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Double Ionization of Water in Strong NIR Fields[1] GREG MCCRACKEN, Stanford University, Department of Applied Physics, PULSE Institute, CHELSEA LIEKHUS-SCHMALTZ, ANDREAS KALDUN, Stanford University, Department of Physics, PULSE Institute, PHILIP BUCKSBAUM, Stanford University, Department of Physics, Department of Applied Physics, PULSE Institute — Strong field ionization of molecules is more complex than its atomic counterpart due to nuclear motion. This is particularly true in a molecule such as water, which has vibrational half periods on the order of a few optical cycles. In this work, we study the double ionization of H_2O in 40 fs, 800 nm pulses at intensities ranging from 10^{14} W/cm^2 to 10^{15} W/cm^2. Single OH+-H+ dissociations are fully reconstructed using a time and position sensitive ion detector in ultra-high vacuum. We build a 2D map of the kinetic energy release and angular distribution of the dissociation. The map reveals a wealth of different ionization pathways including tunnel ionization from multiple orbitals, bond softening, and enhanced ionization. The fast unbending of the water molecule caused by some pathways is also apparent in rovibrational structure of the OH+ fragments seen in the 2D map.

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Greg McCracken
Stanford University, Department of Applied Physics, PULSE Institute

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