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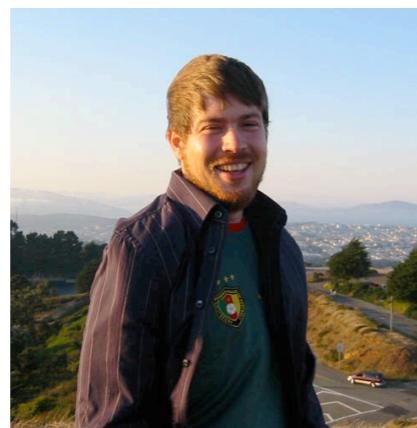
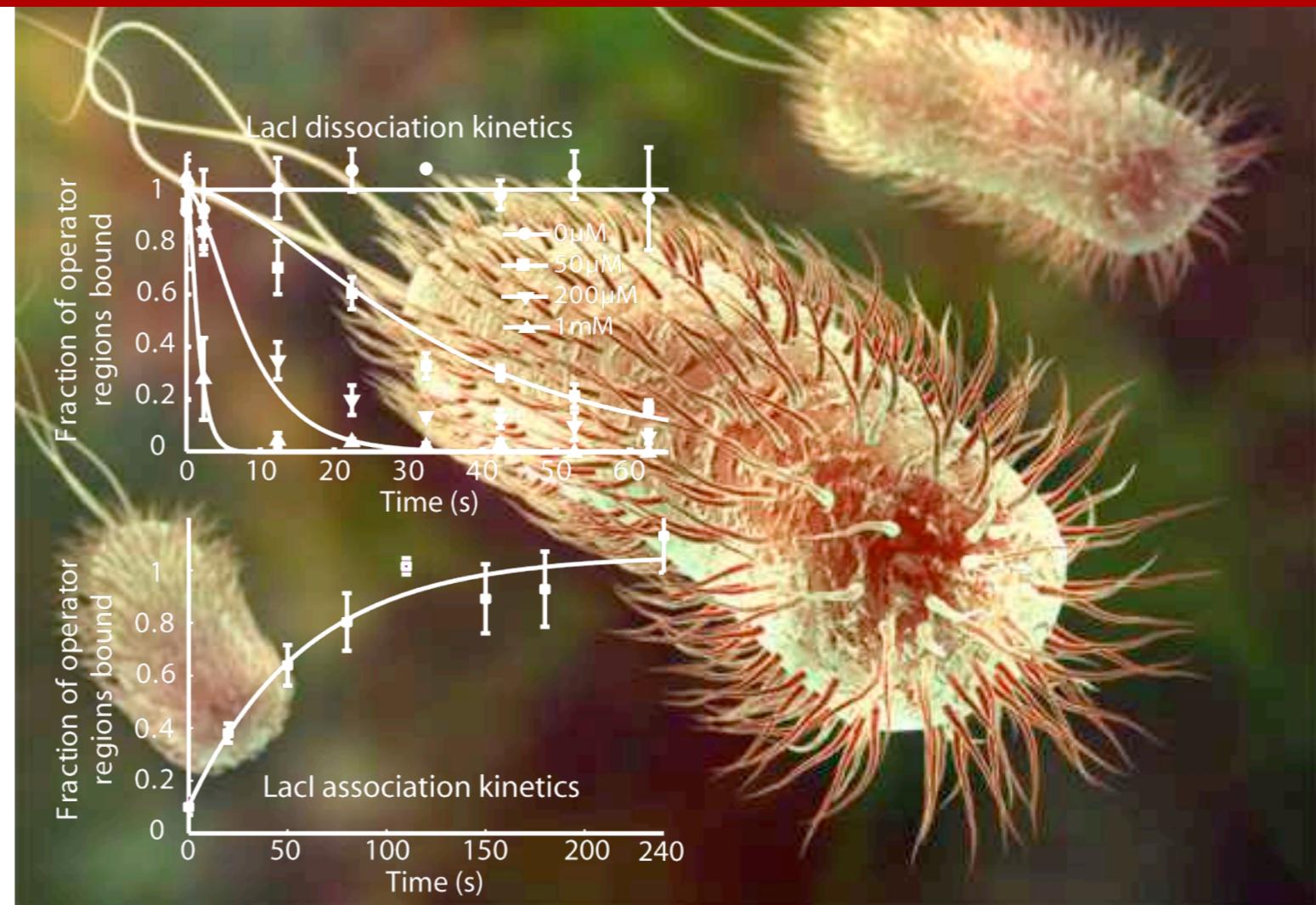
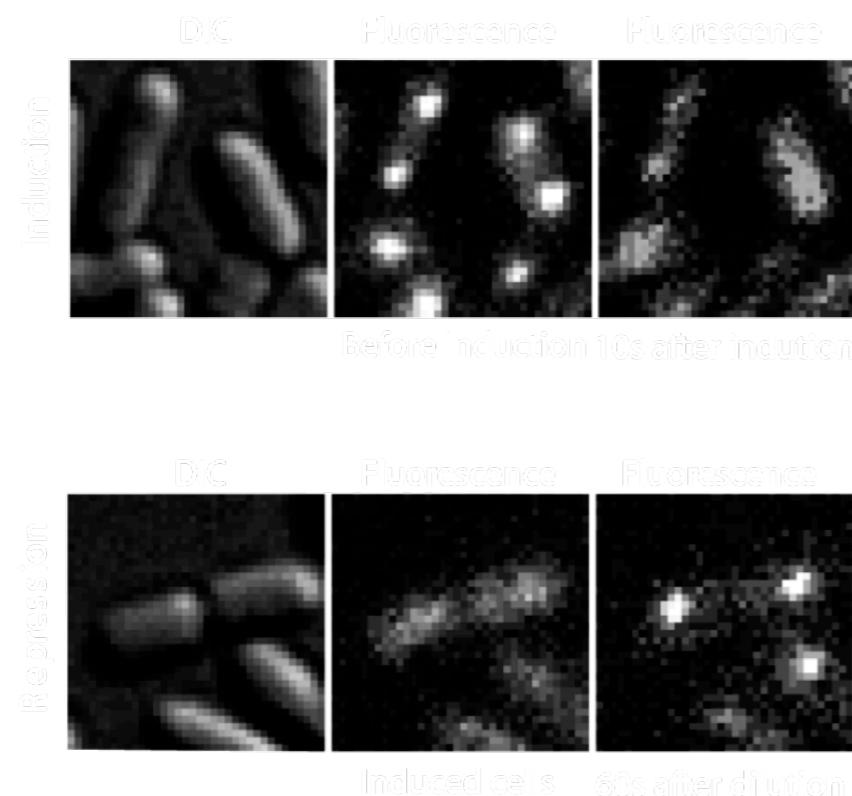
# THE VALIDITY OF THE REACTION-DIFFUSION MASTER EQUATION IN 1, 2 AND 3 DIMENSIONS

Paul Sjöberg  
Uppsala University, Sweden  
Department of Cell & Molecular  
Biology



