Sea ice floe model Mathematical methods Parameterized models Data analysis Analysis methods for novel High-resolution remote sensing Stochastic and Machine Learning Improved sea ice modeling sea ice models and in-situ data analysis sea ice models at floe scales Data assimilation and UQ Superparameterization Sea ice coupling $\dot{\mathbf{x}} = f(\mathbf{x}, t) + G(\mathbf{x}, t)\omega(t),$ Atm. $x \in \mathbb{R}^n, \varepsilon[\omega \omega^T] = Q(t)$ Ice $+\frac{1}{2}\sum_{i,j=1}^{n}\frac{\partial^{2}}{\partial x_{i}x_{j}}\big[p(GQG^{T})_{ij}\big]$ Quantifying model errors and Computationally-efficient and Sea ice predictability in coupled accurate sea ice modeling atmosphere-ice-ocean models uncertainty in parameter estimates