1086-86-2693 **J. David Neelin*** (neelin@atmos.ucla.edu), **Mickael Chekroun**, **Annalisa Bracco**, **Hao Luo**, **James C. McWilliams**, **Dmitri Kondrashov**, **Michael Ghil**, **Sandeep Sahany** and **Richard Neale**. *Fundamentals of parameter sensitivity in climate models.*

The representation of subgrid scale processes introduces many poorly constrained parameters into mathematical representations of the climate system, contributing substantial uncertainty in model projections of climate change. For example, simulations of regional scale precipitation change and of climate variability such as El Niño exhibit substantial scatter across model ensembles. Is the underlying parameter dependence rough or approximately smooth; how strong is the nonlinearity? Requirements for accuracy in different regions and variables yield a multi-objective optimization problem of high dimension. Are the resulting trade-offs more limiting than those associated with nonlinear parameter dependence? Results from current global climate models appear to be reasonably smooth, but with substantial nonlinearity over the feasible parameter range in key variables. To understand potential limitations to smooth approximations, this is contrasted with rough parameter dependence in an intermediate complexity model of El Niño. This motivates an approach based on estimating Ruelle-Pollicott resonances filtered through a climate observable in a related talk by M. Chekroun. Finally, a practical example will be provided of improving constraints on deep convective parameterization. (Received September 25, 2012)