK, In stitute of Physics, Academy of Scie nces of the Czech Republic, LIMEI XU, ENGE WANG, YING JIANG, School of Physics, Peking University, COLLABORATIVE INNOVATION CENTER OF QUANTUM MATTER COLLABORATION — Resolving the hydrogen-bonding configuration of water on the solid surfaces with atomic-scale precision is crucial in water science yet it remains challenging. Recently we have shown the possibility of attacking this problem by STM based on the submolecular orbital imaging of water. However, STM mainly probes the spatial distribution of the density of states near the Fermi level, thus is not sensitive to the chemical structure of molecules. Here we report the ultrahigh resolution imaging of water molecules on a NaCl film by NC-AFM, which enables us to determine the topology of hydrogen-bonding network in unprecedented details. Comparison with the theoretical simulations reveals that the sharp features in the AFM images result from the relaxation of the tip apex mainly due to the electrostatic force between the tip and the water molecules. Our results shed new light on the underlying mechanism of the ultrahigh imaging with NC-AFM and highlight the importance of electrostatics in the imaging of polar molecules such as water.

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