Recent observations in Extreme Ultraviolet (EUV) by the Solar Dynamics Observatory (SDO)/Atmospheric Imaging Assembly (AIA), provide ample evidence of fast magnetosonic waves in the solar corona. Global EUV waves are associated with major Coronal Mass Ejections (CMEs) and flares, appear to traverse the whole solar corona at speeds of up to ~2000 km/s for the strongest events (associated with X-class flares) with possible evidence of shocks. The waves produce reflections from coronal hole regions, and secondary fast magnetosonic waves in coronal active region magnetic structures. Fast quasi-periodic wave trains are also produced by the CME bubbles as well as by localized smaller C-class flares in active region magnetic funnels. Coronal loops oscillations are often observed in association with these events and can be used for coronal magnetic seismology. The observed waves exhibit nonlinear steepening and carry significant energy flux that can heat the solar corona to millions of degrees. Nonlinear waves were also observed as a result of magnetized fluid instabilities, such as the Kelvin-Helmholtz instability associated with CME and jet eruptions. I will present an overview of the fast EUV waves observations in the solar corona and the associated energy release events in the solar corona. I will discuss the propagation reflection, and dissipation of these waves, as well as the effects of nonlinearity. I will present the results of realistic 3D MHD modeling of the fast magnetosonic waves aimed at understanding these complex phenomena and show what can be learned on the properties of coronal plasma from these waves.