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Method development for ultrafast correlated electron dynamics

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Describing the correlated dynamics of electrons is a major goal of modern molecular physics. With attosecond and strong-field probes, these correlated dynamics are now being investigated on their natural timescales. These investigations are frequently understood with the aid of computational solutions of the time-dependent Schrödinger equation, but this is intractable for molecules larger than diatomics. Quantum chemistry can describe correlation well, but due to the localized basis functions they use it struggles to deal with the ionization that these laser pulses necessarily induce. I will describe recent developments using overset grids, which adapt to molecular geometries and describe ionization accurately and compactly. Through the use of effective orbital spaces, I will show how we can use overset grids to describe correlated electronic dynamics.