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Using stochastic parameterisations to study the sensitivity of the global atmosphere to variability in unresolved processes.

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At scales near the grid-size of global climate models, variability in the atmosphere is often dominated by "fast" unresolved processes such as deep convection, which are parameterized in the models. Whilst modern parameterizations for these processes produce realistic tendencies in an average sense, their high-frequency variability is often deficient and/or unrealistic. In recent years, efforts have been made to tackle this problem through the development of increasingly sophisticated stochastic parameterizations. But we do not fully understand the scale-interactions which motivate such efforts; how and by what mechanisms is the atmosphere's large-scale behavior sensitive to its high-frequency variability? To investigate this sensitivity, some simple stochastic parameterizations from the literature are used to alter the variability associated with the parameterized processes in a global Aqua-Planet simulation with prescribed SSTs. Large-scale tropical rainfall variability is found to be sensitive to the stochastic parameterizations, and possible mechanisms are explored.