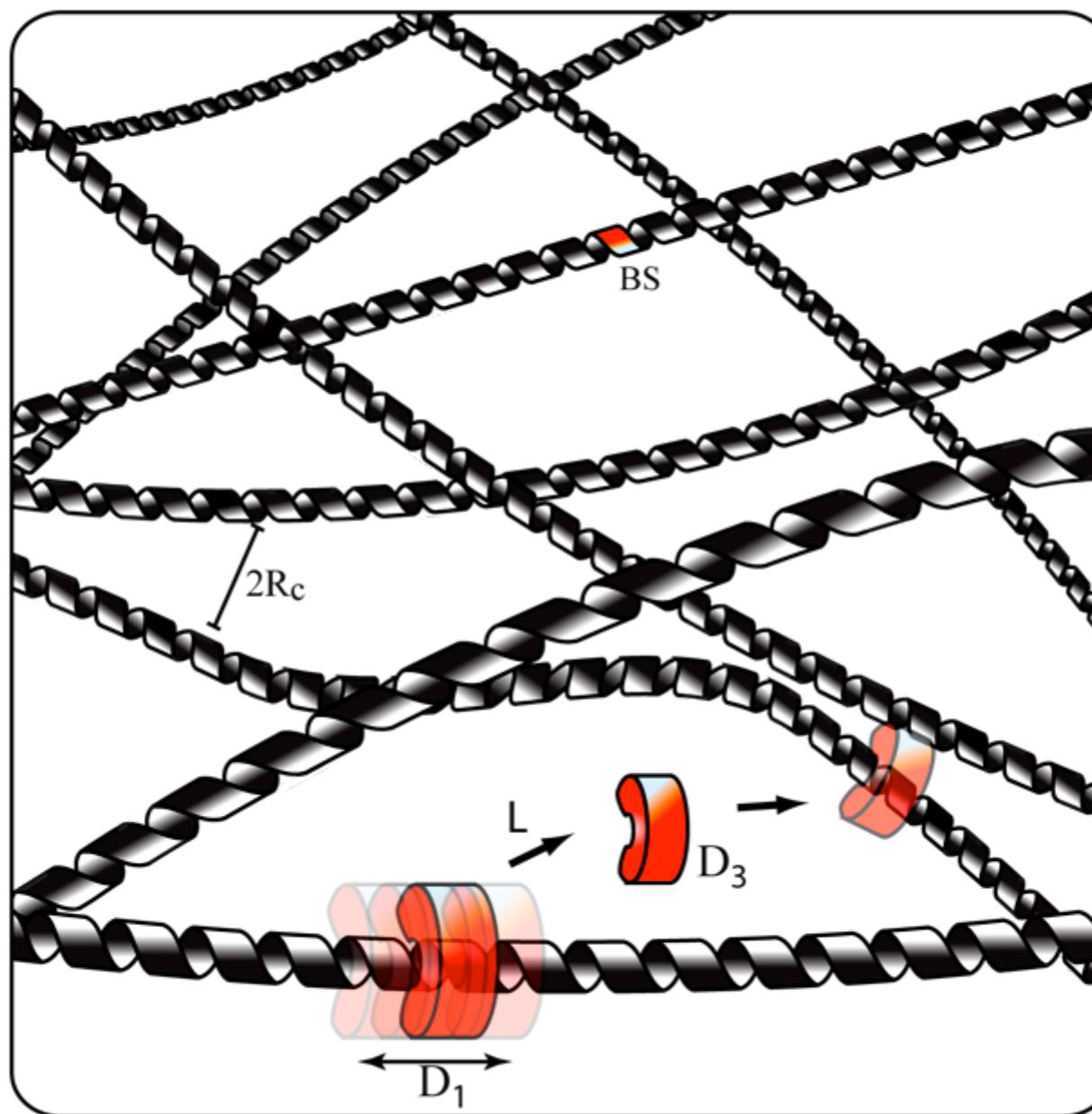
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# Elf Lab





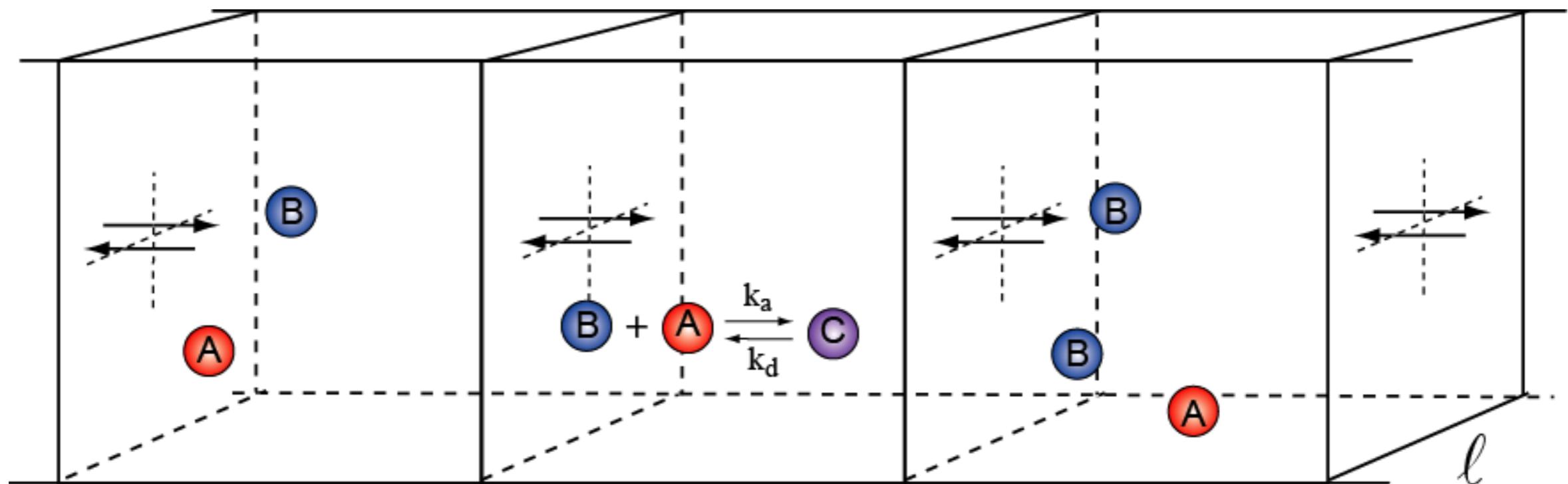
# Search problem of transcription factors





# Stochastic simulation of reactions and diffusion

Stochastic Simulation Algorithm  
Kinetic Monte Carlo





# MesoRD - Next Subvolume Method

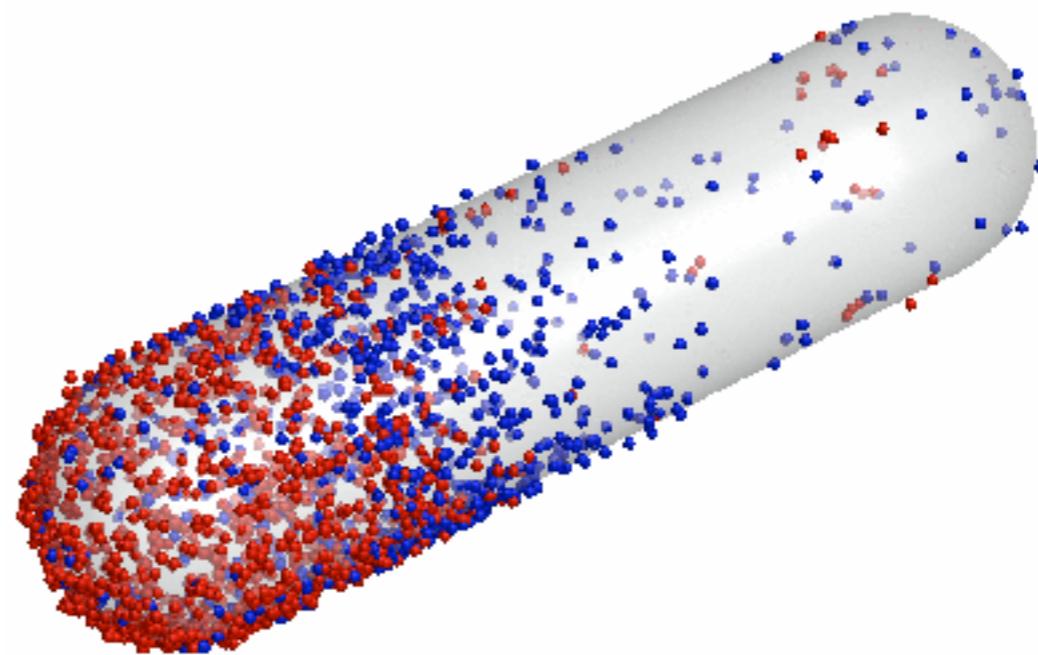
Open Source, downloadable:  
<http://sourceforge.net/projects/mesord/>

