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Contr. Talk 6 - Anomalous and anisotropic diffusion of hydration water in fluid lipid membranes

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We report on diffusion of hydration between phospholipid membranes using incoherent quasi-elastic neutron scattering (QENS) and computer simulations [1]. The combination of a well-aligned stack of DMPC membranes with the large, 2-dimensional detectors available at the neutron spectrometer Let (ISIS, UK) allows for simultaneous access to water motions lateral and perpendicular to the membranes. The resulting 2-dimensional maps of relaxation time and stretching exponent evidence anomalous (sub-diffusive) and anisotropic diffusion of membrane hydration water varying on nanometer distances. By combining molecular dynamics and coarse-grained Brownian dynamics simulations, the overall behavior is reproduced, and the apparent features can be linked back to an intrinsic sub-diffusivity of water at picosecond time scales, and the anisotropy of confinement and local dynamical environments.

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