Thesis Proposal

Ionic transport properties in the nano-channel

A study on the ionic coulombic blockade

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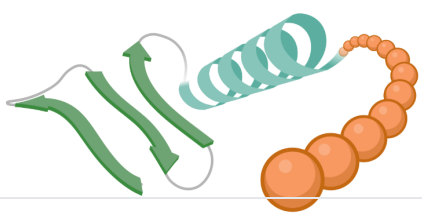
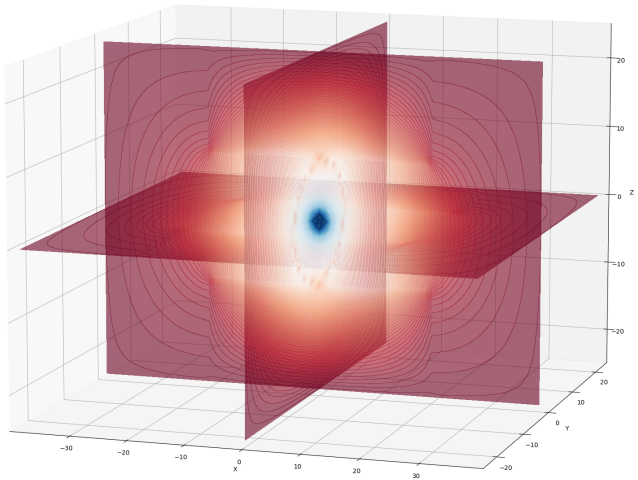


Background



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$$\nabla^2 \phi = -\rho$$

1. Zhou, Z., Payne, P., Vasquez, M., Kuhn, N. & Levitt, M. Finite-difference solution of the Poisson–Boltzmann equation: Complete elimination of self-energy. J Comput Chem 17, 1344–1351 (1996).

An approximation

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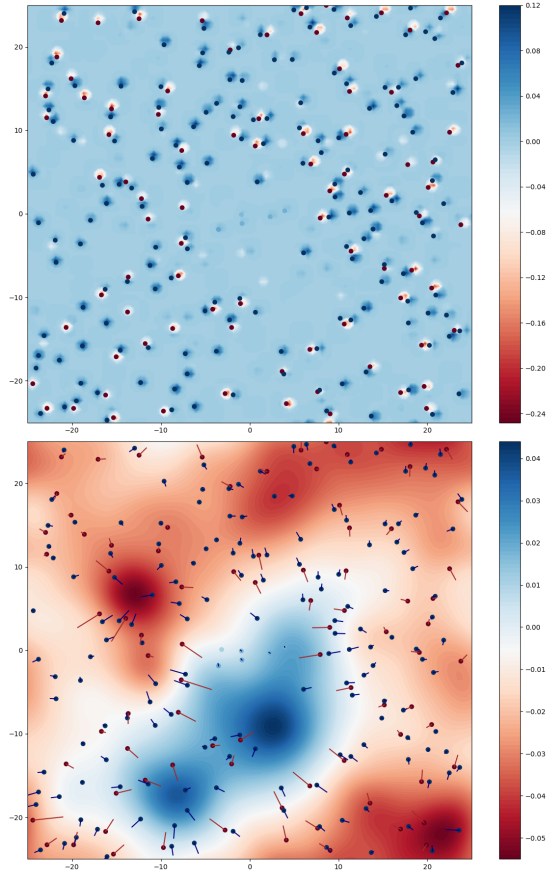

Literature

We define $\delta p_0^{(i)}(\xi') = \left(p_0^{(i)}(\xi') - \left\langle p_0^{(i)}(\xi') \right\rangle\right)$. Then we have:

$$
\begin{aligned}
var\left(p_0^{est}(\xi')\right) &= \left\langle \left(\sum_{i=1}^{M} w_i \delta p_0^{(i)}(\xi') \right)^2 \right\rangle \\
&= \left\langle \sum_{i=1}^{M} w_i^2 \left(\delta p_0^{(i)}(\xi')\right)^2 + \sum_{j=1}^{M} \sum_{k!=j}^{M} w_j w_k \delta p_0^{(j)}(\xi') \cdot \delta p_0^{(k)}(\xi') \right\rangle \\
&= \sum_{i=1}^{M} w_i^2 \left\langle \left(\delta p_0^{(i)}(\xi')\right)^2 \right\rangle + \sum_{j=1}^{M} \sum_{k!=j}^{M} w_j w_k \left\langle \delta p_0^{(j)}(\xi') \cdot \delta p_0^{(k)}(\xi') \right\rangle
\end{aligned}
$$