[1] David Fange and Johan Elf (2006) Noise induced Min phenotypes in E. coli. PLoS Comp. Biol. link

[2] Johan Hattne, David Fange and Johan Elf (2005) Stochastic reaction-diffusion simulation with MesoRD Bioinfomatics. pdf

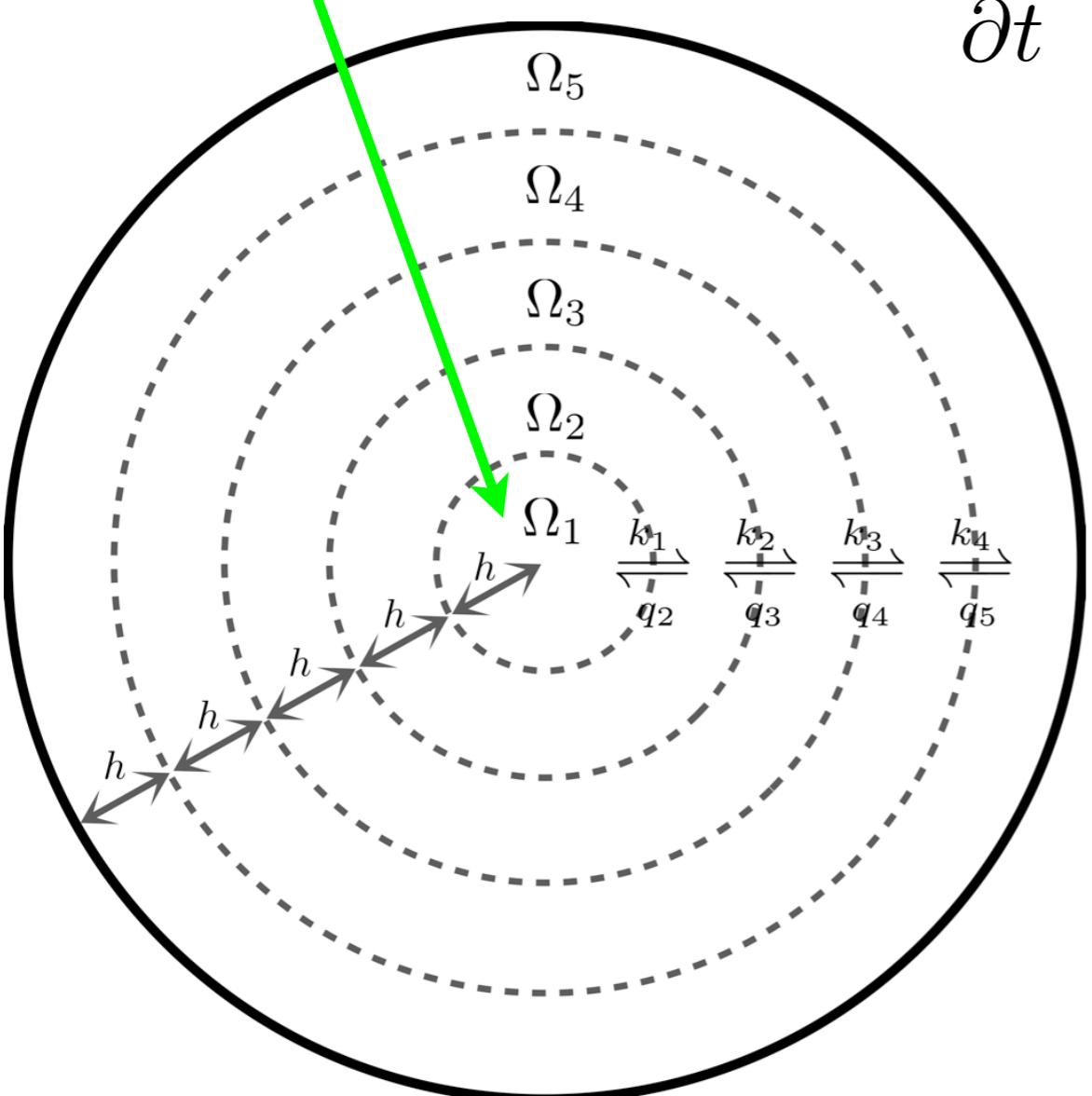
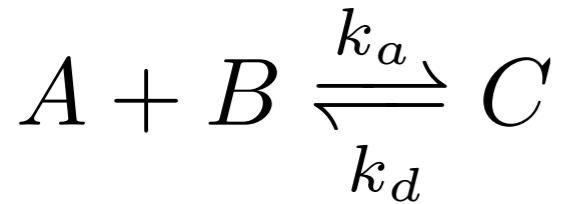
[3] Elf and Ehrenberg (2004) Spontaneous separation of bi-stable biochemical systems into spatial domains of opposite phases Systems Biology 2. pdf, Supplementary material: Next Subvolume Method algorithm

[4] Elf et al. (2003) Mesoscopic reaction-diffusion in intracellular signaling SPIE 5110 114-124 2003. pdf





# Reaction-diffusion in a radial variable



$$\frac{\partial p(r, t)}{\partial t} = D \left( \frac{\partial^2 p(r, t)}{\partial r^2} + \frac{n - 1}{r} \frac{\partial p(r, t)}{\partial r} \right)$$

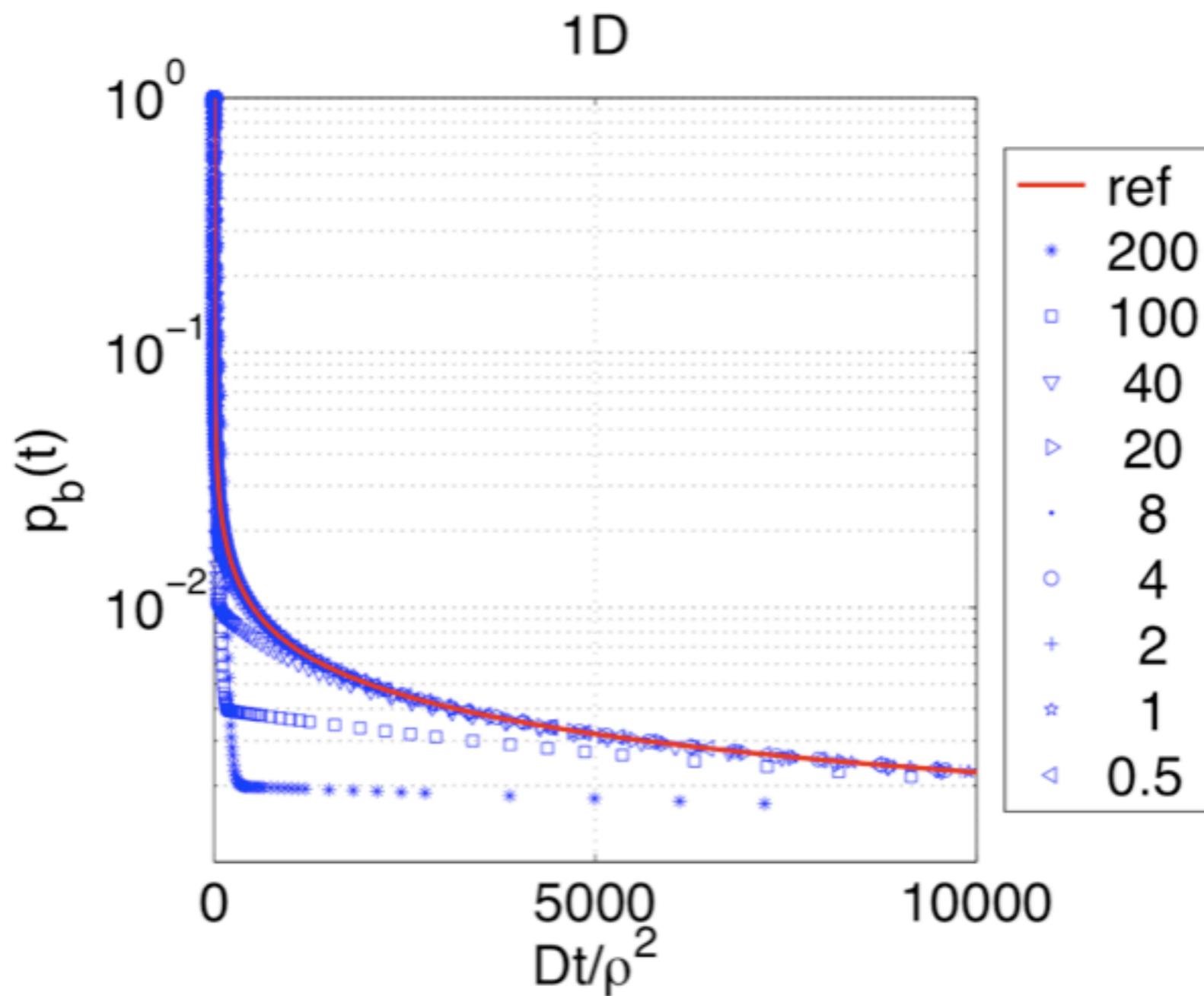
$$\frac{dp_b(t)}{dt} = k_a p(\rho, t) - k_d p_b(t)$$

