$$C(z) = C_{sat} - (C_{sat} - C_\ell)\ \mathrm{erf}\left(\frac{z}{\delta\sqrt{2}}\right)$$

$$\Rightarrow j(z)\Big|_{z=0} = -D\frac{d}{dz}C(z)\Big|_{z=0}$$

$$= +D\,[C_{sat} - C_\ell]\,\frac{d}{dz}\frac{2}{\sqrt{\pi}}\int_0^{z/\delta\sqrt{2}} e^{-t^2}\,dt$$

$$= +\frac{2D}{\sqrt{\pi}}[C_{sat} - C_\ell]\,\underbrace{\frac{d}{dz}\left[\frac{z}{\delta\sqrt{2}}\right]}_{\text{internal derivative}}\,e^{-z^2/\delta^2\cdot 2}$$

$$\frac{d}{dx}\int_0^x f(t)\,dt = f(x)$$

$$\Rightarrow j(z)\Big|_{z=0} = \frac{2D}{\sqrt{\pi}}\,\frac{[C_{sat} - C_\ell]}{\delta\sqrt{2}}\,e^{-z^2/\delta^2\cdot 2}$$

$\delta \sim \sqrt{2Dt}$ (see later in lecture)

$$\Rightarrow j(z)\Big|_{z=0} = \underbrace{\frac{(C_{sat} - C_\ell)\sqrt{D}}{\sqrt{\pi}\sqrt{t}}}\ e^{-(z/\delta\sqrt{2})^2}$$

$$\frac{kg}{m}\,\frac{m}{s^{1/2}\,s^{1/2}} = \frac{kg}{s}$$