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- Single molecule dynamics: Ergodicity breaking; time averages; anomalous diffusion; transport through nano-channels.
- Single molecule spectroscopy: Photon counting statistics; frequency resolved single molecule spectroscopy; spectral diffusion.
- Critical transitions: Effects of quenched disorder on critical transitions in pattern-forming systems; effects of localized states on critical transitions in spatially extended systems; early-warning signals for critical transitions.
- Stochastic processes in geophysical fluid dynamics: The relation between wind statistics and open ocean currents; wave turbulence.
- Climate dynamics: Improvement of climate predictions using learning algorithms; quantifying the uncertainties in climate predictions and understanding their origin; improving parameterization of unresolved processes by learning model past performances.