$$\frac{\partial p(R, t)}{\partial r} = 0$$

$$D \frac{\partial p(\rho, t)}{\partial r} = k_a p(\rho, t) - k_d p_b(t)$$

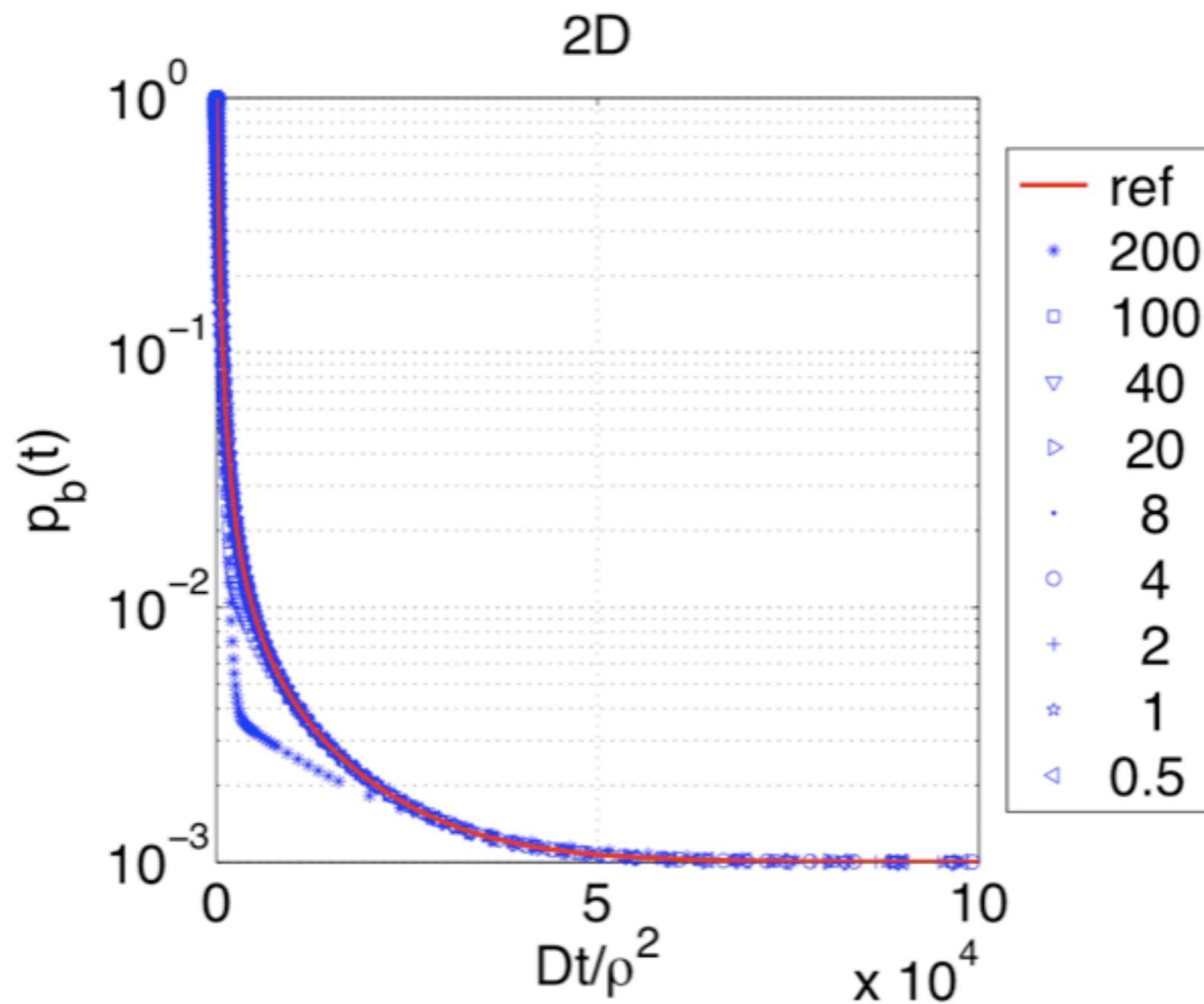


# Matching the rate constants



