CORE-CM SEMINAR
Michigan State University — Department of Chemistry

Prof. Andrei Tokmakoff
University of Chicago

Ultrafast dynamics of hydrogen bond networks in water from broadband infrared spectroscopy

Water's physical properties and unique abilities to influence chemical reactions originates in its dynamical hydrogen bond network. We have investigated the strong and rapidly evolving interactions between water molecules and how hydrogen bonding networks influence the mechanism of proton transfer in strong acids and bases. These studies are performed with a new ultrafast broadband mid-infrared light source that allows one to probe the entire mid-infrared vibrational spectrum with <70 femtosecond time resolution. These studies reveal highly mixed inter- and intra-molecular vibrations in the neat liquid. In aqueous acids, excess protons give rise to a continuum absorption in the mid-infrared that is largely featureless and spans over 2000 cm^{-1}. This continuum arises from the absorption of protons whose potentials vary from weakly anharmonic to double well, and can be related to solvated proton configurations from hydronium (or Eigen complex) to Zundel complex. Rapid interchange between proton configurations is also thought to lead to the observed line-broadening. Our experiments provide insight into aqueous proton complexes in water and the dynamics of the water that mediates their transport.

Thursday, March 27, 2014
12:00 PM
Room 1400 – BPS
Professor Jim McCusker – Host

Accommodations for persons with disabilities may be requested by calling the Chemistry Department at (517) 355-9715, X345 two days prior to the event to ensure sufficient time to make arrangements. Requests received after this date will be met when possible.