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## Multivariate state and parameter estimation using data assimilation in a Maxwell-Elasto-Brittle sea ice model

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In an idealised setup, a dynamics-only sea ice model is used to investigate the fully multivariate state and parameter estimations that uses a novel Maxwell-Elasto-Brittle (MEB) sea ice rheology. In the fully multivariate state estimation, the level of damage, internal stress and cohesion are estimated along with the observed sea ice concentration, thickness and velocity. In the case of parameter estimation, we estimate the air drag coefficient and the damage parameter of the MEB model. The air drag coefficients adjust the strength of the forcing on the sea ice dynamics while the damage parameter controls the mechanical behaviour of the internal property of sea ice. We show that, with the current observation network, it is possible to improve all model state forecast and the parameter accuracy using data assimilation approaches even though problems could arise in such an idealised setup where the external forcing dominates the model forecast error growth.