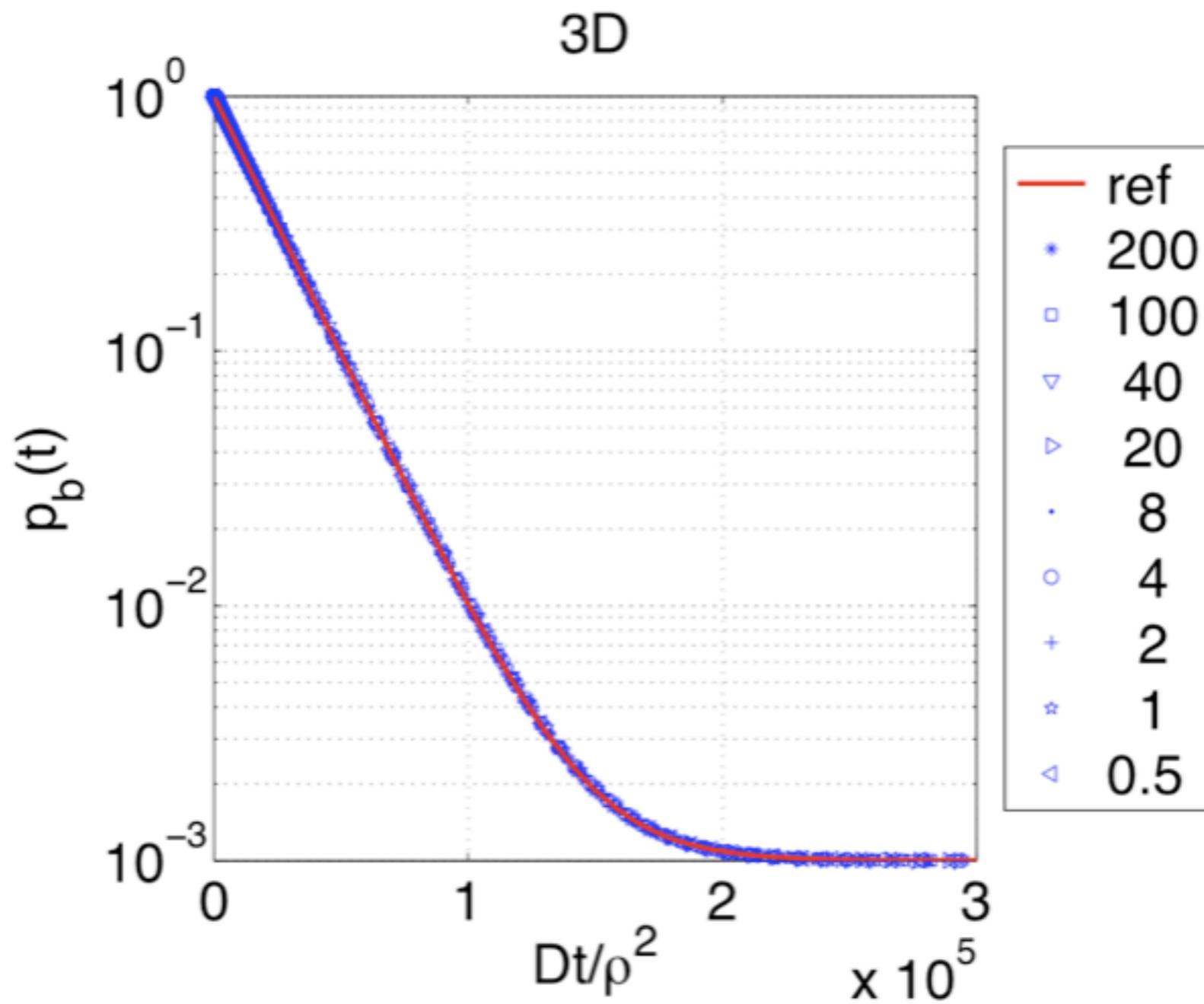


# Matching the rate constants



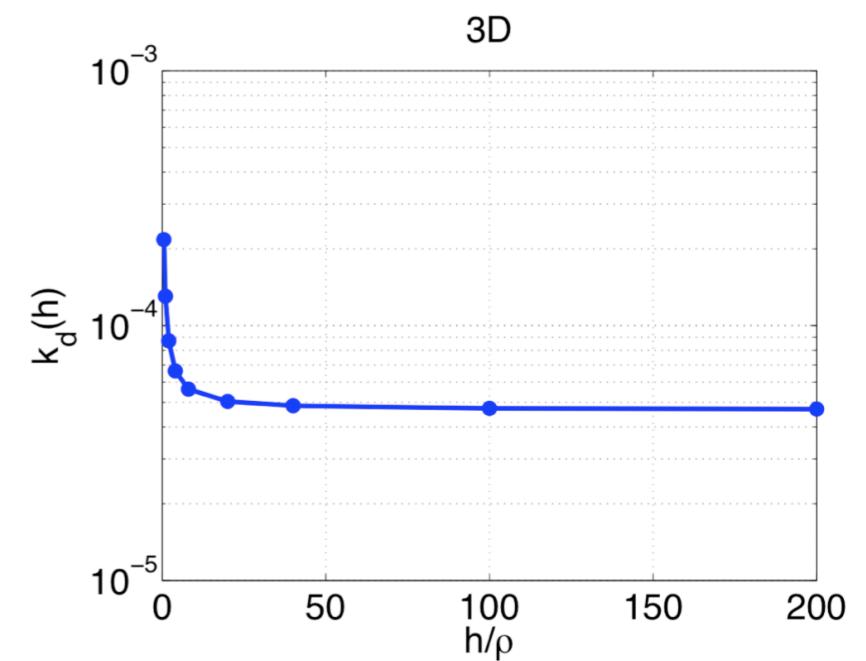
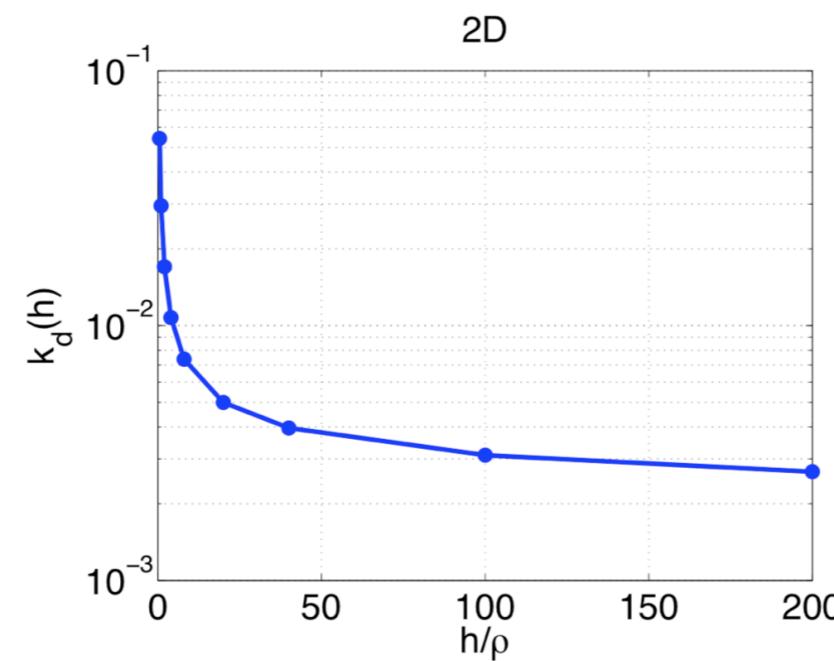
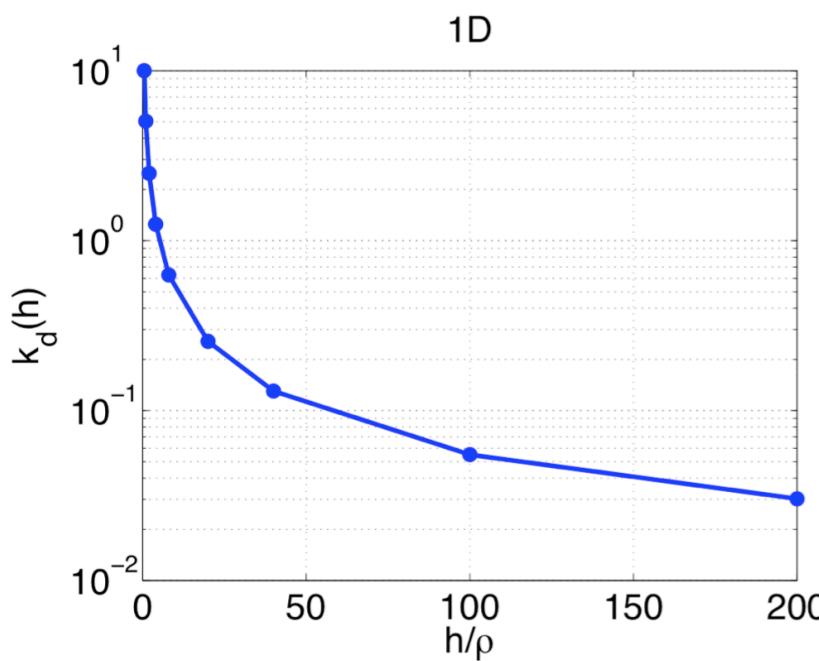


# Matching the rate constants



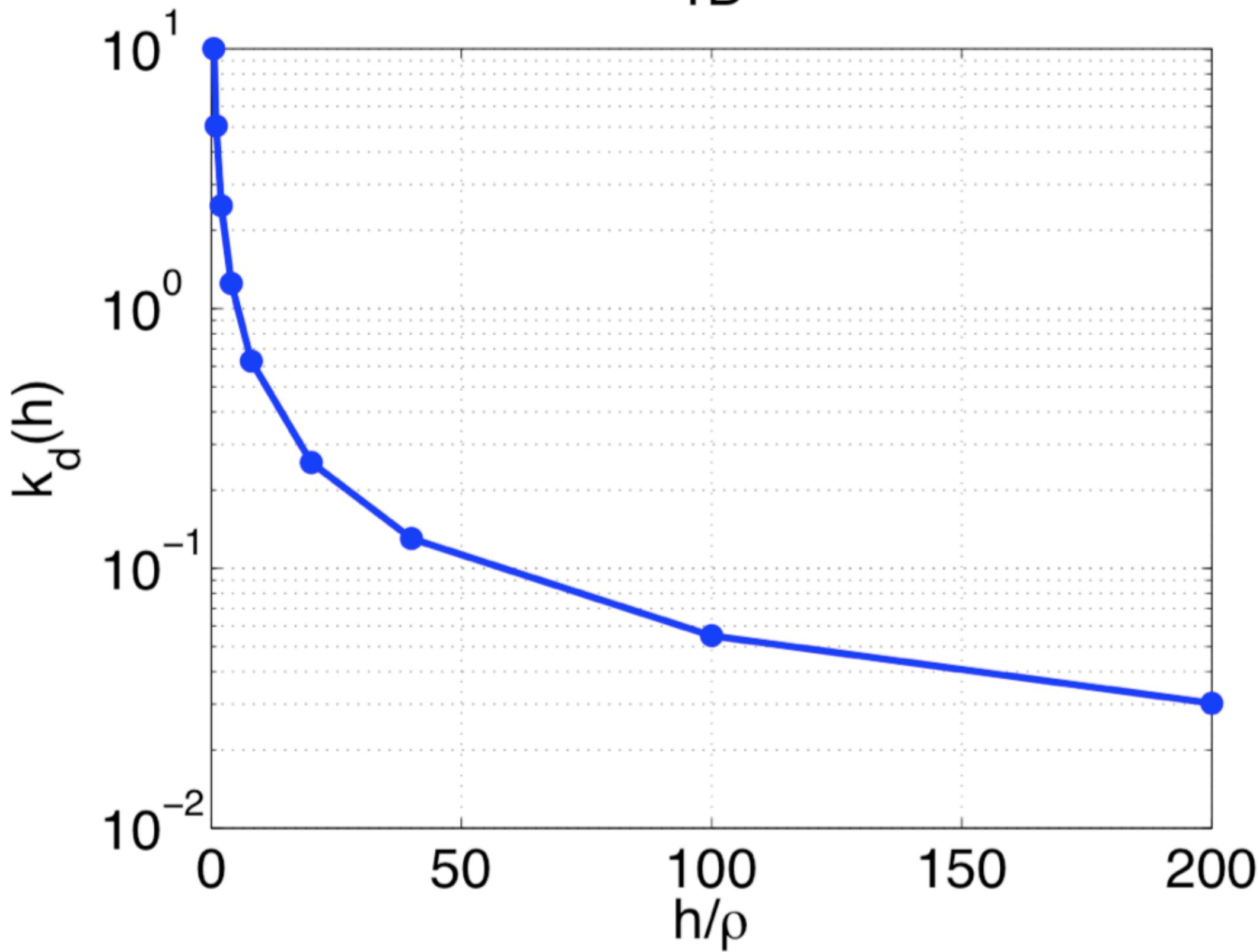


# Correction in rate constants



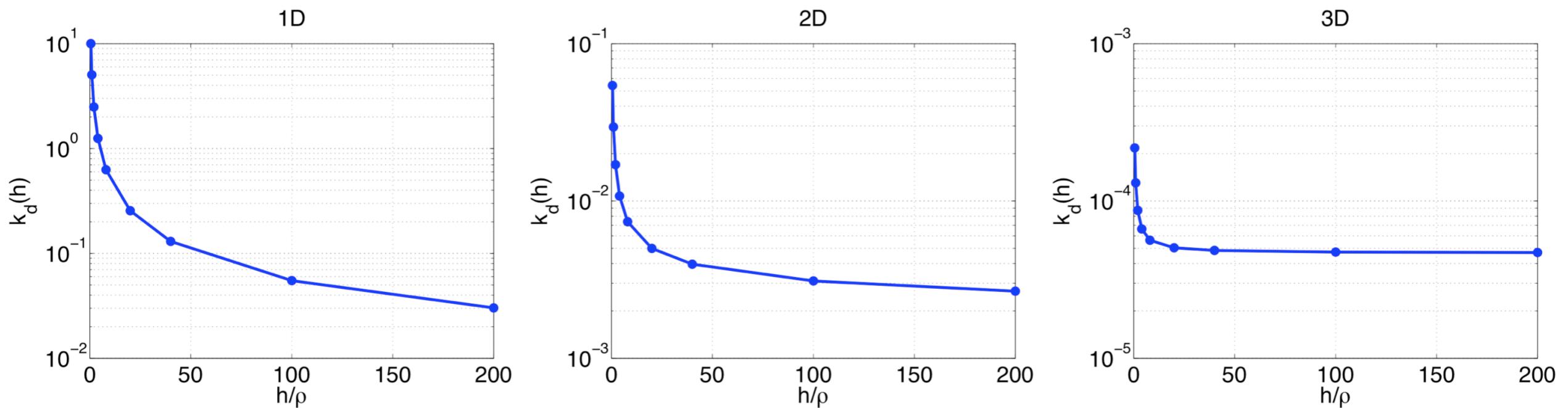


# Correction in rate constants 1D



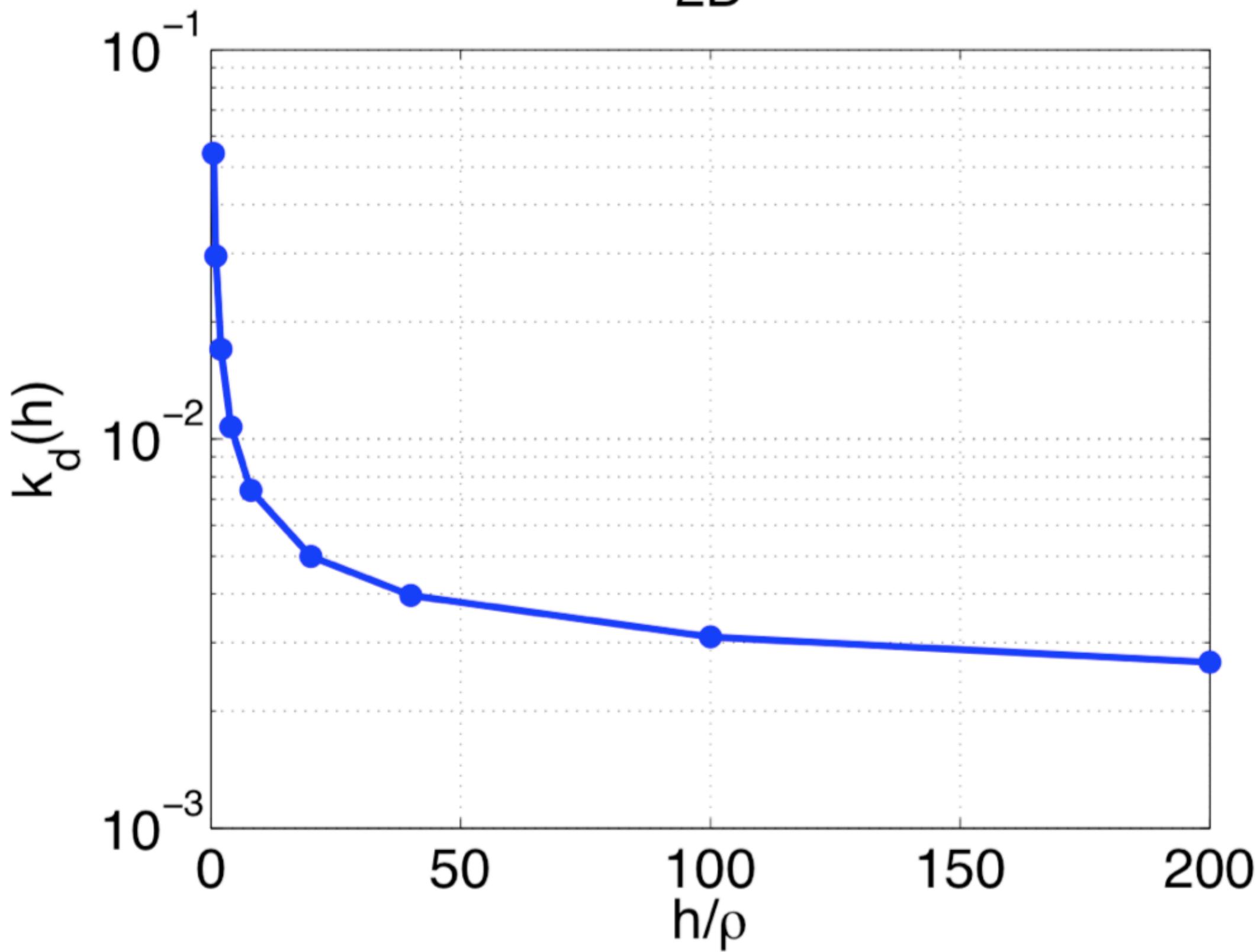


# Correction in rate constants



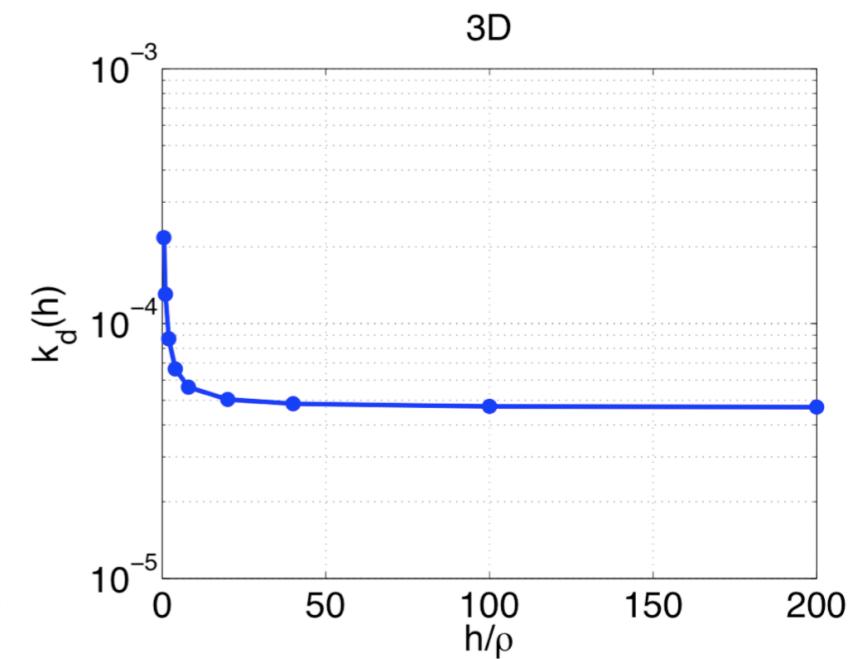
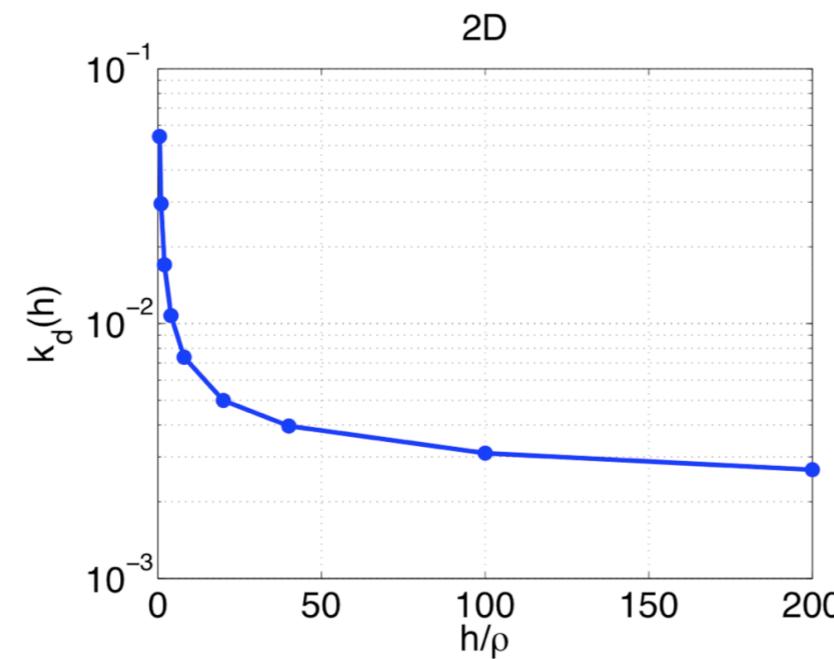
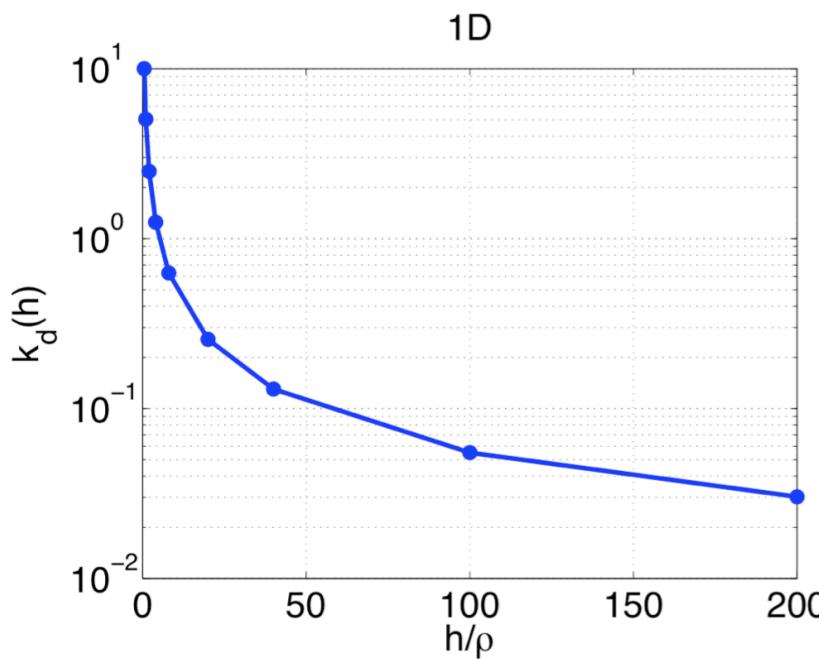


## Correction in rate constants 2D





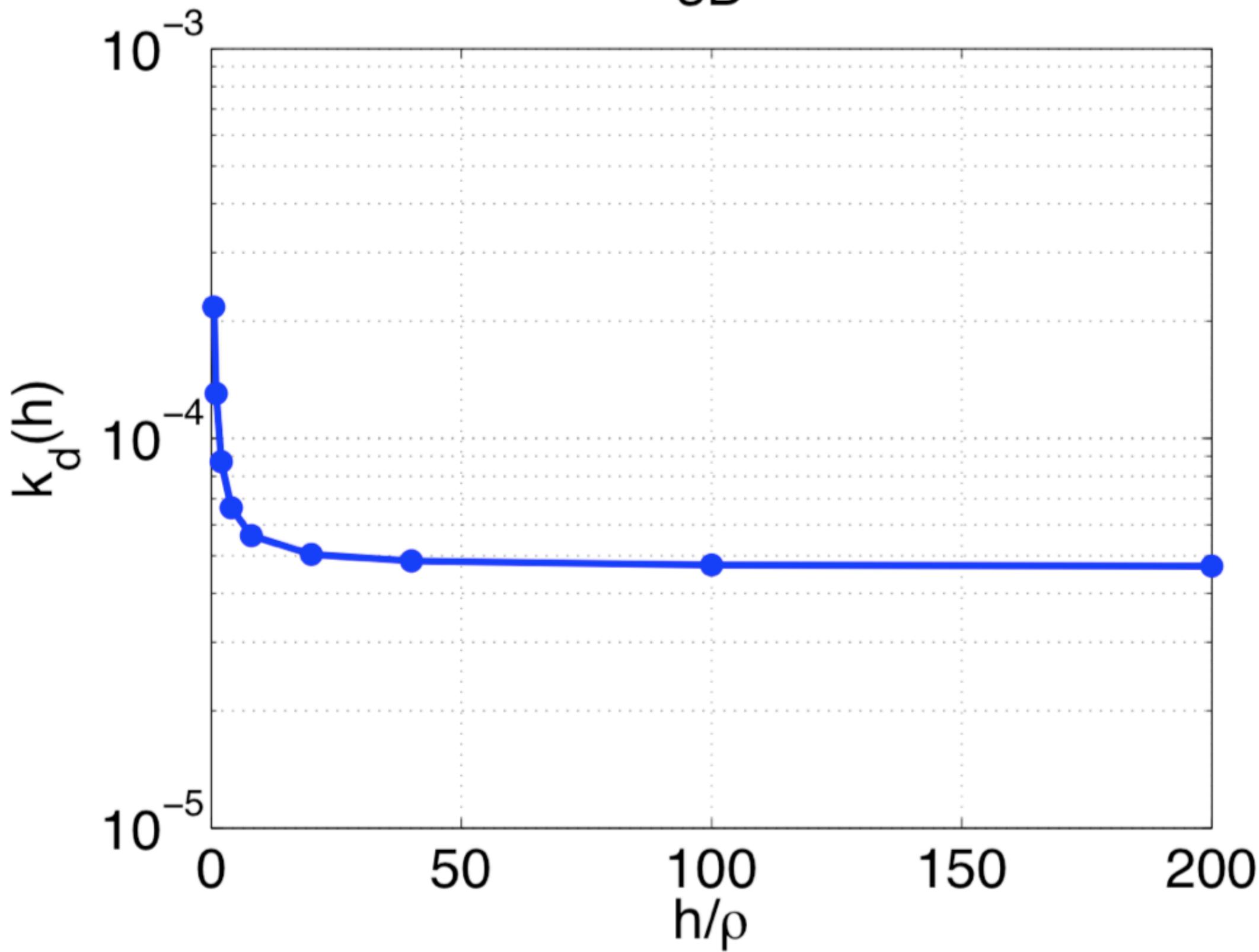
# Correction in rate constants





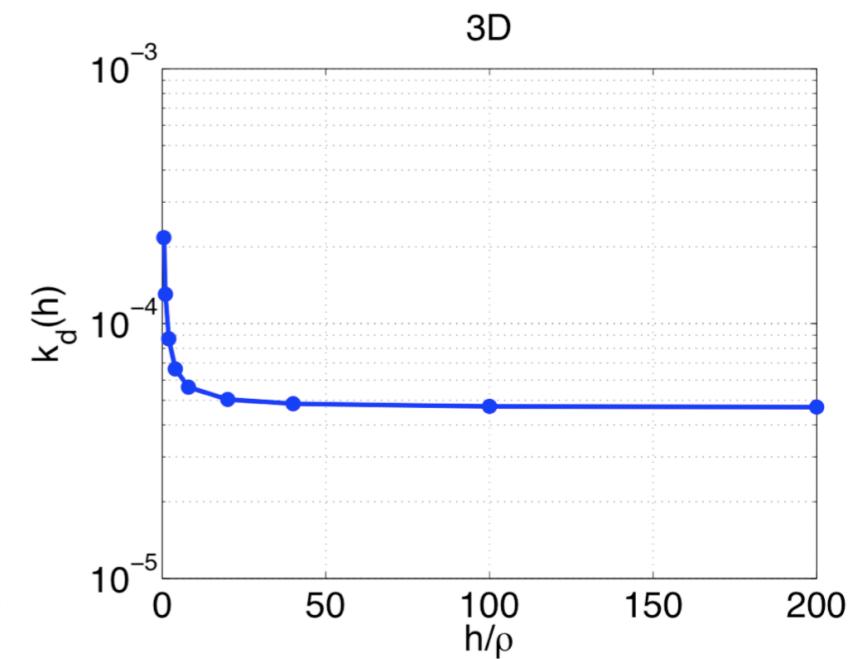
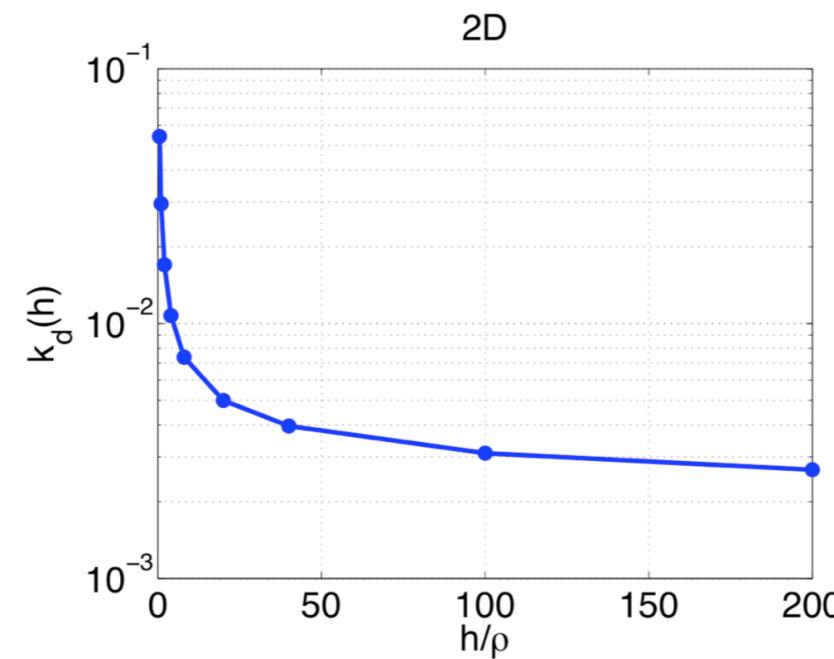
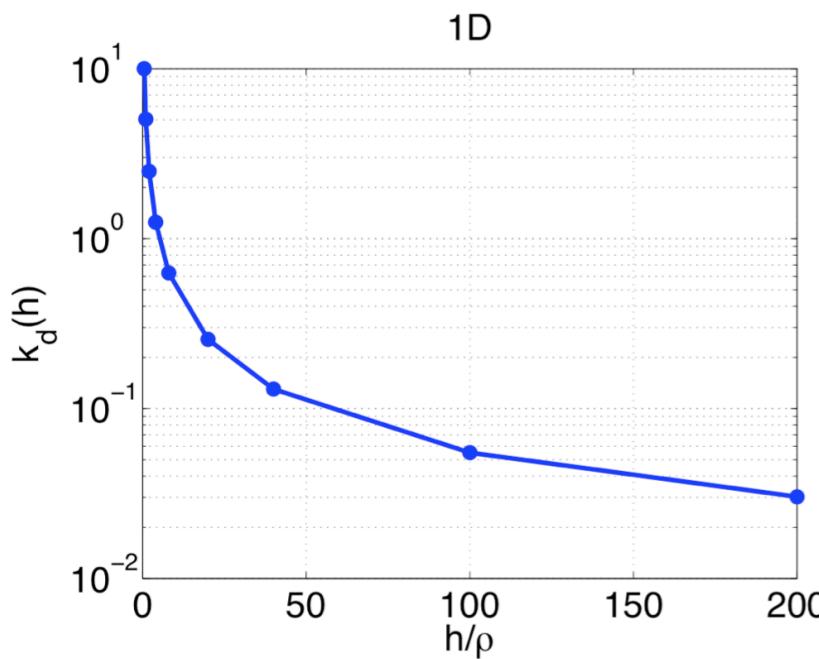
# Correction in rate constants

3D





# Correction in rate constants





# Implications

